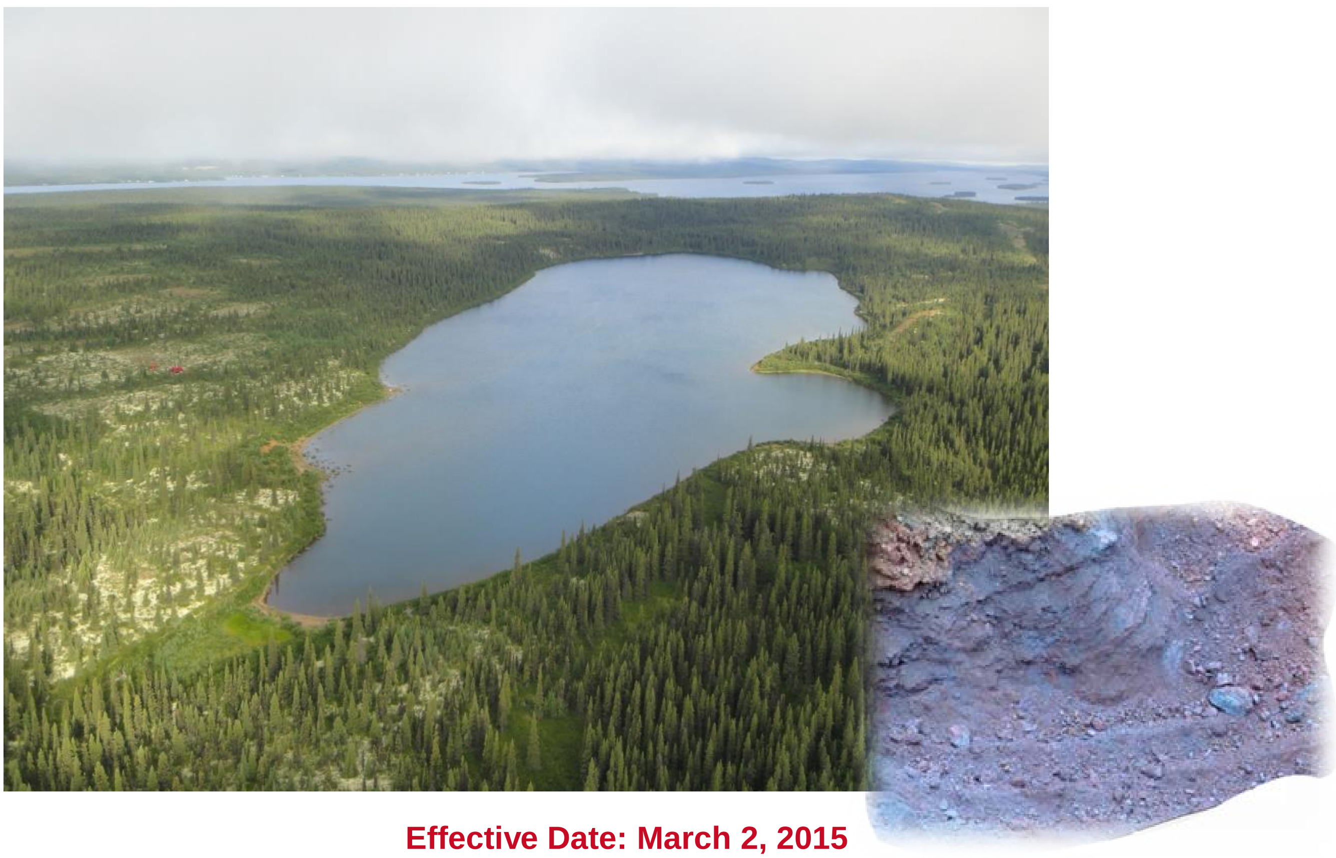
NI 43-101 Technical Report - Feasibility Study
Joyce Lake Direct Shipping Iron Ore (DSO) Project
Attikamagen Property, Labrador



Effective Date: March 2, 2015
Report Date: April 14, 2015

Angelo Grandillo, P.Eng., BBA
Patrice Live, P.Eng., BBA
Claude Duplessis, P.Eng., SGS
Carolyn Anstey-Moore, P.Geo., Stantec
Pascal Garand, P.Eng., LVM
Byron O'Connor, P.Eng., BluMetric Environmental

Prepared by

BBA

In collaboration with:

SGS Stantec LVM BluMetric Environmental

DATE AND SIGNATURE PAGE

This Report is effective as of the 2nd day of March 2015.

Original signed	April 14, 2015
Angelo Grandillo, P.Eng. Project Manager BBA Inc.	Date

Original signed	April 14, 2015
Patrice Live, P. Eng. Mining Manager BBA Inc.	Date

Original signed	April 14, 2015
Carolyn Anstey-Moore, P.Geo. Project Manager Stantec Consulting Ltd.	Date

Original signed	April 14, 2015
Claude Duplessis, P.Eng. Senior Consultant SGS Canada Inc.	Date

Original signed	April 14, 2015
Pascal Garand, P.Eng. Senior Engineer LVM Inc.	Date

Original signed	April 14, 2015
Byron O'Connor, P.Eng. Senior Engineer BluMetric Environmental Inc.	Date

CERTIFICATE OF QUALIFIED PERSON

I, Angelo Grandillo, do hereby certify that:

1. I reside at 1060 des Perdrix, Longueuil, Québec, Canada, J4J 5J7.

2. I am an Associate and a Project Manager in the consulting firm:
   BBA Inc.
   630 René-Lévesque Blvd. West
   Suite 1900
   Montréal, Québec
   Canada H3B 1S6

3. This certificate accompanies the report titled "Feasibility Study for the Joyce Lake Direct Shipping Iron Ore (DSO) Project of the Attikamagen Property, Labrador" for Labec Century Iron Ore (LCIO), having an effective date of March 2, 2015.

4. I graduated from McGill University with a B. Eng. in Metallurgy in 1981, and M. Eng. in 1988.

5. I am in good standing as a member of the Order of Engineers of Québec (#38342) and Professional Engineers and Geoscientists, Newfoundland and Labrador (#06360).

6. I have read the definition of "qualified person" set out in the National Instrument 43-101 ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.

7. I have personally visited the property on October 16 and 17 of 2014.

8. I am responsible for the coordination, consolidation and review of this NI 43-101 Technical Report. I have also authored and/or am responsible for sections: 1, 2,3, 13, 17, 18, 19, 21, 22 and 24 to 27.

9. I am independent of the issuer as described in Section 1.5 of NI 43-101. I have had prior involvement with the Joyce Lake property as a "qualified person" for the Preliminary Economic Assessment Study preceding this Feasibility Study.

10. I have practiced my profession continuously since my graduation in 1981. My relevant experience includes technical and operations management and project management in iron ore and gold projects.

11. I have read National Instrument 43-101, Form 43-101F1 and the Technical Report has been prepared in compliance with this Instrument.

12. As of the effective date of this Technical Report, to the best of my knowledge, information and belief, the Technical Report and the parts that I am responsible for, contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Prepared in Montréal, Québec, April 14, 2015

Original Signed and Sealed

Angelo Grandillo, Eng., P.Eng., M.Eng.

CERTIFICATE OF QUALIFIED PERSON

I, Patrice Live, do hereby certify that:

1. I reside in Longueuil, Quebec, Canada.

2. I am an Associate and a Mining Engineer in the consulting firm:
   BBA Inc.
   630 René-Lévesque Blvd. West
   Suite 1900
   Montréal, Québec
   Canada H3B 1S6

3. This certificate accompanies the report titled "Feasibility Study for the Joyce Lake Direct Shipping Iron Ore (DSO) Project of the Attikamagen Property, Labrador" for Labec Century Iron Ore (LCIO), having an effective date of March 2, 2015.

4. I graduated from Laval University with a B. Eng. in Mining in 1976.

5. I am in good standing as a member of the Order of Engineers of Québec (#38991) and Professional Engineers and Geoscientists, Newfoundland and Labrador (#07044).

6. I have read the definition of "qualified person" set out in the National Instrument 43-101 ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.

7. I have not visited the property.

8. I have supervised and verified the preparation of Sections 15 and 16 of this NI-43-101 Technical Report.

9. I am independent of the issuer as described in Section 1.5 of NI 43-101. I have not had prior involvement with the Joyce Lake property.

10. I have practiced my profession continuously since my graduation in 1976. My relevant experience includes technical and study management in iron ore and gold projects.

11. I have read National Instrument 43-101, Form 43-101F1 and the Technical Report has been prepared in compliance with this Instrument.

12. As of the effective date of this Technical Report, to the best of my knowledge, information and belief, the Technical Report and the parts that I am responsible for, contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Prepared in Montréal, Québec, April 14, 2015

Original Signed and Sealed

Patrice Live, Eng., P.Eng.

CERTIFICATE OF QUALIFIED PERSON

I, Claude Duplessis P. Eng., do herby certify that:

1. I reside in Quebec, Quebec, Canada

2. I am a senior engineer at GoldMinds Geoservices Inc. and consultant with SGS Canada Inc. – Geostat with an office at 10 Blvd de la Seigneurie East, Suite 203, Blainville, Quebec, Canada, J7C 3V5;

3. This certificate is to accompany the Report entitled: "Feasibility Study for the Joyce Lake Direct Shipping Iron Ore (DSO) Project of the Attikamagen Property, Labrador" for Labec Century Iron Ore (LCIO), having an effective date of March 2, 2015

4. I am a graduate from the University of Quebec in Chicoutimi, Quebec in 1988 with a B.Sc.A in geological engineering and I have practiced my profession continuously since that time. I am a registered member of the Ordre des ingénieurs du Québec (Registration Number 45523), registered engineer in the province of Alberta (Registration Number M77963) and a registered engineer in the province of Newfoundland & Labrador (Registration Number 0681) I have worked as an engineer for a total of 24 years since my graduation. My relevant experience for the purpose of the Technical Report is: Over 20 years of consulting in the field of Mineral Resource estimation, orebody modeling, mineral resource auditing and geotechnical engineering. I have specific experience in modelling and estimation of various types of iron deposits.

5. I did the personal inspection of the Joyce Lake property in Newfoundland & Labrador and the Schefferville facilities in Quebec from September 26th and 27th of 2012, for a review of exploration methodology, RC drilling technique and sampling procedures for 2013 technical report. A subsequent visit was conducted on March 9th and 10th of 2013 and October 3rd and 4th 2013, for a review of exploration methodology, RC drilling technique, core diamond drilling and sampling procedures with density measurements for the 2014 Mineral Resource Estimate update.

6. I am responsible for sections 4, 5, 6, 7, 8, 9, 10, 11, 12, 14 and 23 of the Technical Report as well as co-author of sections 1, 25 & 26.

7. I am independent of Labec Century Iron Ore Inc as described in section 1.5 of the Instrument;

8. I have had no prior involvement with the property that is the subject of the Technical Report;

9. I have read the Instrument and the sections of the Technical Report that I am responsible for, which have been prepared in compliance with the Instrument; and

10. As of the effective date of the Technical Report, to the best of my knowledge, information, and belief, the parts of the Technical Report that I am responsible for, contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Prepared in Québec, Quebec this April 14th 2015

Original Signed and Sealed______

Claude Duplessis, P.Eng.

Carolyn Anstey-Moore, M.Sc., M.A.Sc., P.Geo.
Stantec Consulting Ltd.
141 Kelsey Drive, St. John's, NL
A1B 0L2
Telephone: 709-576-1458
Fax: 709-576-2126
Email: carolyn.ansteymoore@stantec.com

CERTIFICATE OF REVIEWER

To Accompany the Report entitled:

"NI 43-101 Technical Report on the Feasibility Study for the Joyce Lake Direct Shipping Iron Ore (DSO) Project of the Attikamagen Property, Labrador" dated April 14, 2015 with effective date of March 2, 2015.

I, Carolyn Anstey-Moore, M.Sc., M.A.Sc., P.Geo., do hereby certify that:

1) I am a Senior Associate and Project Manager presently with Stantec Consulting Ltd. with an office situated at 141 Kelsey Drive, St. John's, NL, Canada;
2) I graduated from Memorial University of NL in 1987 with a B.Sc. (Hons) in Geology; from the University of Toronto in 1992 with a M.Sc. in Geology; and from Memorial University of NL in 2003 with a M.A.Sc. in Environmental Engineering.
3) I am a member in good standing of the Professional Engineers and Geoscientists of Newfoundland and Labrador (No. 04085);
4) I have worked as a geoscientist continuously since graduation from university in 1987, 1992, and 2003;
5) I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined by NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101;
6) I am responsible for the review of Sections 20.1, 20.2, 20.3, 20.4, 20.5, 20.6, 20.9, 20.10, and 20.11 (only) of the report entitled **"NI 43-101 Technical Report on the Feasibility Study for the Joyce Lake Direct Shipping Iron Ore (DSO) Project of the Attikamagen Property, Labrador"** dated April 14, 2015 with effective date of March 2, 2015;
7) I have visited the site from August 20 to 22, 2012;
8) I have had prior involvement with the project that is the subject of the Feasibility Study in earlier studies for Labec Century Iron Ore Inc. for the Joyce Lake DSO Project;

9) I state that, as of the date of the certificate, to the best of my qualified knowledge, information and belief, the sections of the Technical Report that I am responsible for contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading;

10) I have no personal knowledge, as of the date of this certificate, of any material fact or material change that is not reflected in this Technical Report;

11) I am independent of the issuer as defined in section 1.5 of NI 43-101;

12) I have read National Instrument 43-101 and Form 43-101F1, and the sections of the Technical Report that I am responsible for have been prepared in compliance with that instrument and form;

This 14th day of April, 2015.

Original signed and sealed

(Signed) “Carolyn Anstey-Moore”

____

Carolyn Anstey-Moore, M.Sc., M.A.Sc., P.Geo.
Senior Associate, Project Manager
Stantec Consulting Ltd.

CERTIFICATE OF QUALIFIED PERSON

I, Pascal Garand, do hereby certify that:

1. I reside in Westmount, Quebec, Canada.

2. I am a senior engineer acting as Consulting Expertise Director in the consulting firm:
   LVM, a division of EnGlobe Corporation
   1200 Saint-Martin boulevard West, Suite 400
   Laval, Québec
   Canada H7S 2E4

3. This certificate accompanies the report titled "Feasibility Study for the Joyce Lake Direct Shipping Iron Ore (DSO) Project of the Attikamagen Property, Labrador" for Labec Century Iron Ore (LCIO), dated April 14th, 2015 with effective date of March 2nd, 2015.

4. I graduated from École Polytechnique of Montreal with a B. Eng. in Civil Engineering in 1977 and completed a Master's Degree in Applied Sciences with a major in Geotechnical Engineering in 1981.

5. I am in good standing as a member of the Order of Engineers of Québec (# 31373) and Professional Engineers and Geoscientists, Newfoundland and Labrador (# 07787).

6. I have read the definition of "qualified person" set out in the National Instrument 43-101 ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.

7. I have not visited the property.

8. I have supervised and verified the preparation of Chapters 20.7 of this NI-43-101 Technical Report.

9. I am independent of the issuer as described in Section 1.5 of NI 43-101. I have not had prior involvement with the Joyce Lake property.

10. I have practiced my profession continuously since my graduation in 1977. My relevant experience includes technical and study management in iron ore, gold and multi-metallic mining projects.

11. I have read National Instrument 43-101, Form 43-101F1 and the Technical Report has been prepared in compliance with this Instrument.

12. As of the effective date of this Technical Report, to the best of my knowledge, information and belief, the Technical Report and the parts that I am responsible for, contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Prepared in Montréal, Québec, April 14th, 2015

Original Signed and Sealed

Pascal Garand, P.Eng.

CERTIFICATE OF QUALIFIED PERSON

I, Byron O'Connor, do hereby certify that:

1. I reside in Kingston, Ontario, Canada.

2. I am a Senior Engineer in the consulting firm:
   BluMetric Environmental Inc.
   4 Cataraqui Street, Tower Suite
   Kingston, Ontario
   K7K 1Z7

3. This certificate accompanies the report titled "Feasibility Study for the Joyce Lake Direct Shipping Iron Ore (DSO) Project of the Attikamagen Property, Labrador" for Labec Century Iron Ore (LCIO), having an effective date of March 2, 2012.

4. I graduated from the University of New Brunswick with a B.Sc. in Geology in 1986 and a B.A.Sc. in Geological Engineering in 1989.

5. I am in good standing as a member of the Professional Engineers and Geoscientists, Newfoundland and Labrador (05067). Professional Engineers Ontario (90323999), Association of Professional Engineers and Geoscientists of Alberta (110438), Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists (L1670), and Association of Professional Engineers of Yukon (1976) .

6. I have read the definition of "qualified person" set out in the National Instrument 43-101 ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.

7. I have personally visited the property on October 14, 15, 16, 17, 2014.

8. I have contributed to Chapter: 20.8.

9. I am independent of the issuer as described in Section 1.5 of NI 43-101. I have had no prior involvement with the Joyce Lake property as a "qualified person".

10. I have practiced my profession continuously since my graduation in 1989. My relevant experience includes water management, dewatering assessments, and groundwater and surface water characterizations at iron ore mines, base metals mines, and gold mines.

11. I have read National Instrument 43-101, Form 43-101F1 and the Technical Report has been prepared in compliance with this Instrument.

12. As of the effective date of this Technical Report, to the best of my knowledge, information and belief, the Technical Report and the parts that I am responsible for, contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Prepared in Kingston, Ontario, April 14, 2015

Original Signed and Sealed

Byron O'Connor, P.Eng.

List of Abbreviations			
°	degree	h	hour
µg/L	microgram per litre	H_2O	water
µm	micron	ha	hectare
Al_2O_3	aluminum oxide	HG	high grade
Ave.	average	HLS	heavy liquid separation
BBA	BBA Inc.	IBA	Impact Benefit Agreement
CAD	Canadian dollar	ID	identification
CFR	Cost and Freight	IOC	Iron Ore Company of Canada
CIM	Canadian Institute of Mining, Metallurgy and Petroleum	IP	induced polarization
CLM	Consolidated Thompson Limited	IRR	internal rate of return
cm	centimetre	IT	information technology
CO_2	carbon dioxide	K_2O	potassium oxide
COG	cut-off grade	kg	kilogram
CRA	commercial, regional or Aboriginal	km	kilometre
CSIRO	Commonwealth Scientific and Industrial Research Organisation	km/h	kilometres per hour
CSRS	Canadian Spatial Reference System	km^2	square kilometre
CSV	comma separated value	kV	kilovolt
CWi	Bond crusher work index	kW	kilowatt
d	day	kWh/t	kilowatt hour per tonne
DMS	dense media separation	L	litre
DMT	dry metric tonne	L/s	litres per second
DSO	direct shipping ore	lb	pound
DTH	down-the-hole	LCIO	Labec Century Iron Ore Inc.
DXF	drawing exchange format	LG	Lerchs-Grossman
EA	environmental assessment	LG	low grade
EIS	Environmental Impact Statement	LGZ	low grade zone
EPCM	Engineering, Procurement and Construction Management	LM&E	Labrador Mining & Exploration
EPR	Environmental Preview Report	LMH	Lower Massive Hematite
Fe	iron (also referred to as TFe)	LOI	loss on ignition
Fe_2O_3	iron oxide	LOM	life of mine
FIFO	fly-in fly-out	LRC	Lower Red Chert
FOB	Free on Board	m	metre
FS	feasibility study	m^3	cubic metre
ft	foot	masl	metres above sea level
g	grams	MgO	magnesium oxide
G&A	general and administrative	mi	mile
GPR	ground penetration radar	MIF	Middle Iron Formation
GPS	global positioning system	min	minutes
GSC	Geological Survey of Canada	MIRIAD	Mineral Rights Administration System
GWh	gigawatt hour	mm	millimetre
Mn	manganese	S	sulphur

List of Abbreviations			
MnO	manganese oxide	S.G.	specific gravity
Mt	million tonnes	SE	southeast
MTO	material take-off	SEC	Securities and Exchange Commission
Mtpa	million tonnes per annum	SEDAR	System for Electronic Document Analysis and Retrieval
MW	megawatt	SG&A	selling, general and administrative
Na_2O	sodium oxide	SiO_2	silicon dioxide
NAD83	North American Datum 1983	sq.mi.	square mile
NE	northeast	t/m^3	tonnes per cubic metre
NFPA	National Fire Protection Association	TDS	total dissolved solids
NLDOEC	Newfoundland and Labrador Department of Environment and Conservation	TFe	total iron (also referred to as Fe)
NPV	net present value	TOS	trade-off study
NW	northwest	TRT	Tshiuetin Rail Transportation Inc.
P_2O_5	phosphorus pentoxide	TSE	Toronto Stock Exchange
PEA	preliminary economic assessment	TSX	Toronto Stock Exchange
PGC	Pink Grey Chert	UHF	ultra high frequency
POV	pre-operational verifications	UIF	Upper Iron Formation
PSD	particle size distribution	UMH	Upper Massive Hematite
Pt	platinum	URC	Upper Red Chert
QA/QC	quality assurance / quality control	USD	United States dollar
QNS&L	Quebec North Shore and Labrador Railway	UTM	Universal Transverse Mercator
QP	qualified person	V	Volt
RC	reverse circulation	VHF	very high frequency
RC	Red Chert	VLF-EM	very low frequency -electromagnetic
RFQ	request for quotation	WHIMS	wet high intensity magnetic separation
ROM	run of mine	XRF	x-ray fusion
RQD	rock quality designation	yr(s)	year(s)
RS	Ruth Shale		

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 SUMMARY

1.1 Introduction

BBA has been mandated by Labec Century Iron Ore Inc. (Labec Century or LCIO) to prepare a Feasibility Study for the Joyce Lake DSO Project (the Joyce Lake Project or the Project), located in Newfoundland and Labrador, 20 km northeast of Schefferville. A total of 17.72 Mt of Mineral Reserves, as classified according to NI 43-101 guidelines, have been defined to be processed over approximately 7 years using conventional open pit mining and a dry crushing and screening process. The nominal 2.5 Mtpa of combined lump and sinter fines products are to be trucked to a rail loop connecting to the existing rail network and loaded into rail cars for delivery to the IOC port in Sept-Îles.

This Technical Report presents the results of the Feasibility Study (FS) for the development of the Joyce Lake DSO Project. The effective date of the FS is March 2, 2015. For this study, LCIO retained the services of several specialized firms including:

- BBA Inc. (BBA) for general study management, mining, processing, site infrastructure, estimation and financial analysis and report integration;
- SGS Canada Inc. (SGS Geostat or SGS) for the mineral resource estimate;
- Stantec Consulting Ltd. (Stantec) for environmental and permitting;
- LVM Inc. (LVM) a division of EnGlobe Corporation Inc. for geotechnical considerations including the pit slopes;
- BluMetric Environmental Inc. (BluMetric Environmental) for hydrogeology.

While BBA prepared the financial analysis, the product selling price and applicable taxation regimes were provided by LCIO.

1.2 Property Description and Ownership

The Project is part of the Attikamagen Property (the Property). The Property includes one group of claims straddling the boundary between the Provinces of Québec and Newfoundland and Labrador that are presently owned 100% by LCIO. The Property includes 405 designated claims located in Québec (which include the Hayot Lake taconite deposit) and six mineral licences in Labrador (which include the Joyce Lake DSO Project). The Property covers a total area of approximately 36,142 hectares.

The Project is comprised of six mineral licences located in Newfoundland and Labrador and includes a total of 682 mineral claims covering a total area of approximately 17,049 hectares.

The Project is located approximately 20 kilometres northeast of Schefferville, Québec and is only accessible by air. The Schefferville area is characterized by a sub-arctic continental climate with mild summers and very cold winters. This area is in the boreal forest with low rolling hills rising from 600 to 700 m above sea level.

LCIO is a joint venture company with 60% owned by Century Iron Ore Holdings Inc. (Century Holdings) and 40% by WISCO Canada Attikamagen Resources Development & Investment Limited (WISCO Attikamagen). The joint venture is governed by a shareholders' agreement dated December 19, 2011 (the "Attikamagen Shareholders Agreement") between Century Iron Mines Corporation (Century), WISCO International Resources Development & Investment Limited (WISCO International), WISCO Attikamagen and LCIO. WISCO Attikamagen, as a wholly owned subsidiary of WISCO International, has invested an aggregate of $40M under the Attikamagen Shareholders' Agreement in consideration for the acquisition of its 40% interest in LCIO. Century's 60% interest in LCIO is held through Century Holdings, a 100% owned subsidiary of Century. The Attikmagen Shareholders' Agreement outlines the fundamental agreements between Century and WISCO International pertaining to the joint ownership, funding, management and operation of LCIO and the Attikamagen Iron Project.

According to the Attikamagen Shareholders Agreement, upon production from the Joyce Lake DSO Project, WISCO Attikamagen will have the right to purchase a percentage of product from LCIO equal to its equity share interest in LCIO at market value and on standard commercial terms. WISCO International will also have the right to purchase an additional 20% of the production from the Joyce Lake DSO Project at a price to be agreed upon with Century.

Royalties on the Property are presented in Section 4.4.1 of this report.

1.3 History

The Québec-Labrador Iron Range has a tradition of iron ore mining since the early 1950s and is one of the largest iron producing regions in the world. The former direct shipping iron ore (DSO) operations at Schefferville operated by the Iron Ore Company of Canada (IOC) produced in excess of 150 million tons of lump and sinter fines between 1954 and 1982.

The first serious exploration in the Labrador Trough occurred in the late 1930s and early 1940s when Hollinger North Shore Exploration Company Limited (Hollinger) and Labrador Mining and Exploration Mining Company Limited (LM&E) acquired large mineral concessions in the Québec and Labrador portions of the Trough. In 1951 Burgess mapped the Joyce Lake area. Mining and shipping from the

Hollinger lands began in 1954 under the management of the IOC, a company specifically formed to exploit the Schefferville area iron deposits.

As the technology of the steel industry changed over the ensuing years, more emphasis was placed on the concentration of ores from the Wabush area, while interest in and markets for the direct shipping ores of Schefferville declined. In 1982, IOC closed its operations in the Schefferville area.

In 2007, 3099369 Nova Scotia Ltd. examined the correlation between aeromagnetic response and iron content by using the iron formations in the area. It was postulated that regions of lower magnetic susceptibility may be enriched in hematite relative to the surrounding more magnetic rocks.

Also in 2007, Champion conducted an airborne magnetic, gamma-ray and VLF-EM (very low frequency - electromagnetic) geophysical survey on the Property, as well as a preliminary surface-mapping and a reconnaissance sampling program to provide ground reference samples for correlation with the geophysical data.

Champion extended their airborne geophysical study in 2008 to gain coverage on the Québec portion of their property. Detailed mapping, sampling and trenching done on the Lac Sans Chef, Jennie Lake and Joyce Lake areas confirm that the airborne high resolution vertical gradient magnetic anomalies coincide with Middle and Upper Iron formation. The sampling program focused on the magnetite-(hematite)-chert iron formation outcrops found at the Lac Sans Chef and Jennie Lake areas where these iron host units are repeated by folding, adding significant width potential. These folded areas offer the best potential for significant iron mineral resources and are outlined by strong airborne magnetic anomalies within the 60 km strike length of the property.

The Project is located within the Labrador Trough, a Proterozoic volcano-sedimentary sequence wedged between Archean basement gneisses. The Labrador Trough, otherwise known as the Labrador-Québec Fold Belt, extends for more than 1,000 km along the eastern margin of the Superior Craton from the Ungava Bay to Lake Pletipi, Québec. The belt is about 100 km wide in its central part and narrows considerably to the north and south.

The iron formation occurring on the Project consists mostly of subunits of the Sokoman formation characterized by recrystallized chert and jasper with bands and disseminations of magnetite, hematite and martite; a type of hematite pseudomorph after magnetite and specularite. Other gangue minerals are a series of iron silicates comprised of minnesotaite, pyrolusite and stilpnomelane and iron carbonate, mainly siderite.

1.4 Status of Exploration

Most historic explorations on the Schefferville area iron ore properties were carried out by IOC until the closure of its operation in the early 1980s. A considerable amount of data used in the evaluation of the resource and reserve estimates for Joyce Lake is provided in the documents, sections and maps produced by IOC or their consultants.

More recent aeromagnetic exploration has been carried out by 3099369 Nova Scotia Ltd. in 2007. The same year, Champion conducted an airborne magnetic, gamma-ray and VLF-EM (very low frequency - electromagnetic) geophysical survey on the Property, as well as a preliminary surface-mapping and a reconnaissance sampling program to provide ground reference samples for correlation with the geophysical data.

In the fall of 2010, LCIO drilled boreholes in the area and found three potential DSO targets. All targets were selected based on geological and geophysical data. The taconite target is a shallow dipping magnetite-rich iron formation with an expected minimum thickness of 60 m to 100 m.

At the end of November 2012, 78 RC drillholes were completed in Joyce Lake. In addition to drilling, 30 tonnes of bulk sample were collected for metallurgical testing and sent to Actlabs and SGS Lakefield.

From 2010 to 2013, LCIO completed 176 drillholes and 16 channels on its then Joyce Lake DSO prospect, and collected samples to evaluate the iron ore deposit. LCIO also conducted gravity surveys on the property in 2011 and 2013.

1.5 Mineral Processing and Metallurgical Testing

No new metallurgical testwork was done for the purposes of this FS. Testwork on both composites and bulk samples was conducted for the Preliminary Economic Assessment (PEA) and included mineralogical analyses, beneficiation testing as well as simple screening tests of as-crushed samples.

In general, the beneficiation testwork was performed on composites ranging from ~40-60%Fe including Wilfley table tests, dense media separation (also referred to as heavy liquid separation), flotation and wet high intensity magnetic separation (WHIMS), and concluded that it would be difficult to upgrade low Fe grade samples to acceptable product grades without fine grinding.

Testwork on bulk samples included comminution tests, screening of as-crushed samples, scrubbing and beneficiation testwork. Size-by-size assays showed that Fe grade decreased with decreasing particle size. Consequently, a slight upgrading of iron to the lump product was observed in the screening tests. Beneficiation tests including heavy liquid separation, WHIMS and Wilfley table tests showed that upgrading of the bulk samples was possible, however not without significant iron losses, especially when dealing with lower grade samples, as would be expected.

1.6 Mineral Resource Estimation Methodology and Geological Modeling

The resource block model for Joyce Lake uses drillhole data, which comprises the basis for the definition of 3D mineralized envelopes with resources limited to the material inside those envelopes. Drillhole data within the mineralized envelopes are then transformed into fixed length composites followed by interpolation of the grade of blocks on a regular grid and filling the mineralized envelopes from the grade of composites in the same envelopes. All the interpolated blocks below the topography form the mineral inventory at that date and they are classified according to proximity to composites and corresponding precision/confidence level.

The current resource estimate for the Joyce Lake deposit is 24.29 million tonnes of Measured and Indicated mineral resources at an average grade of 58.55% total iron (Fe), plus an additional 0.84 million tonnes of Inferred mineral resources at cut-off grade (COG) of 50% Fe, as shown in Table 1-1.

Mineral resource reporting was completed in GENESIS using the conceptual iron envelope. Mineral resources were estimated using variable ellipsoids in conformity with generally accepted CIM Estimation of Mineral Resource and Mineral Reserve Best Practices Guidelines. The current Mineral Resource Statement for the Joyce Lake Iron DSO deposit is presented in Table 1-1.

Table 1-1: Current Resources, Joyce Lake DSO Iron Project March 2014

55% Fe Cut-off	Tonnes	% Fe	% SiO_2	% Al_2O_3	% Mn
Measured ("M")	12,880,000	61.45	9.02	0.54	0.86
Indicated ("I")	3,600,000	61.54	9.38	0.49	0.64
M+I	16,480,000	61.47	9.1	0.53	0.81
Inferred	800,000	62.47	7.73	0.43	0.80

50% Fe Cut-off	Tonnes	% Fe	% SiO_2	% Al_2O_3	% Mn
Measured ("M")	18,650,000	58.67	13.02	0.55	0.81
Indicated ("I")	5,640,000	58.14	14.39	0.51	0.54
M+I	24,290,000	58.55	13.34	0.54	0.75
Inferred	840,000	62.00	8.43	0.43	0.78

1. Within mineralized envelope, % Fe Cut-Off on individual blocks
2. Variable Density (equation derived from core measurements), tonnes rounded to nearest 10,000.

In SGS's opinion, the geological interpretation, sample location, assay intervals, drillhole spacing, QA/QC, and grade continuity of the Joyce Lake DSO deposit are adequate for the current resource estimation and classification.

1.7 Mineral Reserves

The FS block model for the Joyce Lake deposit was prepared by SGS Geostat (SGS). The variables contained in the resource block model include coordinate location, density of blocks (mineralized block only), percentage of block inside mineralized envelope, classification (1=Measured, 2=Indicated, 3=Inferred) and grades (%Fe, %SiO_2, %Al_2O_3, %Mn). The densities provided with the model for mineralized material ranged from 2.85 t/m^3 to 3.79 t/m^3.

Pit optimization was carried out using the MineSight Economic Planner Module and the Lerchs-Grossman 3D ("LG 3-D") algorithm. The LG 3-D algorithm is based on the graph theory and calculates the net value of each block in the model. With defined pit optimization parameters such as mining costs, processing costs, transportation costs and pit slopes, the algorithm maximizes the undiscounted value of the pit shell. For this FS, only the Mineral Resources classified as either Measured or Indicated can be counted towards the economics of the pit optimization run. A series of pit optimization were produced using variable revenue factors (reduction factors on selling prices) ranging from 1% to 100% of the base case selling price for the FS (C$95.65/t 62% Fe product, FOB Sept-Îles) in order to produce the industry standard pit-by-pit graph. Then the Net Present Value (NPV) of each of the pit shells was calculated at a discount rate of 8% to identify the optimal pit. The NPV is estimated assuming a constant stripping ratio and product for sale on an annual basis and does not account for capital expenditures. Based on this analysis, the chosen pit optimization for this FS was the pit having a revenue factor of 0.775 (PIT 69). The milling cut-off grade used to classify material as an economic product for the feasibility study was determined to be 52% Fe. The ore cut-off grade was determined based on technical considerations that are more restrictive than normal economic considerations for determining the cut-off grade.

The selected optimized pit shell was then used to develop the engineered pit where operational and design parameters such as ramp grades, bench angles and other ramp details were incorporated. Once the engineered pit design was completed, the Mineral Reserves, as shown in Table 1-2, were derived.

Table 1-2: Joyce Lake Mineral Reserves at 52% Fe COG

Mineral Reserves Mineral Category	Tonnage (t)	Grade (%Fe)	Grade (%SiO_2)	Grade (%Al_2O_3)	Grade (%Mn)
High Grade Proven (Above 55% Fe)	11.63 M	61.35	9.16	0.54	0.84
Low Grade Proven (52% - 55% Fe)	2.89 M	53.31	20.70	0.60	0.70
Total Proven (Above 52% Fe)	**14.52 M**	**59.75**	**11.45**	**0.55**	**0.81**
High Grade Probable (Above 55% Fe)	2.45 M	61.50	9.48	0.50	0.61
Low Grade Probable (52% - 55% Fe)	0.75 M	53.09	21.90	0.58	0.30
Total Probable (Above 52% Fe)	**3.20 M**	**59.52**	**12.40**	**0.52**	**0.54**
Total Reserve (Above 52% Fe)	**17.72 M**	**59.71**	**11.62**	**0.55**	**0.76**
Waste Measured (50% - 52% Fe)	1.91 M	50.85	24.49	0.56	0.59
Waste Indicated (50% - 52% Fe)	0.78 M	50.81	25.44	0.56	0.19
Total Low Grade Stockpile (50% - 52% Fe)	**2.69 M**	**50.84**	**24.76**	**0.56**	**0.48**
Overburden	2.33 M	-	-	-	-
Waste Rock (<50% Fe)	67.39 M	-	-	-	-
Total Waste	**72.42 M**				
Total Material	**90.14 M**			**Strip Ratio**	**4.09**

1. The Low Grade Measured and Indicated Resources are all blocks inside the engineered pit design in the Measured and Indicated categories that fall between 50% and 52% Fe. The Low Grade Measured and Indicated Resources are reported for information only and are considered as waste.
2. Proven Reserves are all blocks inside the engineered pit design in the Measured category.
3. Probable Reserves are all blocks inside the engineered pit design in the Indicated category.
4. Open pit Mineral Reserves have been estimated using a cut-off grade of 52% Fe and a process recovery of 100%.
5. Open pit Mineral Reserves have been estimated using a dilution of 1% at 35%Fe and 46.96% SiO_2 and an ore loss of 4%.

1.8 Mining

A mine plan based on continuous operations over 360 days per year, 7 days per week and 24 hours per day was developed using MineSight's Interactive Planner Module. Mining phases, including initial overburden and waste pre-stripping requirements and a mining schedule was developed. The starter pit was designed to avoid excavation close to Joyce Lake during the pre-production and construction phases. The open pit production schedule has been developed on a 4-month basis for the life-of-mine (LOM) and was developed based on a fixed production target of 2.5 M dry tonnes per year of iron ore lump and fines products at an average grade of 60 to 62% Fe.

The mining method selected for the Project is based on conventional drill, blast, load and haul using a drill/shovel/truck mining fleet. Annual mining equipment fleet requirements were developed based on equipment performance parameters and average hauling distances based on pit design and configuration and location on the site plan for the crusher and waste piles. The primary equipment fleet includes 96-tonne diesel haul trucks, 10 m^3 diesel-hydraulic shovels, 10 m^3 front-end loader and 8.5" down-the-hole

(DTH) blast hole drills. The BBA Mining Group estimated initial and sustaining capital costs required to support the mining operation, as well as annual mining operating costs based on mining operations assumed to be carried out by LCIO using its own equipment and workforce with the exception of explosives supply and blasting services that are assumed to be contracted out.

1.9 Recovery Methods

Using the testwork performed for the PEA, BBA conducted a trade-off study (TOS) to evaluate dry versus wet processing options for the Project. It was determined that a dry processing flowsheet was most favourable and was used for design.

The Joyce Lake process consists of a two-stage dry crushing and screening process to produce “lump” and “fines” products.

Run-of-mine (ROM) material is loaded into a hopper and fed to a static grizzly screen to scalp off any oversized material (+600 mm) which is stockpiled to potentially be processed at a later date. The material passing the grizzly is fed directly onto a primary inclined linear screen and the screen oversize is crushed in a jaw crusher. The jaw crusher product and the primary screen undersize are conveyed to a secondary screening. The triple-deck screen separates material into three products: an oversize (+31.5 mm) material that is conveyed to a cone crusher for further size reduction to a targeted top size of 32 mm, a lump product (-31.5/+6.3 mm) and a fines product (-6.3 mm).

Each of the crushed products, lump and fines, are discharged onto their respective conveyors and delivered to their dedicated stockpiles. Loaders transfer the lump and fine products from the stockpiles into haul trucks for transport to a rail loop connecting to the existing Tshiuetin rail line, located 43 km away.

1.10 Project Infrastructure

The Project is staged in two main areas. The open pit mine site area, located to the north of the Iron Arm water body, includes the mineral deposit, mine operations areas including truck shop, truck wash and warehouse, explosive magazine, as well as the processing facility and laboratory, centralized power station and workers permanent camp. The product load out and rail loop area, on the eastern side of the Tshiuetin rail line approximately 20 km south of Schefferville, includes the product rail loadout stockpile, a 6.9 km rail loop and facilities and equipment for loading railcars. These two main areas are connected by a new product haul road covering a distance of 43 km. This includes a new 1.2 km rock causeway crossing the Iron Arm water body that is to be used for year-round access to the open pit mine area.

Access to the site from the town of Schefferville, Quebec will be by an existing road that will be upgraded over part of its length and extended to connect with the aforementioned product haul road. LCIO will not build, own or operate any other facility outside the aforementioned main Project areas. Product rail transportation services, from the Project rail loop connecting to the main Schefferville to Sept-Îles, Tshiuetin railway, and subsequently the IOC QNS&L railway, will be contracted from service providers, as will product unloading and ship loading at the IOC port in Sept-Îles.

1.10.1 Power Generation

The Project is not connected to an electric power utility grid and generates its own power using diesel generator sets. Electric power is provided to the main mine area infrastructure by a centralized diesel power generation station through a local power distribution grid. More remote infrastructure will have local generators for their specific power requirements.

The centralized power plant design consists of five 600 V, 818 kW prime-rated generator sets, each complemented by a step-up transformer (0.6-13.8 kV) delivering power to the processing plant, the mine infrastructure facilities (mine offices, truck shop, wash bay and warehouse), the permanent camp and the administrative buildings via 13.8 kV overhead lines.

Remote areas (rail-loop area, explosives magazine area, telecom towers, guard-house, pit perimeter dewatering pumps) will be fed by independent, stand-alone 600 V diesel generator sets.

The estimated power demand used for design of the central power plant is 2.4 MW. The average annual power generation by the central power plant is estimated at 14.1 GWh.

1.10.2 Fuel

Fuel for mining equipment, product haul trucks, wheel loaders, auxiliary equipment and for the diesel generators will be railed in from Sept-Îles. Four diesel fueling stations (namely the mine equipment station, the power plant station, the product haul truck station and the rail-loop station) will be located in proximity to its end users. Gasoline for light vehicles will be purchased directly from a distributor in the nearby communities and delivered to site.

1.10.3 Telecom

The Telecom, IT and networking systems designed for the Project will be provided by two trailer-mounted towers. All services will be installed progressively depending on when they are needed during the Early Works, Construction and Operation phases of the Project.

1.10.4 Site Services

Potable water will be pumped from a fresh water well and treated prior to use. Raw water wells will supply the truck shop, truck wash, load out and rail-loop areas, and will also be used to fill the fire water reserve tanks. A centralized sewage treatment facility for the entire site will be located at the workers camp and the solid waste generated will be disposed of through a contracted service in Schefferville.

1.10.5 Water Management

In order to develop the mine, two thirds of Joyce Lake will be drained during the construction period using a floating barge and a series of pumps, and the remaining one third will be emptied before the end of the first production year. Drainage of Joyce Lake is expected to take from four to six months in total. The design provides that perimeter trenches also be constructed along the north and south of the open pit and Joyce Lake, as recommended by Stantec. The catchment trench system collects surface run-off water that normally drains into Joyce Lake and discharges it into the watershed where Joyce Lake naturally drains. These trenches are also used to collect water pumped from the open pit perimeter wells and water pumped from the trench system at the bottom of Joyce Lake. This system is designed to collect surface water and precipitation inside the Joyce Lake footprint to avoid draining into the open pit.

Furthermore, following its hydrogeological study, BluMetric Environmental recommended that a perimeter deep well dewatering strategy be adopted as part of the mine dewatering strategy. A series of seven perimeter dewatering wells is expected to control the level of the water table in order to keep the open pit dry and to support pit slope design parameters developed by LVM in its pit stability geotechnical study. Each well will have a dedicated pumping station consisting of a pump with an electric motor and a local generator for providing the required electric power. It is expected that the water pumped from each well will be relatively clean and can be directed without treatment into the surrounding watershed via the north/south perimeter trenches.

1.11 Market Studies and Pricing

LCIO performed its own internal market study for iron ore products pricing and demand. It also provided a summary to BBA of information related to its discussions with service providers for rail transportation, unloading and ship loading at port.

1.11.1 Iron Ore Market Overview

The developing world, and in particular Asia, will be the growth engine for the next decade. The developed world demand outlook is more moderate and so the majority of the growth in materials demand is expected to come from developing world consumption, supported by the continued urbanization of the major developing economies, including China and India.

The price of iron ore declined by nearly 50% in 2014 as mining companies, including Rio Tinto Group and BHP Billiton Ltd., expanded production in Australia, resulting in an oversupply of iron ore. It is expected that more of China's higher cost iron ore supply will exit the market, as the lower cost Australian supply continues to flood the market. The Australian Bureau of Resources and Energy Economics estimated that "global trade in iron ore increased by 10% in 2014 to 1.35 billion tonnes, driven by a 24% increase in Australian exports and a 10% increase in Brazilian exports. China's imports are estimated to have increased by 118 million tonnes as steel mills continued to switch from domestics to cheaper foreign sources of iron ore."

As noted in Australia's Resources and Energy Quarterly, December 2014 – "2015 world trade in iron ore is forecast to increase by 2.8% to 1.4 billion tonnes, supported by a 7% increase in Australian and Brazilian exports. However, this increase is forecast to be partially offset by a reduction in exports from high cost producers."

Australia & New Zealand Banking Group Ltd. recently said in a report "that any recovery in the price of iron ore will be driven by supply cuts, including high-cost mines in China, where almost the entire industry is loss-making at current prices now." They further noted that prices are set to remain weak in 2015, but appear to be "oversold" and there is potential for a relief rally in the second half of 2015.

1.11.2 Iron Ore Pricing for Project Financial Evaluation

The Project will produce high grade lump and sinter fines products (approximately 62%Fe) in its first six years of operation and, subsequently, low grade lump and sinter products from stockpiles accumulated over the course of the mining operation. Low grade stockpiles (52% to 55%Fe) will be processed once the high grade ore has been exhausted.

Recent iron ore market and price volatility has made selling price forecasting difficult. Current prices are likely near market lows and consolidation, followed by price increases, are anticipated over the 2016-2020 period, as described earlier. LCIO's internal forecasting is based on confidence in continued Chinese iron ore demand and a recovery in the sustained long term price of iron ore products.

For this FS, the long term price base case is US$95 DMT CFR China for 62% Fe sinter fines. This is based on an average Metals Price Forecast from various reports from banks, analysts and other financial institutions in 2014 as presented in Table 1-3.

Table 1-3: Analyst long term price forecast ($US/DMT, 62%Fe sinter fines CFR China)

Company	Date	2014E	2015E	2016E	2017E	2018E	LT
RBC	09/Nov/14	$111.50	$105.00	$100.00	$100.00	$90.00	$80.00
BMO	29/Sep/14	$106.00	$95.00	$105.00	$100.00	$115.00	$109.00
CS	24/Sep/14	$100.00	$89.00	$87.00	$90.00	-	$90.00
Canaccord	2/Dec/14	$96.80	$70.00	$77.50	$85.00	-	$85.00
Metal Expert Consulting	31/July/14	$104.00	$105.00	$110.00	-	-	$120.00
Scotia Bank	6/Oct/14	$99.00	$88.00	$85.00	$80.00	$85.00	$100.00
Goldman Sachs	6/Aug/14	$106.00	$80.00	$82.00	$82.00		$80.00
Average (Consensus)		$103.33	$90.29	$92.36	$91.17	$96.67	$94.86(1)

1. Rounded to US$95 for financial evaluation purposes

CAUTION: *Readers are cautioned that the period for collection of "forward looking information" related to forecasts for iron ore selling prices was July through December 2014 and the effective date of the Feasibility Study NI 43-101 Technical Report is March 2, 2015. During the first two months of 2015, the benchmark price for 62%Fe per DMT sinter fines CFR China has seen significant volatility and has occasionally reached levels below US$60 per DMT. It is unlikely that LCIO will develop the Joyce Lake DSO project until iron ore prices recover to above US$95/t.*

1.11.3 Premiums and Penalties

The base case iron ore price of US$95.00 per DMT, CFR China is based on a 62% Fe sinter fines product. The base case iron ore price of US$83.00 per DMT, CFR China is based on a 58% Fe sinter fines product. LCIO has reviewed published data for the past 6.5 years and has derived premiums and penalties as indicated in Table 1-4 and in Table 1-5. This information was provided to BBA in order to determine revenues based on the project mining and production plans.

It is assumed that the less than 55% Fe but greater than 52% Fe materials mined from the pit will be stockpiled separately during the six year period when high grade processing takes place. These products will be processed and sold based on the 58%Fe basis selling price at the end of the LOM.

Table 1-4: Premiums and Penalties for 62% Fe products

Item	Specification	Premium / Penalty (US$)
Base Case 62% Fe Sinter Fines CFR China	62% Fe	$95.00
Ocean Freight to China	$/net tonne (wet)	$15.00
FOB Port Sept-Îles	$/DMT	$79.04
Fe premium (for each 1% change)	Fe > 62%	$1.50/t
Fe penalty (for each 1% change)	Fe 62% < x > 60%	$1.50/t
Fe penalty (for each 1% change)	Fe < 60%	$3.00/t
SiO_2 penalty (for each 1% change)	SiO_2 > 4.5%	$0.75/t
Mn penalty (for each 0.1% change)	Mn > 1%	$0.20/t
Lump premium	$/DMT	$15.00/t

Table 1-5: Premiums and Penalties for 58% Fe products

Item	Specification	Premium / Penalty (US$)
Base Case 58% Fe Sinter Fines CFR China	58% Fe	$83.00
Ocean Freight to China	$/net tonne (wet)	$15.00
FOB Port Sept-Îles	$/DMT	$67.04
Fe premium (for each 1% change)	Fe > 58%	$1.50/t
Fe penalty (for each 1% change)	Fe 58% < x > 56%	$2.00/t
Fe penalty (for each 1% change)	Fe < 56%	$4.00/t
SiO_2 penalty (for each 1% change)	SiO_2 > 10%	$0.75/t
Mn penalty (for each 0.1% change)	Mn > 1%	$0.20/t
Lump premium	$/DMT	$15.00/t

It should be noted that there are also penalties applicable to other deleterious elements, as well as to particle size (oversize and undersize) in both lump and sinter fines products. It is assumed that penalties pertaining to these parameters will not apply.

For the financial analysis, shipping costs to China are assumed to be US$15.00 per net wet tonne. As such, an adjustment needs to be made to take into account product humidity levels, as discussed in Chapter 17 of this Report. This rate is based on loading vessels of at least 170,000 wet tonne capacity (Cape Size Vessels).

The Canadian to US dollar exchange rate used in the financial analysis is C$1.00 = US$0.80, based on forward exchange rates for up to five years.

1.12 Environment Studies, Permitting and Social or Community Impact

Under their joint mandate, Stantec and WSP (formerly Genivar) have initiated baseline and a Project Description, as well as a Provincial Registration Document that have been submitted to federal and provincial government authorities to initiate the environmental assessment for this Project.

The mining infrastructure for the Project is wholly located on provincial Crown Land within the Province of Newfoundland and Labrador. Iron Ore Products will be shipped on the existing railway to Sept-Îles in Québec and no changes to Port Authority or adjacent lands in Québec are required for this Project to proceed.

The Project will be subject to environmental assessment (EA) in accordance with provincial and federal requirements. Mining projects in the Province of Newfoundland and Labrador are subject to EA under the Newfoundland and Labrador Environmental Protection Act, and associated Environmental Assessment Regulations. The Project will also be subject to a Federal EA under the Canadian Environmental Assessment Act, 2012 and the associated Regulations Designating Physical Activities (Section 15(a)).

The provincial and federal EA processes are public and work in parallel. Both the provincial and federal processes have been initiated for this Project. The anticipated duration of these processes from registration to release from environmental assessment is in the order of approximately 20 to 24 months, depending on the nature of the issues and concerns raised, and mitigation applied. Following release from the federal and provincial EA processes, the Project will require a number of approvals, permits and authorizations during all stages of the life of the Project. These requirements are in accordance with various standards contained in federal and provincial legislation, regulations, and guidelines. LCIO will also be required to comply with any other terms and conditions associated with the EA release issued by the provincial and federal regulators.

As part of the environmental assessment process, a number of environmental baseline studies have been undertaken on the following topics:

- Ambient noise;
- Climate and air quality;
- Sediment and water quality;
- Vegetation;
- Fish and fish habitat;
- Avifauna;
- Mammals and herpetofauna;
- Heritage and historic resources;
- Hydrology and hydrography;
- Hydrogeology;
- Land/resource use for traditional purposes;
- Socio-economic environment

In addition to these baseline studies, a Consultation and Engagement Plan has been developed and is being implemented with government representatives, Aboriginal peoples, the public, and other interested parties. Consultation and engagement is required to provide information about the Project throughout the Project life, to solicit feedback on any issues and concerns to inform the EIS, and to obtain information to support the baseline studies and contribute to the Environmental Impact Statement (EIS).

1.13 Capital Costs

The Project scope covered in the Feasibility Study is based on the construction of a greenfield facility having a nominal annual production capacity of 2.5 Mt of combined lump and sinter fines products. The capital cost estimate related to the mine, process plant and site infrastructure was developed by BBA. Costs related to the railway transportation, port handling and ship loading at the port terminal have been provided by LCIO. BluMetric Environmental and Stantec have provided designs for basis of cost estimating for implementing the perimeter dewatering plan and surface water management plan. Table 1-6 presents a summary of total estimated initial capital costs for the Project.

Table 1-6: Summary of Capital Cost Estimate

Cost Area	Initial Capital
Mining Pre-Stripping	$15.3M
Mining Equipment	$23.3M
Project Infrastructure	$139.1M
Railcars	$42.0M
Other Site Mobile Equipment	$25.9M
Contingency	$13.9M
TOTAL	**$259.6M**

1.14 Operating Costs

The Operating Cost Estimate, related to the mine and low-grade stockpile, site infrastructure including dewatering, processing, product hauling and loading, as well as the site administration and services, was developed by BBA. Costs related to site administration, such as room and board, rail transportation, port and ship loading, as well as the corporate general and administrative (G&A) costs, were provided by LCIO. Table 1-7 presents a summary of estimated average LOM operating costs per dry metric tonne of combined lump and fines products.

The total estimated operating costs are $58.25/t of dry product. Royalties and working capital are not included in the Operating Cost Estimate but are treated separately in the Economic Analysis.

Table 1-7: Estimated Average LOM Operating Cost ($/t Dry Product)

Cost Area	LOM Average Cost per tonne (C$ / DMT)
Mining	$12.98/t
Low Grade Stockpile Reclaim	$0.25/t
Perimeter Dewatering and Water Management	$0.34/t
Processing and Handling	$2.25/t
Product Hauling	$3.52/t
Load-out and Rail Loop	$1.11/t
Site Administration & Services (Site)	$2.45/t
Site Administration (Room & Board and FIFO Air Tickets)	$1.71/t
Rail Transportation, Port and Ship loading	$32.60/t
Corporate G&A	$1.05/t
TOTAL	**$58.25/t**

1.15 Financial Analysis

A summary of the results of the before-tax and after-tax project economic analyses based on the projected annual revenues, capital and operating costs, royalties, other costs including rehabilitation and closure costs, as well as any deposit provision payments developed in the Feasibility Study are presented in Table 1-8 and Table 1-9 respectively.

Table 1-8 : Before Tax Financial Analysis Results

IRR = 18.7% Discount Rate	NPV ($M)	Payback (yrs)
0%	$300.6	4.4
8%	$130.8	-
10%	$99.9	-

Table 1-9: After Tax Financial Analysis Results

IRR = 13.7% Discount Rate	NPV ($M)	Payback (yrs)
0%	$192.5	4.9
8%	$61.4	-
10%	$37.5	-

The Financial Analysis was performed with the following assumptions and basis:

- The Project Execution Schedule considered key project milestones.
- The Financial Analysis was performed for the entire LOM for the Mineral Reserve estimated in this FS. Production is estimated to span approximately 7 years.
- The financial analysis was based on a benchmark sinter fines price of US$95/DMT CFR Port of China for 62% Fe content. Applicable premiums and penalties were applied as described in Chapter 19.
- Ocean freight from Sept-Îles to Chinese port is assumed to be US$15 per wet tonne shipped over the LOM.
- All of the fines and lump products are sold in the year of production.
- Initial production will focus on processing of high grade ore. Once exhausted, the low grade stockpile generated during the mining of the high grade ore will be processed.
- All cost and sales estimates are in constant Q4-2014 dollars (no escalation or inflation has been taken into account).
- The Financial Analysis includes working capital from two components. The first component includes $14.8M that is required to meet expenses after startup of operations and before revenue becomes available. This is equivalent to approximately 30 days of Year 1 operating expenses. The second component peaking at $45.4M includes the costs associated with carrying inventory in the low-grade stockpile as it is generated, before the material is processed at the end of the LOM.
- A royalty is payable to Champion as outlined in Section 4.4.1 of this report and has been included in the financial evaluation.
- An exchange rate of C$1.00 = US$0.80 was used.

A sensitivity analysis on the before tax Project IRR and NPV was conducted at a discount rate of 8%. The results illustrating the impact of capital and operating cost variations of +/-15%, as well as selling price fluctuations of -30/+50% are illustrated in Figure 1-1 and Figure 1-2.

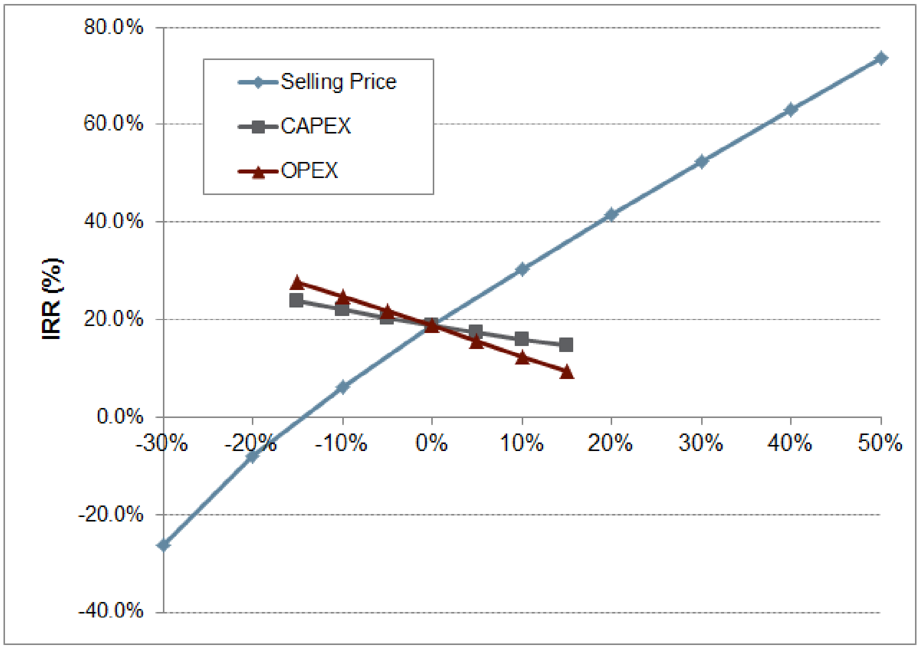


Figure 1-1: Sensitivity Analysis for IRR (Before Tax)

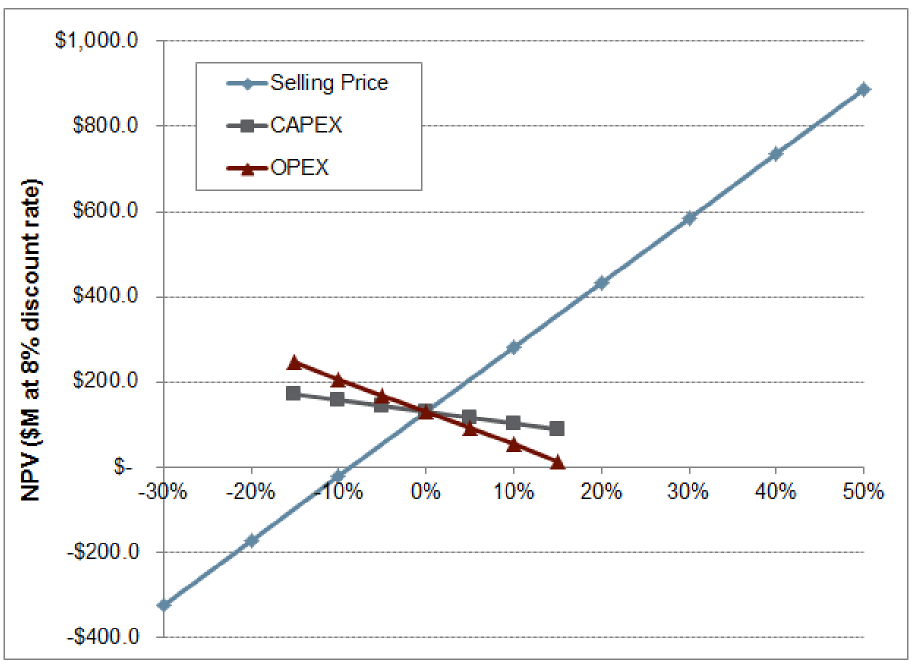


Figure 1-2: Sensitivity Analysis for NPV (Before Tax)

The Project is forecasted to provide a pre-tax IRR of 18.7% and an NPV of $130.8M at a discount rate of 8%. The payback period is 4.4 years after the start of production. Based on the sensitivity analyses performed, it is clear that both the NPV and IRR are most vulnerable to iron ore prices. The economic analysis also showed that the pre-tax project break-even benchmark selling price is US$81.16. Current iron ore market conditions are such that iron ore prices are well below the project break-even price.

1.16 Project Schedule

A Project Implementation and Construction Execution Plan was developed as part of the FS and it was assumed that LCIO will have obtained all environmental permits required to begin construction. Due to the seasonal impact on construction, the schedule was developed with a start date in March of any year. The major project milestones are listed in the Table 1-10. The two monthly columns show the time of occurrence in months relative to the start of construction and to the start of commercial production.

Table 1-10: Key Project Construction Milestones

Major Milestones	Month vs Start Construction	Month vs Start of Production
Award EPCM mandate	-8	-20
Award Mobile Crushing/ Screening Plant Order	-7	-19
Award Mining Equipment Order	-7	-19
Environmental Permit Approval	-3	-15
Start Construction	0	-12
Initial Iron Arm Crossing	5	-8
Telecommunication available across site	5	-8
Causeway completed	6	-6
Start pumping Joyce lake	6	-6
Export Infrastructure Completed	9	-3
Power Available at site	9	-3
Truck shop dome completed	9	-3
Permanent camp available (144 rooms)	10	-2
Mechanical Completion (Turn-Over to POV)	10	-2
Start Commercial Production - Mining and Processing	12	0

1.17 Conclusions and Recommendations

Considering current low iron ore prices, BBA recommends that full-scale engineering and construction of the Project be delayed until the iron ore market returns to more favourable conditions. The following recommendations are however made with the objective of de-risking the project as it is currently defined, to prepare the project for fast track implementation once LCIO decides to proceed. The recommendations also outline some areas of opportunity for potential improvements to project economics.

- Continue advancing the Environmental Impact Study (EIS) with the objective of obtaining all permits prior to the decision to proceed with project implementation.
- Perform additional (confirmatory) metallurgical test work on bulk samples and / or core samples that are representative of the Joyce Lake deposit based on the most recent Mineral Resource estimate and the FS mine plan. The objectives of the testwork should be as follows:
  - Confirm the lump to sinter fines ratio assumed in the Feasibility Study.
  - Confirm the lump %Fe upgrading that was estimated during the PEA metallurgical testwork.
  - Develop a better understanding of the effect of moisture in the ROM ore on the proposed process flowsheet and its impact on final product particle size distribution.
  - Budget in the order of $250,000 should for the aforementioned metallurgical testwork.
- Undertake a more detailed geotechnical and hydrogeological study to confirm pit slope and perimeter dewatering parameters and design.
  - A budget of approximately $1.2M is estimated to cover the execution of the six oriented boreholes, the optical and acoustic tele-viewer surveys, the laboratory testing program and the study of the final geotechnical pit slope design.
  - The estimate of perimeter dewatering requirements (number of wells, estimated dewatering rates) for the feasibility study was partially based on the results of testing conducted on small-diameter (50-mm) monitoring wells. Further pumping tests should be conducted with wells of a minimum diameter of 200 mm. A budget of approximately $1.5M should be planned for the recommended hydrogeological study.
- Systematic density measurements on all cores within the ore zone (from triple tube and sonic drilling) should be completed. Even though the core samples from two drill holes were used for the density measurements used in the Feasibility Study, the bulk of the main ore zones have not been tested. Measurements should include bulk density, dry density and moisture content.

- Perform a trade-off study to evaluate various options for cost reduction such as:
  - The option to purchase used equipment such as railcars, mobile equipment, generators and used camp facilities.
  - The option of building the permanent camp within the Schefferville or the Kawawachikamach communities where power and other services would be available and construction costs for the camp facility would be lower. The camp could also be used for lodging construction workers. Building it within the communities can also provide a longer term benefit to the community and can be part of the Impact Benefit Agreement (IBA) with local stakeholders.
  - The cost- benefit of constructing the haul roads with owner operations personnel and rented equipment.

The Feasibility Study for the Project is based on the development of the Joyce Lake deposit as a stand-alone project. Physical constraints of the deposit and the mining operation limit the annual production capacity to about 2.5 Mt of products. Given the considerable capital costs required to put in place the project infrastructure, extending the period of production or increasing the annual production would both improve project economics. This may be possible through successful exploration and subsequent development of nearby claims under the control of LCIO and/or by acquiring claims from others.

2 INTRODUCTION

2.1 Scope of Study

The following technical report (the Report) summarizes the results of the Feasibility Study for the development of the Joyce Lake DSO Iron Ore Project in Labrador. In June 2014, LCIO commissioned the engineering consulting group BBA to perform this Study and to prepare this Report. LCIO is a joint venture company owned 60% by Century and 40% by WISCO International. Century is a Canadian publicly traded company listed on the Toronto Stock Exchange (TSX) under the symbol FER. Century is a company incorporated under the British Columbia Business Corporations Act, with a head office at Suite 1301, 200 University Avenue, Toronto, Ontario, Canada M5H 3C6. The LCIO head office is at 161 Bay Street, Suite 2515, Toronto, Ontario, Canada, M5J 2S1

This Report titled "Feasibility Study for the Joyce Lake Direct Shipping Iron Ore (DSO) Project of the Attikamagen Property, Labrador", concerning the development of the Joyce Lake deposit, was prepared by Qualified Persons following the guidelines of the "Canadian Securities Administrators" National Instrument 43-101 (effective June 30, 2011), and in conformity with the guidelines of the Canadian Mining, Metallurgy and Petroleum (CIM) Standard on Mineral Resources and Reserves.

This Report is considered effective as of March 2, 2015.

2.2 Sources of Information

This Report is based in part on, internal company technical reports, maps, published government reports, company letters and memoranda, and information, as listed in Chapter 27 "References" of this Report. Sections from reports authored by other consultants may have been directly quoted or summarized in this Report, and are so indicated where appropriate.

It should be noted that the authors have relied upon selected portions or excerpts from material contained in previous NI 43-101 compliant Technical Reports available on SEDAR (www.sedar.com). Other information used to complete the FS includes, but is not limited to, the following reports and documents:

- Mineral Resource block model provided by SGS Geostat;
- COREM, SGS Canada Inc., Soutex Inc., results and reports;
- Internal and commercially available databases and cost models;
- Canadian Milling Practice, Special Vol. 49, CIM;

- Various reports produced by LVM, BluMetric Environmental, Stantec and others concerning environmental studies and permitting, site hydrology, hydrogeology, geotechnical and site closure plan.

2.3 Terms of Reference

Unless otherwise stated:

- All units of measurement in the Report are in the metric system;
- All costs, revenues and values are expressed in terms of Canadian (CDN) dollars;
- All metal prices unless specifically indicated are expressed in terms of US dollars;
- A foreign exchange rate of C$1.00 = US$0.80 was used.

Grid coordinates for the block model are given in the UTM NAD 83 and latitude/longitude system; maps are either in UTM coordinates or latitude/longitude system.

2.4 Site Visit

A site visit was conducted on October 16 and 17, 2014, by Mr. Angelo Grandillo of BBA. The purpose of the visit was to survey the site areas as well as areas of existing and future roads and infrastructure that will be required to support the Project development, operation and closure. A visit of the core storage area was also conducted and several cores were viewed.

Mr. Claude Duplessis of SGS Geostat visited the Property on September 26 and 27, 2012, for a review of exploration methodology, Reverse Circulation (RC) drilling technique and sampling procedures for 2013 technical report. A subsequent visit was conducted on March 9 and 10, 2013 and October 3 and 4, 2013, for a review of exploration methodology, RC drilling technique, core diamond drilling and sampling procedures with density measurements for the 2014 Mineral Resource Estimate update.

Representatives from Stantec also performed visits to the site on different occasions. These representatives were Roy Skanes, Glen Campbell, Stacey Camus, Mary Murdoch, Maria Ma, Sundar Premasiri, Sheldon Smith, and Nikolay Sidenko. Ms. Carolyn Anstey-Moore, the QP representing Stantec, visited the site on August 20-22, 2012

Byron O'Connor of BluMetric Environmental visited the site October 14 to 17, 2014 to inspect the general drilling area and the terrain around the mine site and Joyce Lake.

Mr. Patrice Live, the QP for mining from BBA, and Mr. Pascal Garand of LVM did not visit the site.

3 RELIANCE ON OTHER EXPERTS

Neither BBA nor SGS Geostat has verified the legal titles to the Property nor any underlying agreement(s) that may exist concerning the licences or other agreement(s) between third parties, but has relied on LCIO to have conducted the proper legal due diligence. Project design requires that certain infrastructure be located outside the mineral property limits. LCIO currently does not have surface rights to use these areas but has indicated that they will acquire these rights at an appropriate time during project development.

LCIO has provided a description of the ownership structure in Chapter 4 of this Report, including the Joint Venture agreement between Century and WISCO International. BBA has relied on LCIO to provide all information that is material to this Feasibility Study.

LCIO has undertaken an internal market study in order to derive the base case iron ore product prices used in the project economic analysis presented in Chapter 22. As such, LCIO has provided support for its conclusion on prices.

The FS Financial Analysis was done on a pre-tax basis and incorporated LCIO's statement, outlined in Chapter 22 of this Report, pertaining to the impact of taxes on the Project, as well as taxation amounts that BBA incorporated into the after-tax financial analysis. The estimated impact of taxes on the Project economics is based on applicable Canadian federal and provincial tax structures.

Any statements and opinions expressed in this document are given in good faith and in the belief that such statements and opinions are not false or misleading at the effective date of this Report. BBA has the responsibility for assuring that this Technical Report meets the guidelines and standards stipulated. Certain sections of this Report however, were contributed by other parties. Table 3-1 outlines responsibility for the various sections of the Report.

Table 3-1: Technical Report Section List of Responsibilities

Chapter No.	Chapter Title	Responsibility	Comments and Exceptions
1	**Summary**	BBA	SGS summarized the Chapters under its responsibility
2	**Introduction**	BBA	-
3	**Reliance on Other Experts**	BBA	-
4	**Property Description and Location**	SGS	LCIO provided information on property description and ownership.
5	**Accessibility, Climate, Local Resources, Infrastructure and Physiography**	SGS	-
6	**History**	SGS	-
7	**Geological Setting and Mineralization**	SGS	-
8	**Deposit Type**	SGS	-
9	**Exploration**	SGS	-
10	**Drilling**	SGS	-
11	**Sample Preparation, Assaying and Security**	SGS	-
12	**Data Verification**	SGS	-
13	**Mineral Processing and Metallurgical Testing**	BBA	-
14	**Mineral Resource Estimate**	SGS	-
15	**Mineral Reserve Estimate**	BBA	Pit slope design parameters provided by LVM. Hydrogeology provided by BluMetric Environmental.
16	**Mining Methods**	BBA	-
17	**Recovery Methods**	BBA	-
18	**Project Infrastructure**	BBA	-
19	**Market Studies and Contracts**	LCIO	LCIO performed an internal iron ore market review and provided commodity benchmark price and penalty schedule.
20	**Environmental Studies, Permitting and Social Or Community Impact**	Stantec	LCIO provided section on Community Relations. WSP provided Closure plan and costs.
21	**Capital and Operating Costs**	BBA	Stantec provided cost estimate for site closure plan.
22	**Economic Analysis**	BBA	-
23	**Adjacent Properties**	SGS	-
24	**Other Relevant Data and Information**	BBA	-
25	**Interpretation and Conclusions**	BBA	Contribution from all QPs
26	**Recommendations**	BBA	Contribution from all QPs
27	**References**	BBA	-

The following Qualified Persons (QP) have contributed to the writing of this Report and have provided QP certificates indicating the sections they have authored.

- Angelo Grandillo, P.Eng., BBA
- Carolyn Anstey-Moore, P.Geo., Stantec
- Claude Duplessis, P.Eng., SGS Geostat
- Patrice Live, P.Eng., BBA
- Pascal Garand, P,Eng., LVM
- Byron O'Connor, P.Eng., BluMetric Environmental

The individuals listed below have assisted the listed Qualified Persons and have contributed to this Study. They are not considered as QPs for the purpose of this NI 43-101 Report.

Component	Person	Company
Hydrology and Water Management	Sheldon Smith, P.Geo.	Stantec
Rehabilitation and Closure	Natalie Gagne, Eng.	WSP

4 PROPERTY DESCRIPTION AND LOCATION

4.1 Property Location

The Joyce Lake DSO Project mineral property is located 20 km northeast of Schefferville, Québec, entirely in the province of Newfoundland and Labrador, near Attikamagen Lake. Figure 4-1 shows the location of the mineral property. A more detailed description of the Project site, access and infrastructure is provided in Chapter 18 of this Report.

The coordinates of the DSO Iron project mineral property are shown in Table 4-1.

Table 4-1: Coordinates of DSO Project

Feature	Longitude (X)	Latitude (Y)
DSO Iron Project Site	66° 31' 26.783"W	54° 54' 0.768"N

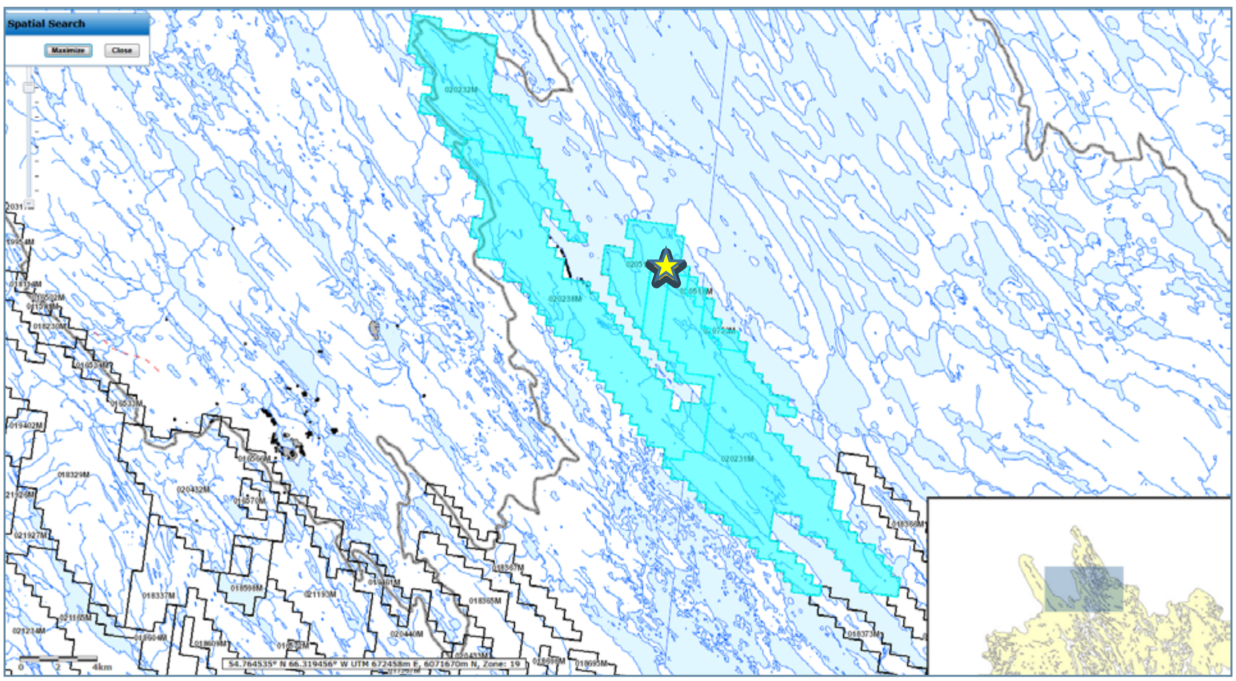


Figure 4-1: Property Location Map from NFLD Natural Resources Management System, the Golden Star is Joyce Lake DSO Deposit

4.2 Mineral Tenure in Newfoundland and Labrador Generally

In Canada, natural resources are a provincial jurisdiction. In the province of Newfoundland and Labrador, the management of mineral resources and the granting of exploration and mining rights for mineral substances and their use are regulated and administered by the Minister of Natural Resources.

4.2.1 Mineral Claims

In Newfoundland and Labrador, a mineral claim grants the exclusive right to explore for all minerals. Mineral claims are map staked online by accessing the staking section of the Mineral Rights Administration System (MIRIAD) for the province, with the exception of restricted areas such as Ecological and Wilderness reserves, National and Provincial Parks. In map staking, a claim is 500 metres square, which is also one quarter of a UTM grid square – bounded by one corner of a UTM grid square. There are no restrictions on the shape of an area being map staked and an application for a single Map Staked Licence must be for a single 25 hectares or greater claim and not greater than 256 full-sized claims. All the claims in the electronic application must be contiguous and cannot overlap existing claims or areas that are exempt from staking by regulations. Assessment work must be filed annually with the Newfoundland Department of Mines and Energy to keep the Newfoundland and Labrador claims in good standing. The annual report of the assessment work performed is due no later than 60 days after the anniversary of their issuance date. Eligible assessment work to a value of $200 per claim is required the first year; $250 per claim in the second year; $300 per claim in the third year; $350 per claim in the fourth year; $400 per claim in the fifth year; $600 per claim in each of the six through tenth years; $900 per claim in each of the eleventh through fifteenth years; and $1,200 per year through each of the sixteenth through twentieth years.

4.2.2 Mineral Exploration Licences

In Newfoundland and Labrador, a mineral exploration licence is issued for a term of five years. However, a mineral exploration licence may be held for a maximum of twenty years provided the required annual assessment work is completed and reported upon and the mineral exploration licence is renewed every five years. In each year of the licence, the minimum annual assessment work must be completed on or before the anniversary date. The assessment report must then be submitted within sixty days after the anniversary date. Any excess assessment work completed in any one year is carried forward for a maximum of nine years and it is automatically credited to the licence.

4.2.3 Extraction Rights

There are two types of extraction rights in Newfoundland and Labrador, i.e. a mining lease for mineral substances and a lease to mine surface mineral substances. The second one is a prerequisite to obtaining a mining lease. In Newfoundland and Labrador, a licence holder has a right to a mining lease for the minimum area necessary to cover an identified mineral resource at any time during its currency, provided the equivalent of the assessment work of the first three years has been completed and acceptable reports submitted to the Minister of Natural Resources. In addition, the applicant for a mining lease must demonstrate to the satisfaction of the Minister of Natural Resources that a mineral resource exists of significant size and quality under the area of application to be potentially economic. This must be confirmed by a qualified person. A qualified person is an engineer or a geoscientist with at least five years of experience in mineral exploration or mine development (or operation or mineral project assessment or a combination of these) who has experience relevant to the project and is a member in good standing of a professional association. An application for a mining lease made pursuant to a map staked licence is to be accompanied by two original copies of the legal survey and a description and sketch of the area covered by the application.

In order to develop a mineral resource, it is necessary for a licence holder to obtain title to the surface rights to the area of the mining lease and areas for sitting the infrastructure required for the mineral development.

4.3 Property Ownership

4.3.1 Mineral Licences

The Joyce Lake DSO Project is comprised of six mineral licences located in Newfoundland and Labrador.

The Project is comprised of six map-staked licences totalling approximately 17,049 ha on 682 claims. A description of the LCIO exploration licence holdings for the DSO Project is shown in Table 4-2 below.

Table 4-2: LCIO Mineral Licences and Status

Licence	Claims	Area (ha)	NTS Areas	Issuance Date	Renewal Date	Work Due Date
020231M	256	6399.7	23J16 23J15	07-11-2005	07-11-2015	06-01-2016
020238M	253	6324.7	23J16 23J15	07-11-2005	07-11-2015	06-01-2016
020517M	51	1274.9	23J15	18-10-2012	18-10-2017	17-12-2015
020518M	4	100.0	23J16 23J15	18-10-2012	18-10-2017	17-12-2015
020753M	10	280 approx.	23J16	11-01-2013	11-01-2018	11-03-2016
020232M	108	2700 approx.	23J/15 23O/02	20-03-2008	20-03-2018	19-05-2015

The first four licences are associated with the Joyce Lake area in reference to the Project area.

The Joyce Lake DSO Project is part of the Attikamagen Iron Project, which is wholly owned by LCIO Century, subject to the royalties described below. The Attikamagen Iron Project includes one group of claims straddling the boundary between the Provinces of Québec and Newfoundland and Labrador. The Attikamagen Iron Project includes 405 designated claims located in Québec (which include the Hayot Lake taconite deposit) and 682 claims located in Labrador (which include the Joyce Lake DSO Project). The Attikamagen Iron Project covers a total area of approximately 36,142 hectares.

LCIO is a joint venture company owned 60% by Century and 40% by WISCO International. The joint venture is governed by a shareholders agreement dated December 19, 2011 (the Attikamagen Shareholders Agreement) between Century, Century Holdings, WISCO International, WISCO Attikamagen and LCIO. WISCO Attikamagen, as a wholly owned subsidiary of WISCO International, has invested a total of $40M under the Attikamagen Shareholders Agreement in consideration of the acquisition of its 40% in LCIO. Century's 60% interest in LCIO is held through Century Holdings, a wholly owned subsidiary of Century. The Attikmagen Shareholders Agreement sets out fundamental agreements between Century and WISCO International as to the joint ownership, funding, management and operation of LCIO and the Attikamagen Iron Project. A copy of the Attikamagen Shareholders Agreement is filed on SEDAR under Century's profile.

4.4 Underlying Agreements and Royalties

4.4.1 Champion Royalty

LCIO entered into a joint venture agreement (the Joint Venture Agreement) with Champion, as amended, whereby LCIO acquired the right to earn up to a 60% interest in the Attikamagen Property by putting up to $13M in exploration and development work expenditures on the property over a six year period. Under the Joint Venture Agreement, LCIO initially earned a 51% interest by funding $7.5M in total exploration and development expenditures on or before March 26, 2012 and then subsequently earned an additional 5% interest by funding a further $2.5M in exploration and development expenditures on or before March 26, 2013. LCIO then earned the right to an additional 4% interest in the Attikamagen Property by funding an additional $3.0M in exploration and development costs on or before March 26, 2014.

Upon acquiring a 51% interest in the property in accordance with the terms of the Joint Venture Agreement, LCIO and Champion formed a joint venture for the purposes of conducting exploration on the Attikamagen Property and, if warranted, engaging in development and mining on the property (the Champion Joint Venture).

Prior to the transfer of the final 4% interest in the Attikamagen Property to LCIO, LCIO completed the acquisition of Champion's interest in the Attikamagen Property and the Champion Joint Venture. The acquisition was completed pursuant to an agreement dated September 30, 2013 between Century

Attikamagen Inc., a wholly owned subsidiary of Century, and Champion (the Acquisition Agreement). Century designated LCIO as the purchaser under the Acquisition Agreement. Upon completion of the acquisition, LCIO acquired Champion's remaining interest in the Attikamagen Iron Project effective November 29, 2013, at which time LCIO became the 100% owner of the Attikamagen Iron Project, subject to the Attikamagen Royalty and a new royalty granted to Champion (the Champion Royalty) further to a royalty agreement dated November 29, 2013 between LCIO and Champion (the Champion Royalty Agreement) upon completion of the acquisition. Under the Champion Royalty Agreement, LCIO is obligated to pay to Champion a royalty based on sales of minerals mined from the area of interest defined in the Champion Royalty Agreement (the Champion Area of Interest). The Champion Royalty is equal to 1% of sales of minerals from the Champion Area of Interest until total payments on account of the Champion Royalty comes to $2.5M, at which time the Champion Royalty will increase to 2% of sales. Values attributable to sales are determined as the invoice price at the point of sale, less all transportation, loading, stockpiling or other costs from the time the minerals leave the Champion Area of Interest to the completion of the sale. The Champion Royalty also applies to sales of minerals from properties owned by Century within the Champion Area of Interest at a rate of 2% of sales. The obligations of LCIO and Century under the Champion Area of Interest are several and not joint. Under the Acquisition Agreement, Champion was issued 2,000,000 common shares of Century, as well as warrants to purchase an additional 1,000,000 common shares on completion of the acquisition, in addition to the grant of the Champion Royalty. LCIO further agreed to assume all of the obligations of Champion under the Attikamagen Royalty and, in turn, Champion assigned to LCIO its rights under the Attikamagen Royalty, including its right to repurchase the Attikamagen Royalty. The Champion Joint Venture was terminated concurrently with the completion of the acquisition effective November 29, 2013.

The mineral licences comprising the Joyce Lake DSO Project are subject to the Champion Royalty.

4.4.2 WISCO Shareholders Agreement

LCIO is a joint venture company owned 60% by Century Holdings and 40% by WISCO Attikamagen under the Attikamagen Shareholders Agreement. The joint venture was formed on September 26, 2012. WISCO Attikamagen, as a wholly owned subsidiary of WISCO International, has invested an aggregate of $40M under the Attikamagen Shareholders' Agreement in consideration for its 40% interest in LCIO. The Attikamagen Shareholders' Agreement sets out fundamental agreements between Century and WISCO International as to the joint ownership, funding, management and operation of LCIO and the Attikamagen Property. Representatives of WISCO International have been appointed to the board of directors and the management team of LCIO. Management of LCIO will be carried out together with Century and WISCO International in accordance with the Attikamagen Shareholders Agreement. The terms of the Attikamagen

Shareholders Agreement are described in detail in the most recent Annual Information Form of Century, which is also available on SEDAR under Century's profile.

4.5 Environmental Considerations

The Project is at an advanced exploration stage. The project areas are uninhabited and are not accessed by road. The area has received limited surface exploration work. The surface disturbances arising from the historical exploration work and the limited work undertaken by LCIO are negligible.

4.6 Permitting

Following release from the federal and provincial EA processes, the Project will require a number of approvals, permits and authorizations during all stages of the life of the Project. These requirements are in accordance with various standards contained in federal and provincial legislation, regulations, and guidelines. The proponent will also be required to comply with any other terms and conditions associated with the EA release issued by the provincial and federal regulators. A preliminary list of permits, approvals, and authorizations are listed in Chapter 20.

This being said, the social acceptability in the region and agreement with First Nations remain as a risk, which is difficult to quantify and judge and must be stated. The author presumes good relations with First Nations are on-going in a positive manner.

The size of the existing property has sufficient space to cover the mining operations.

5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 Accessibility

The Joyce Lake DSO Project mineral property is located 20 kilometres northeast of the town of Schefferville, Québec. The city of Schefferville is only accessible via the Tshiuetin railroad from Sept-Îles. The city of Schefferville is served by an airport with a daily flight to Sept-îles. LCIO currently has an exploration camp to the south of the Iron Arm water body. There are no roads connecting the camp to the Project mineral property so access is by helicopter or floatplane in the summer or by using skidoos during winter.

5.2 Climate

Schefferville Airport Environment Canada's local climate station provides comprehensive year round monitoring with a record period that is sufficient for characterizing long-term climate conditions in the project area. The station is located close to the project site. Therefore, the Environment Canada climate station at the Schefferville Airport was used to characterize the climate conditions at the project site and the average yearly data as summarized in Table 5-1.

Table 5-1: Average Year – Climatic Data

Month	Temperature (ºC)	Rainfall (mm)	Snowfall (cm)	Precipitation (mm)	Snow Depth (cm)
January	-24.1	0.2	57.4	53.2	62.0
February	-22.6	0.2	42.6	38.7	70.0
March	-16.0	1.6	56.6	53.3	71.0
April	-7.3	8.4	54.8	61.4	69.0
May	1.2	27.7	22.9	52.1	18.0
June	8.5	65.4	8.0	73.7	0.0
July	12.4	106.8	0.5	107.2	0.0
August	11.2	82.8	1.7	84.5	0.0
September	5.4	85.3	12.7	98.4	0.0
October	-1.7	24.4	57.2	80.5	7.0
November	-9.8	4.5	70.7	69.4	26.0
December	-20.6	0.9	55.4	50.7	49.0
Year	-5.3	408.1	440.5	822.9	31.0

The Schefferville area is characterized by a sub-arctic continental climate with mild summers and very cold winters. This area is in the boreal forest with low rolling hills rising from 600 to 700 metres above sea level.

Average wind speed and direction is presented in Table 5-2. The annual average wind speed is about 17 km/h and the most frequent wind direction, on an annual basis, is from the northwest.

Table 5-2: Schefferville Area – Average Wind Speed/Direction (1971 – 2000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Speed (km/h)	16.4	16.8	17.4	16.5	16	16.2	15.1	15.6	16.9	17.8	17.3	16	16.5
Most Frequent Direction	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW
Maximum Hourly Speed (km/h)	85	97	83	77	66	97	65	61	80	89	84	80	80
Maximum Gust Speed (km/h)	134	148	148	130	101	126	103	117	137	137	142	153	131
Direction of Maximum Gust	W	W	SW	W	W	W	W	W	SW	SW	SW	SW	SW
Days With wind ≥ 52 km/h	0.7	1.4	1.9	1.1	0.9	0.4	0.6	0.4	0.8	1.1	1.8	2.1	13.9
Days With wind ≥ 63 km/h	0.7	0.5	0.4	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.3	0.6	3.3

Due to its high latitude location, the Schefferville area has short daylight periods in the winter and extended daylight hours in summer. Mining operations are planned to take place year-round, whereas processing activities are scheduled so as to avoid the cold winter months.

The following descriptions regarding the permafrost in the region are summarized from the baseline studies *"Joyce Lake Direct Shipping Iron Ore Project: Project Description and Provincial Registration for Labec Century Iron Ore,"* conducted in October 10, 2012. Local conditions including weather, elevation, presence of water bodies, snow depth and density, as well as vegetation cover, influence the presence and thickness of permafrost in the Schefferville area. While there have been observations of permafrost 120 m thick in the Schefferville region (Brown 1979), permafrost in this region is discontinuous and the depth and thickness are variable. Thom (1969) suggests thick permafrost (up to 60 m) is likely in areas where snow cover is less than 0.4 m during the winter months of January and February.

Permafrost conditions in northern Québec and Labrador are shown in Figure 5-1, from Brown (1979). Nicholson's (1978) research on permafrost distribution in the Schefferville area that indicated deep permafrost underlies areas of exposed high elevation where vegetation cover consisted of tundra. The depth of the permafrost ranged from 60 to 100 m, and entirely unfrozen areas occurred in the valleys and within 30 m from permanently covered shoreline. Earlier research found that permafrost was not present on less exposed and low-lying wood covered ground surfaces and was not expected to exist beneath water bodies that are too deep to freeze solid during the winter (Nicholson and Lewis 1976).

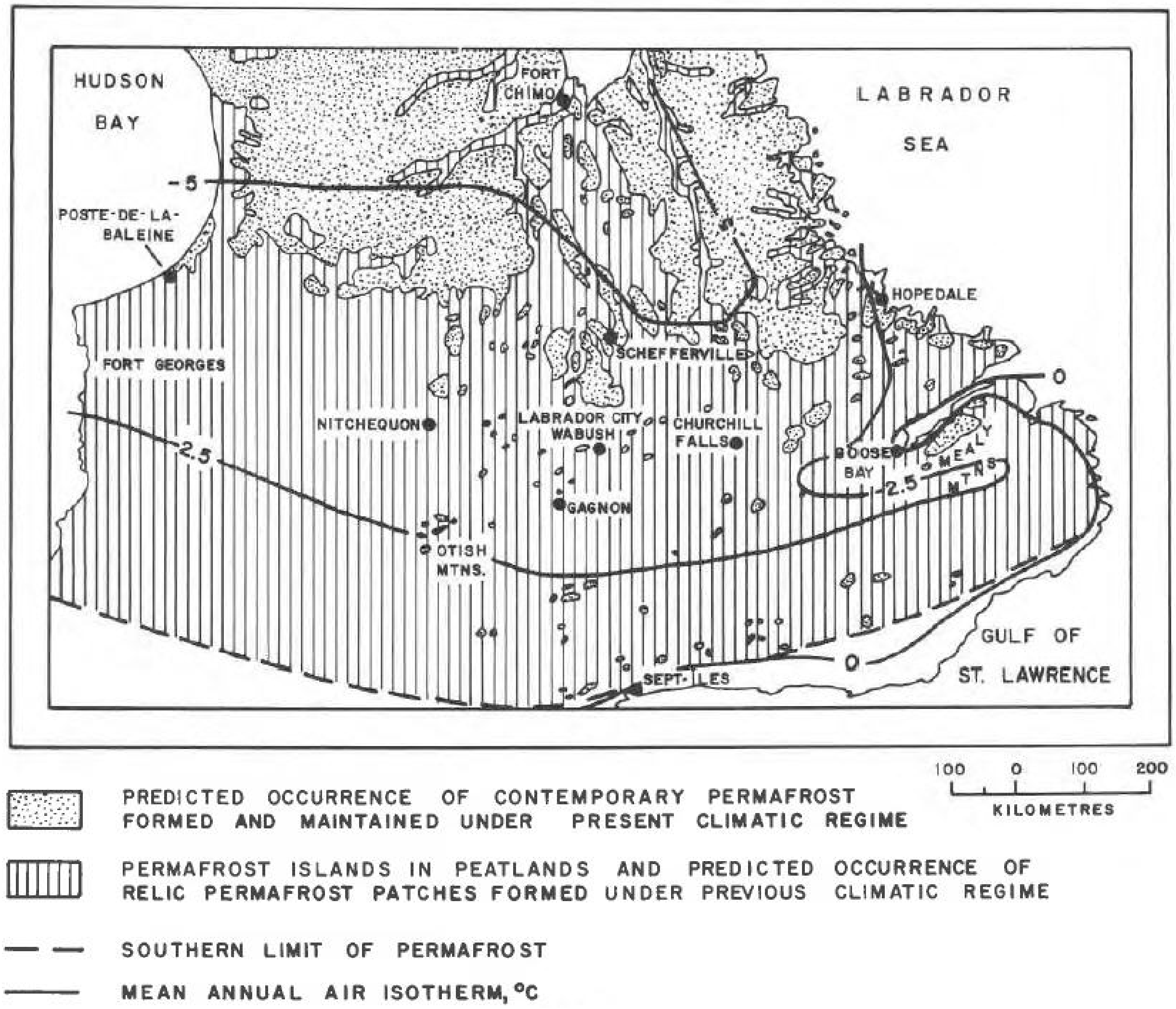


Figure 5-1: Permafrost Distribution in Northern Québec and Labrador (Source: Brown 1979)

5.3 Local Resources

It is assumed that the majority of the workforce would potentially come from the province of Newfoundland and Labrador and employees will also be recruited from the Québec communities close to the project site.

A modern airport includes a 2,000 metre paved runway and navigational aids for passenger jet aircraft. Air service is provided three times per week, to and from Wabush, Labrador, with less frequent service to Montreal or Québec City, via Sept-Îles. In summer, frequency increases to a flight every day.

5.4 Infrastructure

The town of Schefferville has a Fire Department with mainly volunteer firemen, a fire station and firefighting equipment. The “Sûreté Du Québec” Police Force is present in the town of Schefferville and the Matimekush - Lac John reserve. A clinic is present in Schefferville with limited medical care. A municipal garage, small motor repair shops, a local hardware store, a mechanical shop, and a local convenient store, two hotels, numerous outfitters accommodations are also present in Schefferville.

The Menihek power plant is located 35 km southeast of Schefferville. The hydro power plant was originally built to support IOC iron ore mining and services in the Schefferville area. Today, the hydro power supplies Schefferville communities and back-up diesel generators are also present as well.

5.5 The Railroad

Schefferville is accessible by train from Sept-Îles. The Québec North Shore & Labrador Railway (QNS&L) was established by IOC to haul iron ore a distance of 468 km from Schefferville area mines to Sept-Îles, starting in 1954. After shipping some 150 million tons of iron ore from the area, the mining operation was closed in 1982, and, QNS&L maintained a passenger and freight service between Sept-Îles, Labrador City and Schefferville until 2005. In 2005, IOC sold the 208 km section of the railway between Emeril Yard at Ross Bay Junction and Schefferville to Tshiuetin Rail Transportation Inc. (TRT), a company owned by three Québec First Nations. The mandate of TRT is to maintain the passenger and light freight traffic between Sept-Îles and Schefferville. Train departures from Sept-Îles and Schefferville occur three times a week.

Five railway companies operate in the region (as of 2014);

- TRT transporting passengers and light freight between Schefferville and Ross Bay Junction;
- QNS&L hauling iron concentrates and pellets from Labrador City/Wabush area via Ross Bay Junction to Sept-Îles (suspended);
- Bloom Lake Railway hauling ore from the CML mine to Wabush (suspended);
- Arnaud Railways hauling iron ore and concentrates for Wabush Mines (Wabush) and Consolidated Thompson Limited (CLM) between Arnaud Junction and Pointe Noire (suspended);
- Cartier Railway Company hauling iron concentrates from Fermont area to Port-Cartier for Québec Cartier Mining Company.

The Cartier railway is not connected to TRT, QNS&L, Bloom Lake or Arnaud railways.

5.6 Physiography

The topography of the Schefferville mining district is bedrock controlled with the average elevation of the properties varying between 500 m and 700 m above sea level. The terrain is generally gently rolling to flat, sloping north-westerly with a total relief of approximately 50 to 100 m. In the main mining district, the topography consists of a series of NW-SE trending ridges while the Astray Lake and Sawyer Lake areas are within the Labrador Lake Plateau. Topographic highs in the area are normally formed by more resistant quartzites, cherts and silicified horizons of the iron formation itself. Lows are commonly underlain by softer siltstones and shales.

Generally, the area slopes gently west to northeast away from the land representing the Québec – Labrador border and towards the Howells River valley parallel to the dip of the deposits. The finger-shaped area of Labrador that encloses the Howells River, drains southwards into the Hamilton River watershed and from there into the Atlantic Ocean. Streams to the east and west flow into the Kaniapiskau watershed that flows north into Ungava Bay.

The mining district is within a “zone of erosion” such that the last period of glaciation has eroded away any pre-existing soil/overburden cover. Furthermore, the zone of deposition of these sediments is well away from the area of interest. Glaciation ended in the area as little as 10,000 years ago and there is very little subsequent soil development. Vegetation commonly grows directly on glacial sediments and the landscape consists of bedrock, a thin veneer of till, as well as lakes and bogs.

The thin veneer of till in the area is composed of both glacial and glacial fluvial sediments. Tills deposited during the early phases of glaciations were strongly affected by later sub glacial melt waters during glacial retreat. Commonly, the composition of till is sandy gravel with lesser silty clay, mostly preserved in topographic lows. Glacial melt water channels are preserved in the sides of ridges both north and south of Schefferville. Glacial ice flow in the area has been recorded as an early major NW to SE flow and a later less pronounced SW to NE flow. The early phase was along strike with the major geological features, and the final episode was against the topography. The later NE flow becomes more pronounced towards the southern end of the district near Astray Lake or Dyke Lake.

5.7 First Nations Social Context

5.7.1 The Naskapi Nation

The Naskapi Nation of Kawawachikamach is located 16 km northeast of the Town of Schefferville on the Québec-Labrador border and has a population of approximately 718 registered members. The village itself is situated on approximately 41 km^2 of Category IA-N land and covers an area of approximately 16 ha. There is ample room for expansion, whether for residential, commercial, or industrial purposes.

The vast majority of the residents of Kawawachikamach are Naskapi. Naskapi is the principal language, and it is spoken by all Naskapi and written by many. English is the second language, although many people also speak French. The Naskapi still preserve many aspects of their traditional way of life and culture. Like many northern communities, the Naskapi rely on subsistence hunting, fishing, and trapping for a large part of their food supply, and for many raw materials. Harvesting is at the heart of Naskapi spirituality.

5.7.2 The Innu Nations

There are two Innu reserves on the outskirts of Schefferville: Matimekush and Lac John. Both are located in the North Shore Administrative Region, in the Regional County Municipality of Caniapiscau. The Matimekush Reserve is adjacent to Lac Pearce, while the Lac John Reserve is some 4 km east of Schefferville. The Lac John and the Matimekush reserves were established in 1960 and 1968 respectively, following the transfer by the Government of Québec to the Government of Canada of the land onto which they were relocated. After the closing of the Schefferville mines in 1982, and with the departure of most of the non-Native residents; the Governor in Council expanded the area of the Matimekush Reserve in May 1998 from 14.8 to 70.9 hectares. The Lac John Reserve covers 23.3 hectares.

The lnnu of Schefferville designate themselves by the name “Naplekinnuat”, that is the “Innu of Knob Lake”. The expression “Schefferville Innuat” is also used. The Elders still identify themselves as “Mishta Shipu Innuat” or ”Innu of the Great River”, i.e., the Moisie River. The Mishta Shipu Innuat is a sub-group of the Uashau-innuat of Sept-Îles.

The Nation Innu Matimekush - Lac John had 838 members in January 2009, 718 of whom lived on the two local reserves. Based on the 2006 Census, approximately 40% of the population was under 20 years of age.

6 HISTORY

This history from 1937 – 2007 is a summary from MRB & Associates geological consultants NI-43-101 technical report, the Attikamagen iron property, western Labrador, Newfoundland and Labrador by John Langton, M. Sc., P. Geo. Doug Clark, P. Geo. April 8, 2009 (amended September 24, 2009)

Labrador Mining and Exploration (LM&E) discovered iron formation in 1937 and explored the area between Petitsikapau and Iron Arm from 1937 to 1939. Work by B.C. Freeman and another project by J.A. Retty consisted of 1:4,800 scale surfaces mapping and sampling. A limited control grid was established to provide a systematic framework for subsequent chip sampling across the iron-rich rocks. This sampling included the metallic iron formation (unleached iron formation beds), as well as the lean chert and chert/jasper horizons.

LM&E returned to the Property in 1942-1943. Dr. A.E. Moss compiled data from other workers and produced detailed maps at 1:4,800 scale. He reported that several prospecting teams (have) examined much of the area and many specimens were collected. During this time, two bulk samples were obtained and submitted to the American Cynamid Co. to determine the amenability of the ore to beneficiation. The results were that the intimate association of the silica and iron prevented any of the siliceous ores of the area from being amenable to the large scale methods of beneficiation which were being employed at that time in the Lake Superior region. Retty (1945) noted, however, that tremendous tonnages of these siliceous ores are available in the area and may become of commercial value with the improvement of beneficiation methods. Analysis of Sample "A" gave 45.9% Fe and 20.2% SiO_2. Sample "B" contained 41.1% Fe and 34% SiO_2. In reference to metallurgical testwork, very few details on testing procedure used are available. It is significant to note that metallurgical testwork at that time typically involved the grinding of samples to 100 mesh - 200 mesh. Today, prospective iron samples are ground as fine as 325 mesh to achieve acceptable liberation of gangue minerals.

In 1951, a geological mapping project was conducted west of Attikamagen Iron by L.C.N. Burgess working for IOC. This program focused on the area between Attikamagen and Schefferville. The iron formation on the finger of land between Iron Arm and Petitsikapau Lake was also examined. In 1952, a regional survey by T.N. Walthier of IOC examined 100 km of iron formation in the areas around Iron Arm, Dyke Lake and Snelgrove Lake (54°35'N, 64°50'W). He reported a small number of analytical results from hand samples and chip samples.

In 1953, IOC evaluated the area north of Attikamagen Lake. R. S. Girardin led a five-man field party. LM&E examined the Attikamagen area in 1961, as reported by R.A. Crouse. Work consisted of 31 magnetometer lines totalling 24 km over mainly drift-covered areas to delineate the iron formation. Seventy grab samples and one bulk sample were collected and analyzed.

In 1978, J.B. Stubbins did geological reconnaissance mapping and sampling for LM&E in the Lac Sans Chef and Joyce Lake areas. Locations and analytical results of 15 iron formation samples were reported. Forty-eight lake sediment samples were collected near the shores of Iron Arm by J.M. Grant in the same year. The locations and analytical results of 16 samples were reported.

In 1979, LM&E drilled one diamond drillhole at the northern end of the deposit. This 6 m hole was logged by J.M. Grant as cherty metallic iron formation and had an estimated iron content of 25% to 30%. A regional airborne geophysical survey was conducted over parts of the Labrador Trough by Scintrex Ltd. for LM&E in 1980. Instruments used included a GAD-6 scintillometer, a HEM-802 electromagnetic instrument and a MAP-4 proton precision magnetometer (Grant, 1980). The results of the survey indicated seven high U/Th ratios, mostly over the slates. The magnetic intensity ranged from a background of 57,000 gammas to as high as 65,000 gammas over the iron formation. Many conductive horizons were recorded over the Menihek, Attikamagen (Le Fer formation) and Dolly Slate formation. This was thought to represent an increase in magnetite content.

Also, in 1980 LM&E contracted Scintrex to fly an airborne geophysical survey consisting of 328 line kilometres over the Attikamagen Iron area. The airborne survey was focused on possible base metal mineralization, not iron ore. Work continued in the area in 1981 with an induced polarization (IP) survey conducted by Phoenix Geophysics Ltd. The intent of this work was to follow up on previously outlined resistivity and IP anomalies. Limited ground spectrometer surveys indicated and identified a low-level uranium anomaly on the Property. No boulders or outcrops were found that would have accounted for these readings.

In 1982, IOC ceased its exploration activity and closed its mining operations in the Schefferville area. Since 2003, New Millennium Iron Corp. (TSXV:NML, TSX:NML) has been exploring the LabMag and KéMag Taconite Deposits west and north of Schefferville, Québec. These deposits host lithologically similar Sokoman formation iron-rich rocks. New Millennium is considering constructing the world’s largest pelletizing plant and transporting concentrate via a slurry pipeline.

In 2007, Champion Iron Mines Limited conducted an airborne magnetic, gamma-ray and VLF-EM (very low frequency - electromagnetic) geophysical survey on the Property, as well as a preliminary surface mapping and a reconnaissance sampling program to provide ground reference samples for correlation with the geophysical data. In May 2008, the property was optioned to LCIO.

In early 2010, the ground gravity survey provided crucial information leading to the drilling programs of 2010 and 2011. Gravity profiles were carried out on Joyce Lake Area. Strong gravity highs were systematically associated with low magnetic anomalies indicative of potential DSO targets. They were identified in each of the investigated areas. At Joyce, the high gravity mostly matched well with low mag, while at south, high gravity correlating to a magnetic high may indicate magnetic iron formation.

7 GEOLOGICAL SETTING AND MINERALIZATION

7.1 Regional Geology

The Iron Arm - Attikamagen Lake area is located northeast of Schefferville, Québec, and is part of the much larger area that includes the Schefferville Mining District. The area is underlain chiefly by rocks that form the western, miogeosynclinal part of the Labrador Trough (Figure 7-1) in the Churchill Province of the Canadian Shield. These rocks are mainly sedimentary strata of early Proterozoic (Aphebian) age.

To the west (Howells River area), these sediments lie in unconformity on the Archean gneisses of the basement complex and to the east they pass into the eugeosynclinal facies of the Labrador Trough. The sedimentary sequence is referred to as the Knob Lake Group (Kaniapiskau Supergroup) and in the central Labrador Trough it consists of the following members (ascending order):

- Seward Subgroup (of Wardle, 1982) consisting of the Discovery Lake, Snelgrove Lake and Sawyer Lake formations;
- Attikamagen Subgroup (of Wardle, 1982) consisting of the Le Fer, Denault, Dolly and Fleming formations; and
- Ferriman Subgroup (of Wardle, 1982) consisting of the Wishart, Sokoman, Nimish (a local name/time equivalent unit to the Sokoman cherty iron formation), and Menihek formations.

The Kaniapiskau Supergroup has been intruded by numerous diabase dykes known as the Montagnais Intrusive Suite. These dykes, along with the Nimish volcanics (greenstones), are the only rock types representing igneous activity in the western part of the central Labrador Trough.

Harrison et al. (1972) divided the area structurally into three zones:

- a western marginal zone (Howells River area),
- a zone of close spaced folds and thrust faults (Schefferville Mining District),
- an eastern zone of more widely spaced folds and faults.

The Iron Arm - Attikamagen Lake area is within the Eastern Zone and lies on the eastern limb of the Petitsikapau Synclinorium, a major structural feature in the central part of this zone.

The Eastern Zone, as defined by Harrison et al. (1972), lies to the northeast of the Knob Lake thrust fault and extends to the Iron Arm - Attikamagen Lake area.

According to Harrison et al. (1972), it is believed to be underlain by strata of the Attikamagen (i.e., Le Fer formation of Wardle, 1982), Denault, Dolly, Wishart, Ruth, Sokoman and Menihek formations.

Apart from the Knob Lake fault, only one other major thrust fault was defined by Harrison et al. (1972) in this area. This fault lies about 3.2 km (2 mi.) east of the Knob Lake fault and brings strata of the Denault against the Sokoman formation. The fault has a stratigraphic shift of several thousand metres. A number of straight lineaments in the broad belt underlain by Menihek slatey rocks northeast of this fault have been interpreted as thrust faults. The displacement on these faults is unknown.

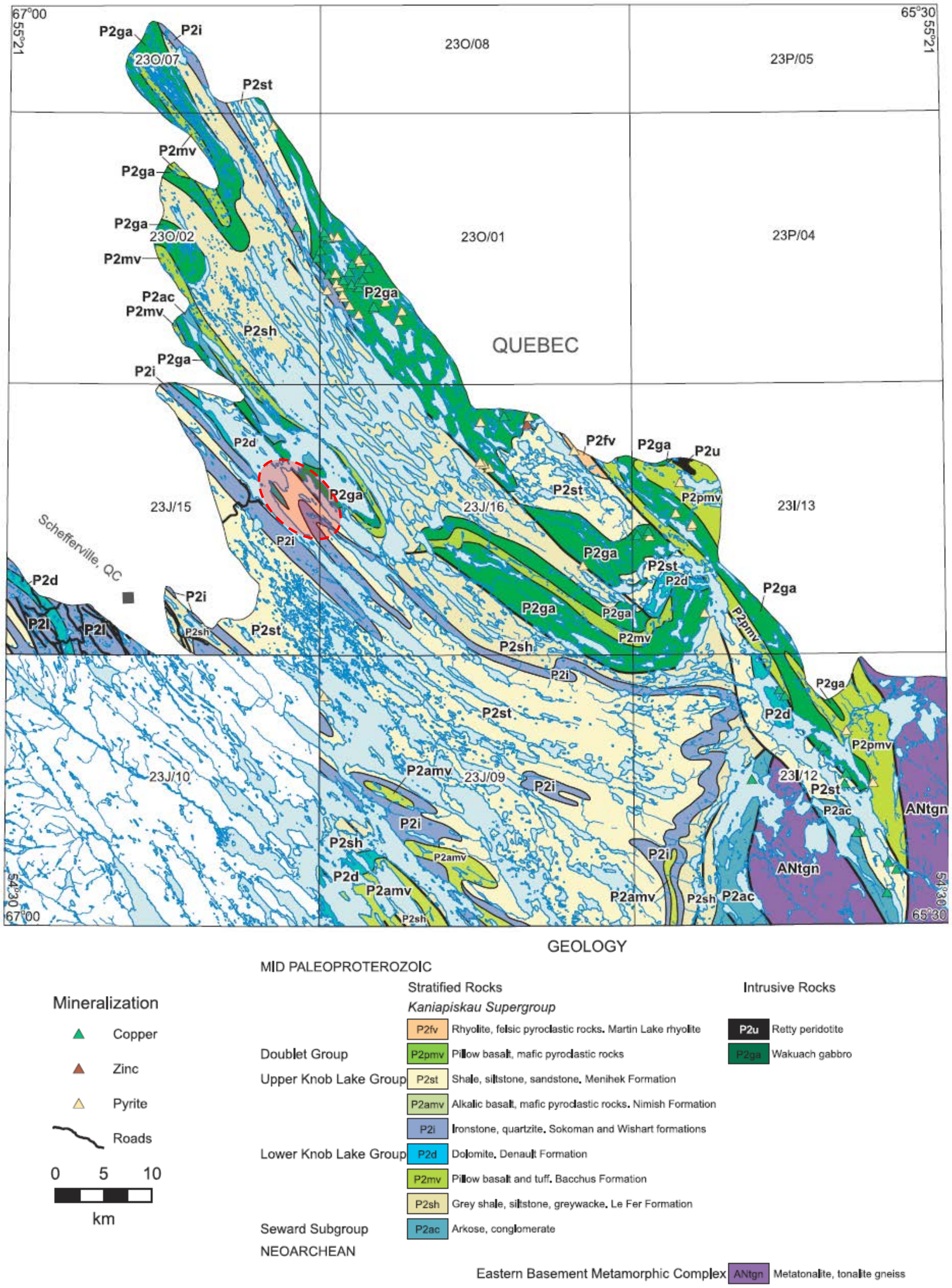


Figure 7-1: Geology of Schefferville area from Newfoundland Labrador Natural Resources

The red ellipse in the figure above shows the Joyce Lake DSO project area.

Open to tightly closed folds, with axial planes dipping about 80 degrees to the northeast, are believed to be the characteristic fold patterns of the competent units of the zone (Harrison et al., 1972).

The Menihek slates are intersected by a pronounced axial cleavage plane dipping 80 degrees to the northeast. The Menihek strata may be much more complexly deformed than the underlying, stronger layers (Harrison et al., 1972).

Harrison et al. (1972) stated that the rather abrupt change in the style of deformation east of the Knob Lake fault is attributed to stratigraphic factors. Probably the development of an intricate pattern of faults and folds in the Eastern Zone was inhibited by the greater thickness of strata. This increased thickness is due to the appearance of the Dolly formation and to an increase in the thickness of the Denault formation.

Burgess, summarized the local structure in the Attikamagen area as being simple, consisting of gently plunging linear folds striking to the northwest. More complex structures occur west of Lac Sans Chef and in the vicinity of Joyce Lake. In both cases, faulting accompanies the folding and in the area west of Lac Sans Chef numerous folds die out in a matter of thousands of metres.

According to Burgess (1951), around Joyce Lake, the structural picture is a confused one. The syncline is not a simple one for it seems quite certain that there are second magnitude folds that account for the distribution of the lenses of Wishart and Attikamagen (Dolly formation of Harrison et al., 1972). On the east limb of the syncline there is an iron formation faulted up between the Wishart and Dolly formations.

7.1.1 Geology of Schefferville Area

The sedimentary sequence of the Knob Lake Group consists of two sedimentary cycles (Figure 7-3).

- **Cycle 1** (the Attikamagen Subgroup of Wardle. 1982) is a marine shelf succession comprising the Le Fer, Denault, Dolly, and Fleming formations.
- **Cycle 2** (the Ferriman Subgroup of Wardle, 1982) represents deposition in a deeper water slope-rise environment. It begins with a transgressive quartz arenite, Wishart formation, followed by shale and iron-formation of the Sokoman formation and conformably overlain by the Menihek formation.

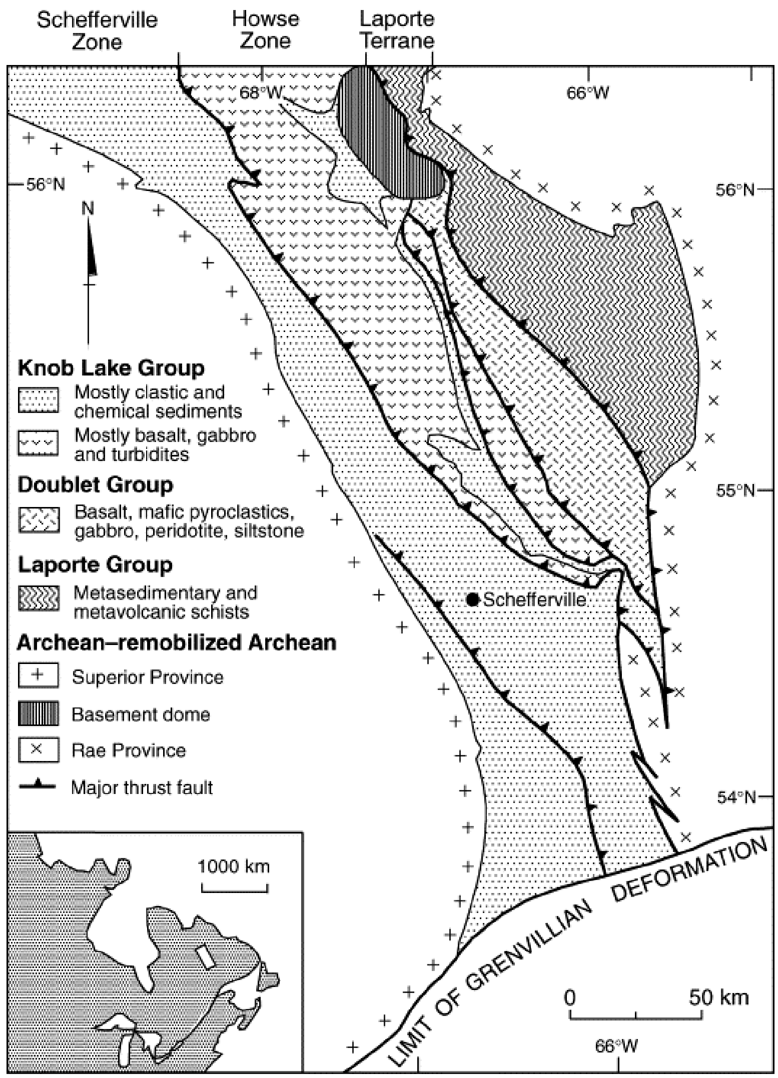


Figure 7-2: Lithotectonic Subdivisions of the Central Labrador Trough (From Williams et al. 2000).

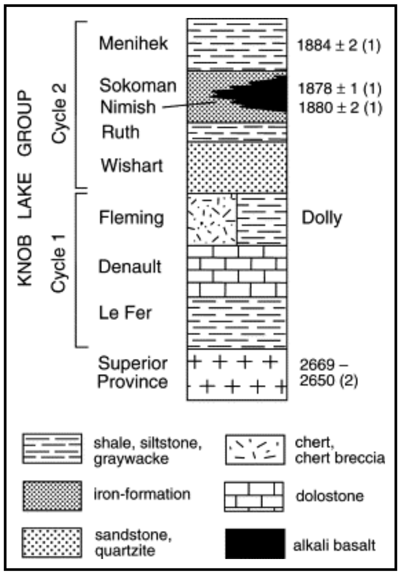


Figure 7-3: Generalized Stratigraphy of the Knob Lake Group (From Williams and Schmidt, 2004 with Numbers Representing Ages of Rock Units in Million Years).

Attikamagen Subgroup – is exposed in folded and faulted segments of the stratigraphic succession where it varies in thickness from 30 metres near the western margin of the Labrador Trough. The lower part of the formation has not been observed. It consists of argillaceous material that is thinly bedded (2-3 mm), fine grained (0.02 to 0.05 mm), grayish green, dark grey to black, or reddish grey. Calcareous or arenaceous lenses as much as 30 cm in thickness occur locally inter-bedded with the argillite and slate, and lenses of chert are common. The formation grades upwards into Denault dolomite, or into Wishart quartzite in areas where dolomite is absent. Beds are intricately drag-folded, and cleavage is well developed parallel with axial planes, perpendicular to axial lines of folds and parallel with bedding planes.

Denault Formation – is inter-bedded with the slates of the Attikamagen formation at its base and grades upwards into the chert breccia or quartzite of the Fleming formation. The Denault formation consists primarily of dolomite, which weathers buff-grey to brown. Most of it occurs in fairly massive beds varying in thickness from a few centimetres to about one metre, some of which are composed of aggregates of dolomite fragments.

Fleming Formation – it has a maximum thickness of about 100 metres and consists of rectangular fragments of chert and quartz within a matrix of fine chert. In the lower part of the formation, the matrix is dominantly dolomite grading upwards into chert and siliceous material.

Wishart Formation – Quartzite and arkose of the Wishart formation form one of the most persistent units in the Kaniapiskau Supergroup. Thick beds of massive quartzite are composed of well-rounded fragments of glassy quartz and 10-30% rounded fragments of pink and grey feldspar, well cemented by quartz and minor amounts of hematite and other iron oxides. Fresh surfaces of the rock are medium grey to pink or red. The thicknesses of the beds vary from a few centimetres to about one metre, but exposures of massive quartzite with no apparent bedding occur most frequently.

Ferriman Subgroup:

Ruth Formation – Overlying the Wishart formation is a black, grey-green or maroon ferruginous slate, 3 to 36 metres thick. This thinly banded, fissile material contains lenses of black chert and various amounts of iron oxides. It is composed of angular fragments of quartz with K-feldspar sparsely distributed through a very fine mass of chlorite, white mica, iron oxides and abundant finely disseminated carbon and opaque material. Much of the slate contains more than 20% iron.

Sokoman Formation – The Sokoman formation is the main iron formation host throughout the Labrador Trough. Its thickness varies between 120 and 240 metres. The basal facies of the Sokoman formation at Joyce Lake are composed of alternating micro- to macro-bands of hematite, magnetite, siderite (ankerite) with red, white and green cherts. This assemblage was affected by alteration and oxidation processes through which carbonate and silica were leached out while magnetite oxidized to martite. Based on field observations and logging data gathered from RC-chips at Joyce Lake, three members of units can be identified; UIF, MIF, LIF.

The Upper Iron Formation (UIF), 10-20 m average thickness, consists of mesobands of cherts and iron oxides that can be divided into two sub-members, UMH and RC.

- Upper Massive Hematite (UMH) consists of Hematite, Magnetite, Jasper and white, grey and red cherts. This sub-member has more Hematite, Magnetite and significantly less jasper (occurs as uncommon globules and laths) than the RC and is considered to be an enriched variety of the RC. It is moderately massive with the dominant mineral being medium grained hematite and with minor magnetite, also with occasional pockets of specularite and abundant goethite. It weathers easily in the field, leaving minimal to no outcrop.
- Red Chert (RC) has much more red chert, so Fe% is reduced when compared to the UMH. It is usually mesobanded hematite and red chert with a weak planar fabric, some jasper (15-20%) and coarse oolites of hematite with ringed jasper - fine oolites. No discernible bedding or cleavage. There is also no green chert in RC compared with LIF, which can be clearly separated into these two units.

The Middle Iron Formation (MIF) (10-60 m), which is highlighted on the Joyce Lake map as LMH, is similar to the UMH. This member contains significantly more Hematite and Magnetite than UIF and LIF. MIF contains Hematite, Magnetite, white chert and carbonate. It is also moderately massive with interlaying bands of white chert to carbonate and massive hematite and specularite. It is weakly magnetic with occasional pods of specularite and tension gashes of specularite and/or magnetite. It displays a leached texture typical of DSO, with large (>5 m) zones of massive hematite and specularite with minor or no white chert bands. Red chert is present only in very small amounts. It comprises sub-units known as Upper Red Chert (URC), Pink Grey Chert (PGC) and Lower Red Chert (LRC).

- In the field, the URC consists of light to dark red coarse-grained three to fifteen centimetre thick non-magnetic cherty layers interbedded with light to dark grey or bluish hematite-magnetite medium- to coarse-grained weakly- to non-magnetic iron formation layers (Figure 7-4). This unit usually forms topographic highs.
- The PGC comprises ten to thirty centimetre thick layers of thinly laminated, light to dark grey, fine-to medium-grained moderately to strongly magnetic iron formation with light grey to brown, medium-grained, 0.5 to 5.0 centimetres thick, weakly to non-magnetic cherty layers (Figure 7-5). PGC is recessive in both Hayot and Hayot East Areas and outcrops in topographic lows, while at Sans Chef North it occupies kilometric outcrops of anticline structure. Both the PGC and URC are the most consistently magnetic illustrating the higher concentration of magnetite from field observations.

The URC is locally magnetic at the base, but it is commonly non-magnetic. In general, the URC is coarser grained with corresponding coarser beds when compared to the PGC that is composed of finer grain sized beds and corresponding thinner beds suggesting a deeper depositional environment.

The Lower Iron Formation (LIF), which is the lowest member in the Sokoman formation stratigraphy column, contains much more chert and low hematite. Based on field observation it has micro to medium banding of chert and iron oxides. The LIF consists of two sub-members; LRC and Ruth shale.

- The Lower Red Chert (LRC/LRGC-LIF) consists of green and red chert, magnetite (5 to 20 centimetres thick), carbonate and hematite. Green chert and higher magnetite is a key factor for this sub-member.
- The Ruth Shale (RS) sub-member, previously considered as a separate formation, contains black shale with traces of pyrite and also magnetite, hematite or quartz at the top. Few thin hematite layers are rarely observed at the top of this sub-member. Please note this sub-member was highlighted on the Joyce Lake geologic map and all cross sections by its historical name, “Ruth formation”.

This rock shows very continuous horizon of thinly banded hematite-jasper rich layers with carbonate blobs, some of them being fresh and others totally altered. The matrix is the same color on fresh and altered surfaces and some horizons have introduced magnetite. In the LRC, magnetite occurs in 5 to 20 cm thick strongly magnetic laminated magnetite beds intercalated with weakly magnetic red magnetite-bearing chert over thicknesses of approximately 15 m.

Menihek Formation – A thin-banded, fissile, grey to black argillaceous slate conformably overlies the Sokoman formation in the Joyce Lake area. The total thickness is not known, as the slate is found in faulted blocks in the main ore zone and forms the large hills to the south of Joyce Lake area.

The Menihek slate is mostly dark grey or jet black. It has a dull sooty appearance but weathers light grey or becomes buff coloured where leached. Bedding is less distinct than in the slates of other slate formations but thin laminations or beds are visible in thin sections.

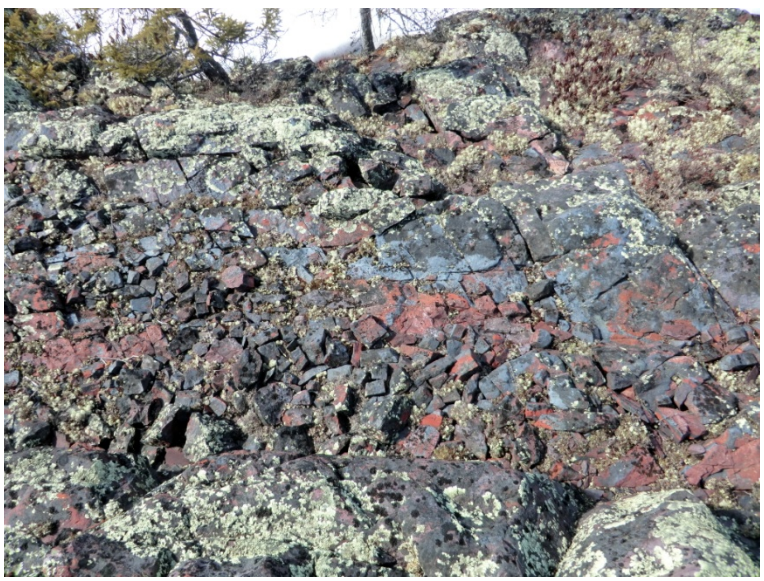


Figure 7-4: URC Outcrop at Joyce Lake Project

7.1.2 Joyce Lake Geological Structure

Field mapping done by LCIO geologists indicates that the fold structure at Joyce Lake is trending NW-SE. There are zones of minimal strain and the units appear undeformed. These low strain zones are of particular interest because they would represent unshortened and therefore thicker iron beds outside of the fold nose. It was observed in the field, especially from the massive hematite units on one limb of the fold structure, that there were specularite and hematite veinlets and tension gashes (1 mm-3 mm) oriented obliquely to the strike of the perceived bedding. These brittle features likely helped to accommodate the volume change during shortening and thus the shortening to be oriented along a strike of NE-SW.

Figure 7-5: PGC Outcrop at Joyce Lake Project

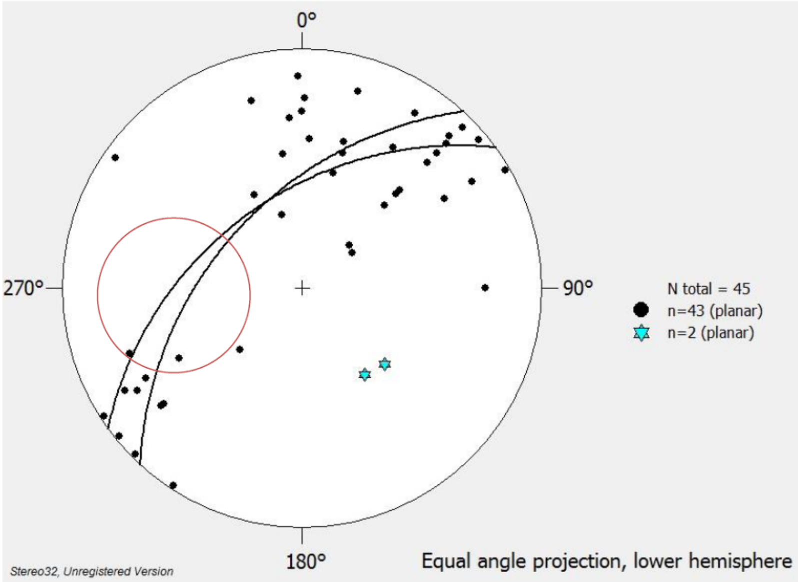


Figure 7-6: Stereo-Net of Field Mapping at Joyce Lake

Figure 7-6 shows a plot of the poles of perceived bedding planes (black dots) measured in the field at Joyce Lake. The red circle represents an obvious gap in the dataset, which likely represents the lack of reliable structural measurements in the nose of the fold. The blue stars are two inferred fold axes with accompanying great circles. The geologist noticed that there is an obvious gap in the number of measurements concerning the fold structure (Figure 7-6), however this is likely accounted for by the lack of outcrop in the nose of the fold and hence it is assumed that those missing orientations would belong to that set of strikes and dips. It was deduced that the fold was trending at approximately 135° with a dip of approximately 42°.

The Ruth shale provides an impermeable layer at depth to cap the down flow of meteoric water and therefore encouraging the leaching of silica and the deposition of enriched hematite as DSO. This is expected to be greatest where there is the greatest brittle deformation and would carry the greater tonnage where the massive hematite units are thicker. These conditions are satisfied within the nose of the fold structure and within the minimal strain zones identified in the field. The fold structure plunges to the Southeast and one would expect the hematite beds to thicken. Eventually, the strata should be capped by the impermeable Menihek Shale unit. Thus, by moving away from the zone of brittle deformation where being capped by an impermeable layer retards the percolation of meteoric water, it therefore reduces the potential of enrichment and DSO formation along this trend.

The mineralization is an iron enrichment as shown in the picture below with the red and yellow and the blue being the higher grade and higher quality material that was not present in the exposed core boxes during the site visit of the author. Figure 7-8 presents the Joyce Lake Geology by Burgess (1951) recompiled by LCIO technical team with gravity survey lines.

The mineralization is an iron enrichment, as shown in the Figure 7-7.

Figure 7-7: Mineralization of Red and Yellow DSO in Fresh Core

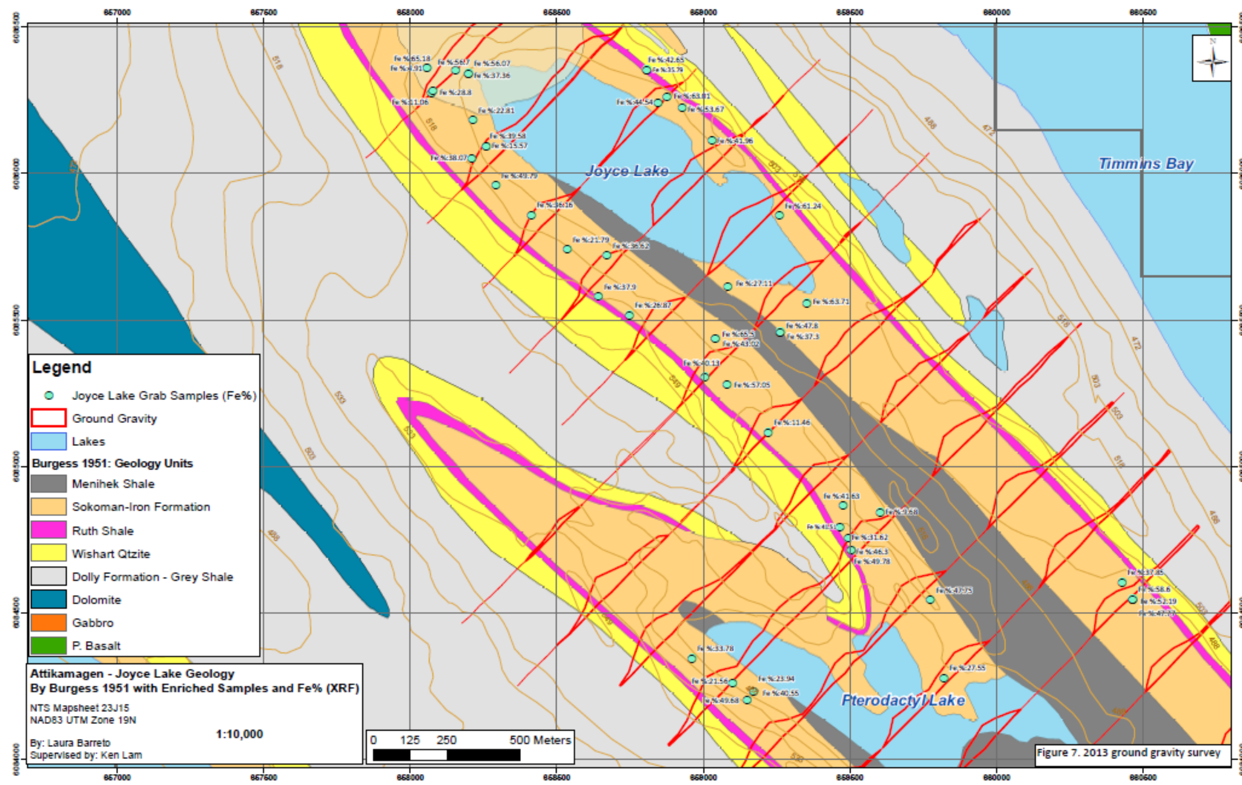


Figure 7-8: Joyce Lake Geology – Burgess 1951 (source 8th Assessment Report)

8 DEPOSIT TYPE

The Labrador Trough contains four main types of iron deposits:

- Soft iron ores formed by supergene leaching and enrichment of the weakly metamorphosed cherty iron formation; they are composed mainly of friable fine-grained secondary iron oxides (hematite, goethite, limonite).
- Taconites, fine-grained weakly metamorphosed iron formations with above average magnetite content, which are also commonly called magnetite iron formation.
- More intensely metamorphosed, coarser-grained iron formations, termed meta-taconites; that contain specular hematite and subordinate amounts of magnetite as the dominant iron minerals.
- Occurrences of hard high-grade hematite ore occur southeast of Schefferville at Sawyer Lake and Astray Lake.

The Sokoman iron formation was formed as chemical sediment under varied conditions of oxidation-reduction potential (Eh) and hydrogen ion concentrations (pH) in varied depths of seawater. The resulting irregularly bedded, jasper-bearing, granular, oolitic and locally conglomeratic sediments are typical of the predominant oxide facies of the Superior-type iron formations, and the Labrador Trough is the largest example of this type.

The facies changes consist commonly of carbonate, silicate and oxide facies. Typical sulphide facies are poorly developed. The mineralogy of the rocks is related to the change in facies during deposition, which reflects changes from shallow- to deep-water environments of sedimentation. In general, the oxide facies are irregularly bedded, and locally conglomeratic, having formed in oxidizing shallow-water conditions. Most carbonate facies show deep-water features, except for the presence of minor amounts of granules. The silicate facies are present in between the oxide and carbonate facies, with some textural features indicating deep-water formation.

The carbonate, silicate and oxide facies contain typical primary minerals ranging from siderite, minnesotaite, and magnetite-hematite respectively. The most common mineral in the Sokoman formation is chert, which is closely associated with all facies. Carbonate and silicate lithofacies are present in varying amounts in the oxide members.

The sediments of the Labrador Trough were initially deposited in a stable basin that was subsequently modified by penecontemporaneous tectonic and volcanic activity. Deposition of the iron formation indicates intraformational erosion, redistribution of sediments, and local contamination by volcanic and related clastic material derived from the volcanic centers in the Dyke-Astray area.

The Joyce Lake DSO is an enrichment zone along the nose of the main fold of the Joyce Lake syncline. This enrichment extends laterally within the iron formation forming a vase (bowl) shape with significant thickness in the hinge of the syncline.

9 EXPLORATION

9.1 History

Iron ore enrichment was discovered along the northeast side of Joyce Lake by Labrador Mining and Exploration Co. Ltd. (LM&E) in 1943. The enrichment (known as the Timmins Bay deposit) was examined by J.A. Retty at that time and found to have a length of 152 m (500 ft.) and a width of 12 m (40 ft.) at its widest point (Retty et al., 1944).

Two samples collected by Retty in 1943 from the northeast side of Joyce Lake gave the following results (Retty et al., 1944):

- No. R-1 (Grab); 1.2 m (4 ft.) Width; 69.0% Fe, 1.34% Insol. 0.16% Mn, 0.01% P, 0.09% S
- No. R-2 (Grab); 6.7 m (22 ft.) Width; 69.1% Fe, 0.86% Insol. 0.39% Mn, 0.01% P, 0.07% S

In 1944, the ore was traced along an additional 152 m (500 ft.) bringing the total length of the deposit to 305 m (1000 ft.). No surface work had been done at the deposit up to that time (Retty and Moss, 1945). According to Stubbins (1978), the area around Joyce Lake had been mapped on a scale of 1" = 200' in 1949. No other information regarding this work is available at present.

In 1951, a geological mapping project was conducted west of Lake Attikamagen by L.C.N. Burgess of IOC. The area mapped covered about 259 km^2 (100 sq. mi.). Mapping was done on a scale of 1" = 1000'.

In summarizing the economics of the area, Burgess stated that it almost certainly contains small ore bodies near some of the ore outcrops on Lac Sans Chef and Joyce Lake, but these were not considered to be large enough to meet the million ton minimum. He added that there are large areas of unexposed iron formation throughout the region that have room for larger tonnages of ore.

Work was done by Harrison et al. of the Geological Survey of Canada (GSC) in the 1950s and has provided much of the material for a detailed account of the stratigraphy and structure of a strip 3.2-4.8 km (2-3 mi.) wide and 45 km (28 mi.) long across the southwest margin of the Labrador Trough (Harrison et al., 1972). This study included part of the Iron Arm - Attikamagen Lake area, which was mapped by Burgess during his 1951 project.

In 1978, a geological reconnaissance traverse and collection of samples was carried out in the Joyce Lake area (Block No. 11) by LM&E. Nine samples were collected and assayed, all of which were channel chip rock samples taken from surface outcrops of 'middle massive iron formation' outcropping in a syncline adjacent to Joyce Lake. All nine samples were submitted for Davis Tube testing to determine their amenability to magnetic concentration (Stubbins, 1978). Stubbins (1978) commented that of the three outcrop areas sampled around Joyce Lake, one sample in each should be iron ore and/or lean ore. However, when tested by Davis Tube, only one sample (No. 29623) had results of interest and even that had relatively low weight recovery at 27%.

More recent aeromagnetic exploration has been carried out by Nova Scotia Ltd in 2007. The same year Champion conducted an airborne magnetic, gamma-ray and VLF-EM (very low frequency - electromagnetic) geophysical survey on the Property, as well as a preliminary surface-mapping and a reconnaissance sampling program to provide ground reference samples for correlation with the geophysical data.

A comprehensive program of exploration work was completed on the Property during the 2008 field season. At the beginning of the season two experts in iron formations, P. K. Pufahl, Ph. D., and E. E. Hiatt, Ph. D., were brought to the Property to familiarize the exploration team with the local geology, especially the Sokoman formation. The group targeted Lac Sans Chef and Jennie Lake where Pufahl and Hiatt offered guidance on the history, formation, geochemistry, deposition and stratigraphy of the Sokoman formation; providing a framework for the summer's geological mapping program. Pufahl and Hiatt (2008) confirmed the potential for the magnetite rich PGC units and commented on the potential for magnetite rich iron formation and for DSO on the Property. Detailed mapping (1:2,500 scale) ensued using the Pufahl and Hiatt criteria of the Sokoman formation along flagged grid-lines oriented northeast-southwest and spaced 150 m to 300 m apart. Seven lines comprising a total of 11 km were mapped on the Joyce Lake grid. Compiled geological data, plotted in the field on 17 × 11 topographic map sheets, were sent to MRB & Associates GIS services in Val-d'Or where they were digitized and assembled into individual geological maps for each grid area. These were then superimposed with the airborne magnetic data, for interpretation of geology in areas covered by water or overburden.

9.2 Recent

A ground gravity survey was undertaken in 2010 for LCIO. The survey was carried out by Geosig Inc., from Québec City, Québec. The gravity method was chosen in order to discriminate between hematite and magnetite mineralization based on their density contrast.

Gravity profiles were carried out on Joyce Lake Area (Claim 013445M), selected on the basis of interpretation of previous work by Champion and compilation. The selected targets are most often located in fold hinges either where the limbs are characterized by magnetic highs, indicative of magnetite rich mineralization or where the hinge is characterized by magnetic lows, frequently indicative of hematite or iron hydroxide rich mineralization. Results from Figure 9-1 show a magnetic high (magnetite) area surrounding a magnetic low (hematite) area. The results delineated magnetic low anomalies located in Joyce Lake, suggesting DSO on this property.

In the fall of 2010, LCIO started drilling boreholes in the area and found three potential DSO targets. All targets were selected based on geological and geophysical data. The taconite at Hayot Lake area is a shallow dipping magnetite-rich iron formation with an expected minimum thickness of 60 to 100 metres.

The Joyce Lake DSO deposit was confirmed by LCIO through ground gravity survey, surface geological mapping and sampling. A systematic reverse circulation drilling program was conducted at Joyce Lake in 2011-2012 that included 116 drillholes totalling 12,601.1 m and covering an area of 1,100 m along strike and 600 m in width. Drillhole spacing of 50 x 50 m was used at the central part of the deposit. The 2012-2013 drilling campaign delineated a high grade zone, tested the extension of the deposit along strike and depth, and provided a detailed information base for the resource estimate. The mineralization remains open to the south.

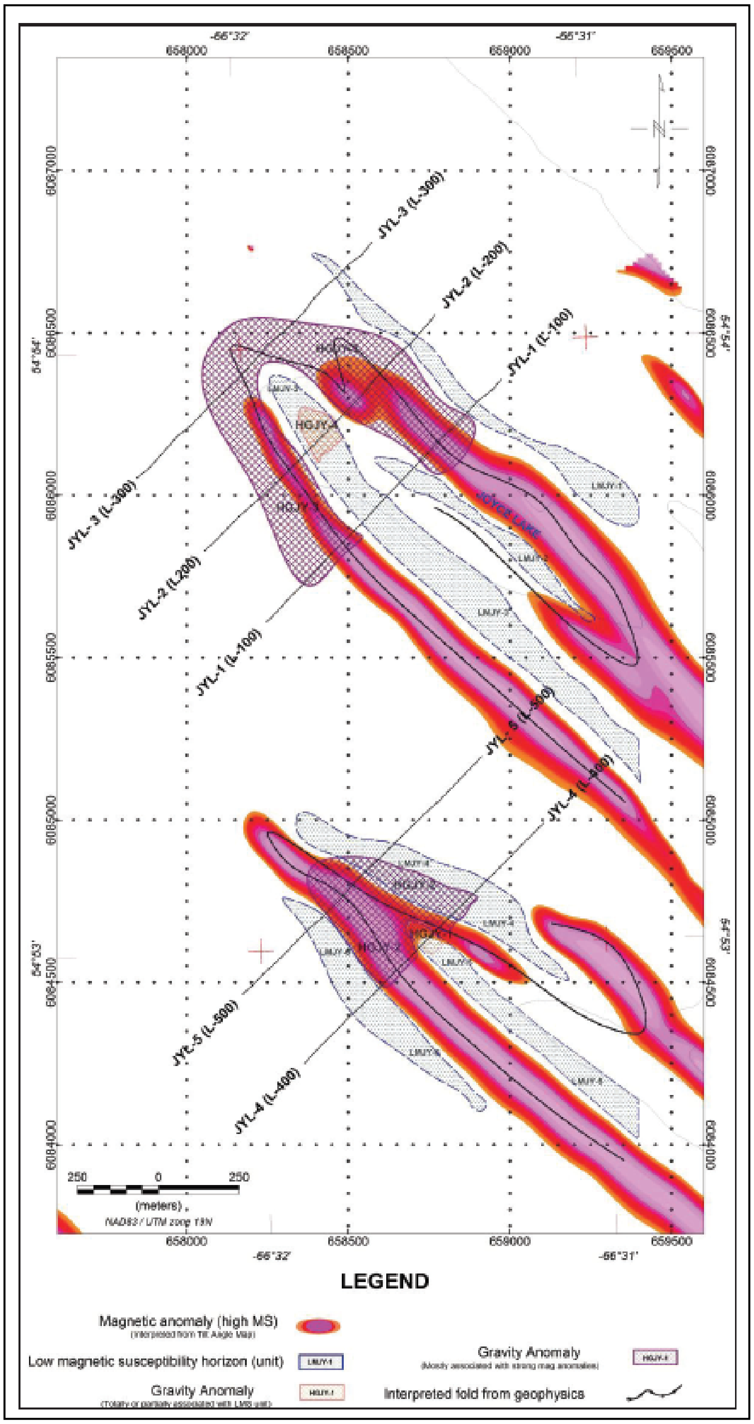


Figure 9-1: Geophysical Interpretation, Joyce Lake Area (From SRK Consulting, *not to scale*)

In 2013, field mapping was undertaken during the months of May to October in order to find surface exposures of high grade ore for the dual purpose of extending the resources and to better understand the local geology. A total of 253 GPS stations were recorded as outcrops around Joyce Lake and Pterodactyl Lake In addition, 110 structural measurements were also recorded where bedding measurements largely exhibit the synclinal structure and locally the complex folding of the Joyce Lake property.

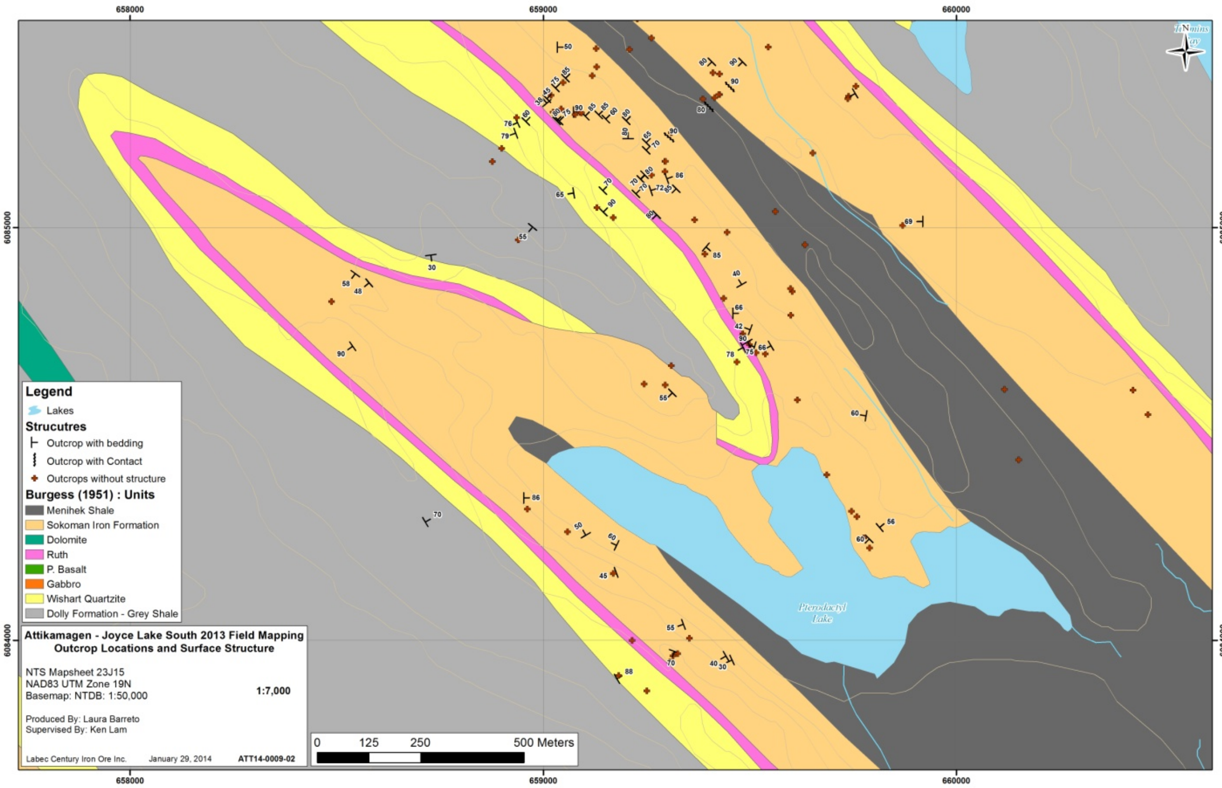


Figure 9-2: Example of Outcrop Map Location with Surface Structure Measurement (8th Assessment Report)

Four grab samples from the northern area of the lake (NE flank of ore body/section 1S) were sent for analytical assay. The results showed Fe values ranging from 40.1 - 64.8%.

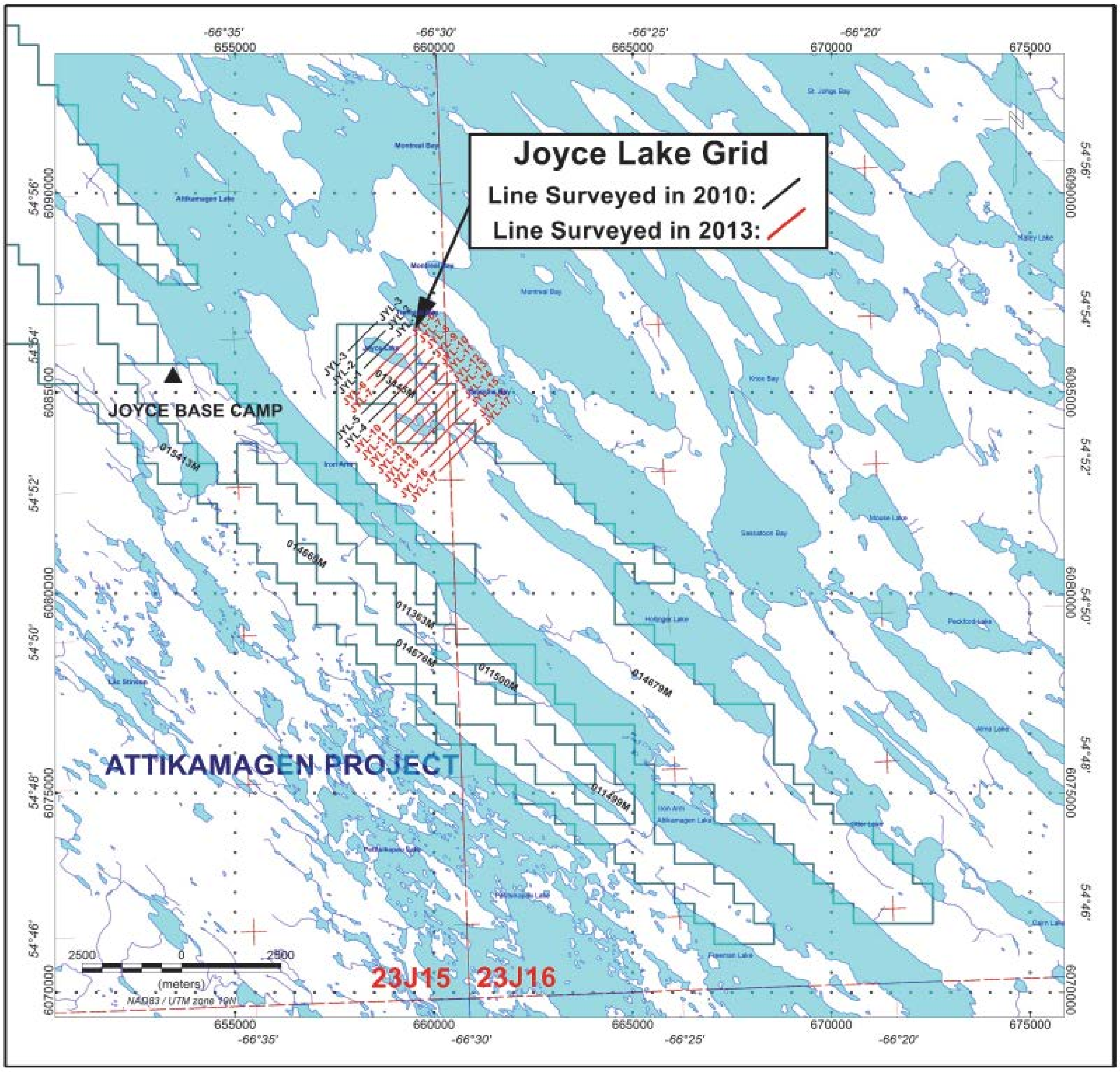


Figure 9-3: Geophysical Gravity Survey, Joyce Lake Area Lines (From 8th Assessment Report)

The ground gravity survey, covering all of Joyce Lake and extended to the SE Station, spacing was set to 50 m, while readings were taken over 1.5 and 2.0 km.

Additional gravity surveys on the Attikamagen Property were conducted between February 18 and March 30, 2013 by Geosig Inc. in order to extend the gravity survey coverage 3.0 km SE of the survey carried out in 2010. The surveys consisted of 1205 gravity points, of which thirty (30) were repeated for quality control. A high-resolution differential GPS was used to position the survey lines as well as the gravity points. Figure 9-4 presents the survey lines and residual Bouguer anomaly map.

Total distance covered was 25,160 metres. Geological interpretation of the magnetic and gravity data was done by Joel Simard, P. Geo, consulting geophysicist.

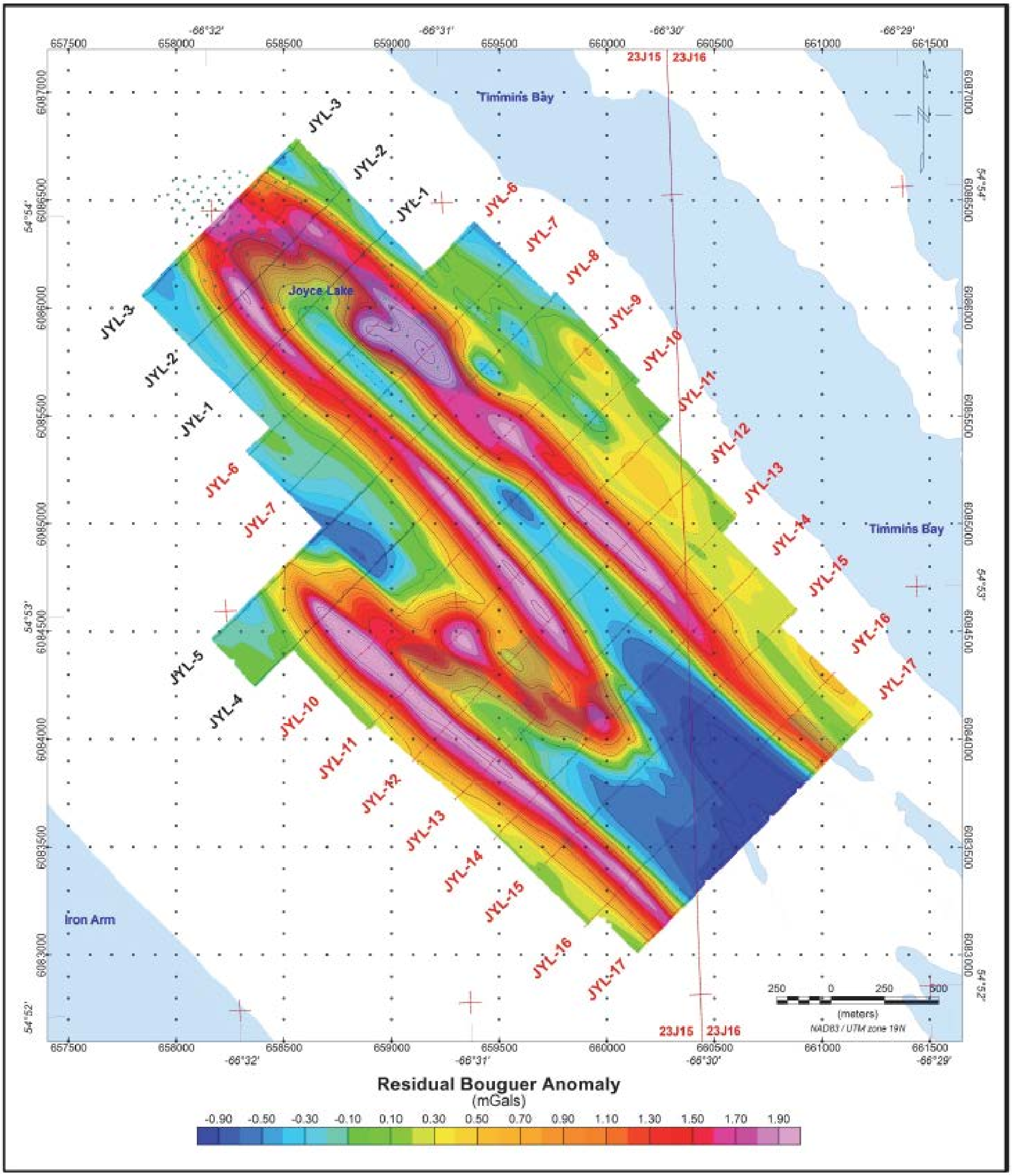


Figure 9-4: Gravimetric Survey with Residual Anomaly Joyce Lake Area
(From Geosig Report, *not to scale*)

10 DRILLING

LCIO started drilling at Joyce Lake in 2010 up to 2013 in different exploration phases using reverse circulation and core drilling (conventional and triple tube core barrel). The following table presents the list of drillholes. The following sections present information about each of the drilling phases in time and coordinates are NAD83 - UTM Zone 19.

Table 10-1: Drillhole List (RC: Reverse Circulation / DDH: Diamond Drillholes)

Hole Name	X	Y	Z	Azimuth	Dip	Length	Type
Joy-10-01	658863.16	6086243.153	514.94	40	-65	110	DDH
Joy-10-02	658193	6086388.000	526.37	0	-90	129	DDH
Joy-10-03	658464	6085964.000	511.59	220	-65	84	DDH
Joy-10-04	658713	6084605.000	536.36	0	-90	39	DDH
Joy-11-05	658329	6086247.000	504.88	0	-90	50	RC
Joy-11-06	658193.35	6086383.592	526.56	0	-90	143	RC
Joy-11-07	658051.12	6086531.959	524.92	0	-90	102	RC
Joy-11-08	658326.03	6086527.701	528.57	0	-90	114	RC
Joy-11-09	658865.32	6086240.166	514.70	0	-90	141	RC
Joy-11-10	658707.64	6086352.332	517.04	0	-90	123	RC
Joy-11-11	659019.47	6086046.251	507.39	0	-90	105	RC
Joy-11-12	658458.42	6086405.467	514.30	0	-90	156	RC
Joy-11-13	658579.25	6086489.205	528.21	0	-90	105	RC
Joy-11-14	658381.04	6086588.159	527.76	0	-90	69	RC
Joy-11-15	658119.57	6086317.948	521.55	0	-90	147	RC
Joy-11-16	658183.36	6086101.215	529.94	0	-90	123	RC
Joy-11-17	658333.3	6085964.489	530.46	0	-90	99	RC
Joy-11-18	658480.8	6085829.100	530.30	0	-90	114	RC
Joy-11-19	658622.28	6085671.379	541.50	0	-90	147	RC
Joy-11-20	658780.57	6085574.893	540.35	0	-90	142	RC
Joy-11-21	658925	6085434.000	535.10	0	-90	117	RC
Joy-11-22	659041.99	6085567.782	521.22	0	-90	144	DDH
Joy-11-23	658122.68	6086463.057	530.93	0	-90	138	RC
Joy-11-24A	659260.77	6085210.656	533.49	225	-65	248	DDH
Joy-11-25	658107.15	6086607.878	536.10	0	-90	60	RC
Joy-11-26	658259.08	6086464.159	528.69	0	-90	153	RC
Joy-11-27	658184.82	6086527.029	533.68	0	-90	120	RC
Joy-11-28	658336.11	6086398.315	518.20	0	-90	162	RC
Joy-11-29A	659396.82	6085350.468	517.42	50	-65	175	DDH
Joy-11-30	658189.59	6086241.705	520.06	0	-90	174	RC
Joy-11-31	659548.63	6085481.73	514.64	50	-65	134	DDH

Hole Name	X	Y	Z	Azimuth	Dip	Length	Type
Joy-11-32	658396.64	6086455.551	521.38	0	-90	174	RC
Joy-11-33	658470.5	6086529.908	528.75	0	-90	138	RC
Joy-11-34	658049.16	6086389.135	529.30	0	-90	130	RC
Joy-11-35	657981.15	6086461.881	530.75	0	-90	90	RC
Joy-11-36	657921.18	6086519.146	530.63	0	-90	51	RC
Joy-11-37	659474.4	6085424.722	507.34	50	-65	197.1	DDH
Joy-11-38	659659.7	6085311.422	511.48	50	-65	155	DDH
Joy-11-39	658221.4	6086422.25	527.63	0	-90	168	RC
Joy-11-40	657985.47	6086590.373	530.31	0	-90	45	RC
Joy-11-41	658631.1	6086421.606	524.05	0	-90	171	RC
Joy-11-42	658268.54	6086173.315	512.67	0	-90	159	RC
Joy-12-100	658299.45	6086484.818	528.49	0	-90	141	RC
Joy-12-101	657960.5	6086526.073	529.63	0	-90	54	RC
Joy-12-102	658002.83	6086412.082	530.74	0	-90	49.5	RC
Joy-12-103	658182.26	6086456.375	530.02	0	-90	153	RC
Joy-12-104	658143.67	6086428.358	529.93	0	-90	153	RC
Joy-12-105	658108.41	6086375.25	523.53	0	-90	135	RC
Joy-12-106	658073.14	6086418.298	524.39	0	-90	117	RC
Joy-12-107	658151.52	6086498.195	530.94	0	-90	123	RC
Joy-12-108	658213.16	6086482.754	531.27	0	-90	147	RC
Joy-12-109	658247.18	6086534.485	531.06	0	-90	102	RC
Joy-12-110A	658292.26	6086422.966	524.41	0	-90	171	RC
Joy-12-111	658256.16	6086394.495	520.91	0	-90	171	RC
Joy-12-112	658198.09	6086292.031	519.79	0	-90	3	RC
Joy-12-112A	658231	6086269.000	515.07	0	-90	57	RC
Joy-12-112B	658225	6086266.000	517.00	0	-90	162	RC
Joy-12-113	658394.22	6086518.081	522.97	0	-90	117	RC
Joy-12-114	658184.88	6086600.615	541.29	0	-90	117	RC
Joy-12-115	658248.98	6086595.342	536.61	0	-90	109.5	RC
Joy-12-116	658077.77	6086330.356	527.13	0	-90	100.5	RC
Joy-12-117	658357.86	6086422.895	520.44	0	-90	177	RC
Joy-12-43	658298.56	6086208.130	504.87	0	-90	176	RC
Joy-12-44	658647	6086289.000	504.86	0	-90	102	RC
Joy-12-45A	658574	6086216.000	504.79	0	-90	58.5	RC
Joy-12-46	658501	6086284.000	504.82	0	-90	109.5	RC
Joy-12-47	658363	6086289.000	504.84	0	-90	102	RC
Joy-12-48	658826	6086183.000	504.89	0	-90	126.5	RC
Joy-12-49	658753	6086111.000	504.89	0	-90	118.5	RC
Joy-12-50	658684	6086042.000	504.86	0	-90	92.5	RC

Hole Name	X	Y	Z	Azimuth	Dip	Length	Type
Joy-12-51	658895	6085974.000	504.91	0	-90	69	RC
Joy-12-52	658968	6086042.000	504.83	0	-90	116	RC
Joy-12-53	658257	6086321.000	504.91	0	-90	82.5	RC
Joy-12-54	658468	6086253.000	504.81	0	-90	141	RC
Joy-12-55	658400	6086321.000	504.83	0	-90	126	RC
Joy-12-56	658330.09	6086248.820	504.87	0	-90	97.5	RC
Joy-12-57	658359.69	6086565.394	526.81	0	-90	128	RC
Joy-12-58	658424.64	6086627.692	535.42	0	-90	60	RC
Joy-12-59	658443.41	6086642.194	536.63	0	-90	66	RC
Joy-12-60	658424.14	6086559.432	526.67	0	-90	95.5	RC
Joy-12-61	658513.42	6086553.509	531.33	0	-90	99	RC
Joy-12-62	658528.05	6086577.584	532.10	0	-90	69	RC
Joy-12-63	658460.58	6086582.484	532.26	0	-90	91.5	RC
Joy-12-64	658330.65	6086612.006	536.27	0	-90	69	RC
Joy-12-65	658076.5	6086562.030	529.37	0	-90	81	RC
Joy-12-66	658009.42	6086550.540	529.52	0	-90	82.5	RC
Joy-12-67	658016	6086488.656	525.05	0	-90	90	RC
Joy-12-68	658051.96	6086530.585	524.92	0	-90	88.5	RC
Joy-12-69	658080.18	6086493.107	524.82	0	-90	118.5	RC
Joy-12-70	658115.76	6086538.620	528.86	0	-90	93	RC
Joy-12-71A	658034.44	6086454.033	524.73	0	-90	90	RC
Joy-12-72	658747.43	6086394.388	518.93	0	-90	84	RC
Joy-12-73	658719.22	6086430.700	521.37	0	-90	33	RC
Joy-12-74	658776.62	6086355.250	516.37	0	-90	90	RC
Joy-12-75	658897.19	6086263.864	521.86	0	-90	93	RC
Joy-12-76	658862.95	6086300.962	522.71	0	-90	99	RC
Joy-12-77A	658931.74	6086232.495	524.48	0	-90	81	RC
Joy-12-78	658179.22	6086159.563	524.01	0	-90	30	RC
Joy-12-79	658242.25	6086076.111	527.51	0	-90	82.5	RC
Joy-12-80	658220.19	6086136.422	526.30	0	-90	85.5	RC
Joy-12-81	658133.01	6086126.211	530.43	0	-90	63	RC
Joy-12-82	658214.1	6086057.711	533.04	0	-90	42	RC
Joy-12-83	658289.27	6086043.166	529.82	0	-90	90	RC
Joy-12-84	658147.33	6086208.211	521.63	0	-90	43.5	RC
Joy-12-85	658221.28	6086344.513	509.75	0	-90	177	RC
Joy-12-86	658146.49	6086557.748	533.00	0	-90	79.5	RC
Joy-12-87	658220.86	6086633.182	544.13	0	-90	48	RC
Joy-12-88	658220.58	6086562.526	534.06	0	-90	69	RC
Joy-12-89	658293.91	6086629.477	538.04	0	-90	45	RC

Hole Name	X	Y	Z	Azimuth	Dip	Length	Type
Joy-12-90	658290.39	6086564.817	530.15	0	-90	78	RC
Joy-12-91	658435.6	6086359.693	507.23	0	-90	171	RC
Joy-12-92	658672.05	6086387.817	521.18	0	-90	42	RC
Joy-12-93	658747.22	6086312.499	512.29	0	-90	76.5	RC
Joy-12-94	658553.05	6086515.400	529.76	0	-90	73.5	RC
Joy-12-95	658964.17	6086192.449	527.63	0	-90	129	RC
Joy-12-96	658994.71	6086153.163	527.81	0	-90	103.5	RC
Joy-12-97	658356.73	6086484.923	525.36	0	-90	150	RC
Joy-12-98	659037.93	6086099.495	525.87	0	-90	45	RC
Joy-12-99	658037.99	6086590.089	531.45	0	-90	57	RC
Joy-12-U1	658146.97	6086345.143	525.08	0	-90	159	RC
Joy-13-119	658540	6086321.000	505.00	0	-90	102	RC
Joy-13-120	658303	6086358.000	505.00	0	-90	171	RC
Joy-13-121	658289	6086289.000	505.00	0	-90	72	RC
Joy-13-122	659139	6085929.000	505.00	0	-90	93	RC
Joy-13-123	659072	6085871.000	505.00	0	-90	150	RC
Joy-13-124	659209	6085860.000	505.00	0	-90	91.5	RC
Joy-13-125	659285	6085655.000	505.00	0	-90	100	RC
Joy-13-126	659213	6085725.000	505.00	0	-90	101	RC
Joy-13-127	659145	6085805.000	505.00	0	-90	45	RC
Joy-13-128	658925	6085871.000	505.00	0	-90	7	RC
Joy-13-129	658998	6085941.000	505.00	0	-90	88.5	RC
Joy-13-130	658352	6086341.000	504.84	0	-90	178.5	RC
Joy-13-131	658936	6086012.000	505.00	0	-90	82.5	RC
Joy-13-132	658899	6086110.000	504.00	0	-90	96	RC
Joy-13-133	658831	6086184.000	504.00	0	-90	93.2	RC
Joy-13-134	658251	6086318.000	505.00	0	-90	180	RC
Joy-13-135	658725	6086208.000	505.00	0	-90	91.5	RC
Joy-13-136	658623	6086254.000	505.00	0	-90	55	RC
Joy-13-137	658095.96	6086577.906	532.94	0	-90	60	RC
Joy-13-138	658221.24	6086277.529	516.50	0	-90	192	RC
Joy-13-139	658015.93	6086436.242	529.95	0	-90	69	RC
Joy-13-140	658404.05	6086610.840	533.12	0	-90	66	RC
Joy-13-141	658086.43	6086429.413	524.29	0	-90	95.5	RC
Joy-13-142	658151.02	6086202.826	521.68	0	-90	134	RC
Joy-13-143	658423.57	6086431.571	518.60	0	-90	168	DDH
Joy-13-144	658976	6084451.000	494.74	0	-90	59.5	RC
Joy-13-145	658466.19	6086467.326	517.91	0	-90	159	RC
Joy-13-146	658525.93	6086451.699	520.16	0	-90	171	RC

Hole Name	X	Y	Z	Azimuth	Dip	Length	Type
Joy-13-147	658432.66	6086492.292	519.89	0	-90	138	RC
Joy-13-148	658605.66	6086394.326	519.45	0	-90	192	RC
Joy-13-149	658865.85	6086241.082	514.75	61	-60	31.5	DDH
Joy-13-149A	658865.85	6086241.082	514.75	61	-50	99	DDH
Joy-13-150	658851.4	6086219.016	510.07	46	-80	99	DDH
Joy-13-151	658829.26	6086251.982	511.99	46	-70	99	DDH
Joy-13-152	658747.26	6086312.691	512.31	46	-60	78	DDH
Joy-13-153	658237.15	6086228.062	516.77	46	-67	199.5	DDH
Joy-13-154	658747.26	6086312.691	512.31	46	-85	88.5	DDH
Joy-13-155	658905.24	6086184.635	507.64	46	-60	90	DDH
Joy-13-156	658386.45	6086384.591	512.13	0	-90	198	DDH
Joy-13-157	658182.54	6086309.391	521.37	0	-90	180	DDH
Joy-13-158	658789.95	6086273.916	510.06	46	-63	79.5	DDH
Joy-13-159	658312.32	6086585.841	531.98	0	-90	60	DDH
Joy-13-160	658707.83	6086353.618	517.08	46	-60	63	DDH
Joy-13-161	658632.23	6086421.851	524.03	46	-65	70	DDH
Joy-13-162	658675.46	6086391.387	521.38	46	-50	63	DDH
Joy-13-163	658573.37	6086437.657	522.95	46	-50	91.5	DDH
Joy-13-164	658674.75	6086390.496	521.44	46	-80	105	DDH
Joy-13-165	658572.38	6086436.700	522.68	46	-80	129	DDH
Joy-13-166	658791	6086264.000	509.18	46	-80	108	DDH
Joy-13-167	658990.49	6086090.537	507.84	46	-60	123	DDH
Joy-13-168	658442.61	6086374.948	511.28	226	-55	264	DDH
Joy-13-169	658990.49	6086090.537	507.84	46	-50	99	DDH
Joy-13-170	658991.03	6086089.153	507.72	0	-50	136.5	DDH
Joy-13-171	658176.34	6086296.886	521.96	226	-50	129	DDH
Joy-13-172	658906.02	6086185.972	507.87	90	-50	109.5	DDH
Joy-13-173	658220.3	6086210.532	519.58	226	-70	150	DDH

A detailed drillhole map location is presented in Section 12.1, while the following figure presents holes with channels in plan view in Genesis and isometric view.

Surface channel samples were also taken on the North East flank and are considered as horizontal drillhole (Joy-13-CXXX).

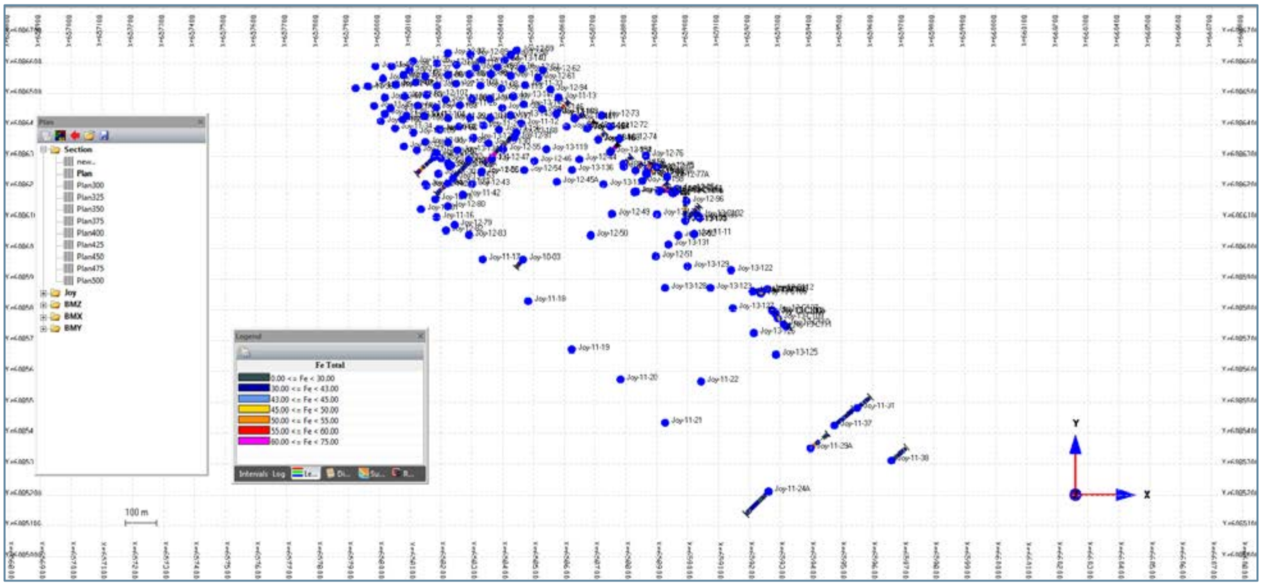


Figure 10-1: Plan View of Drillholes and Channel Positions in Genesis- Y is due North

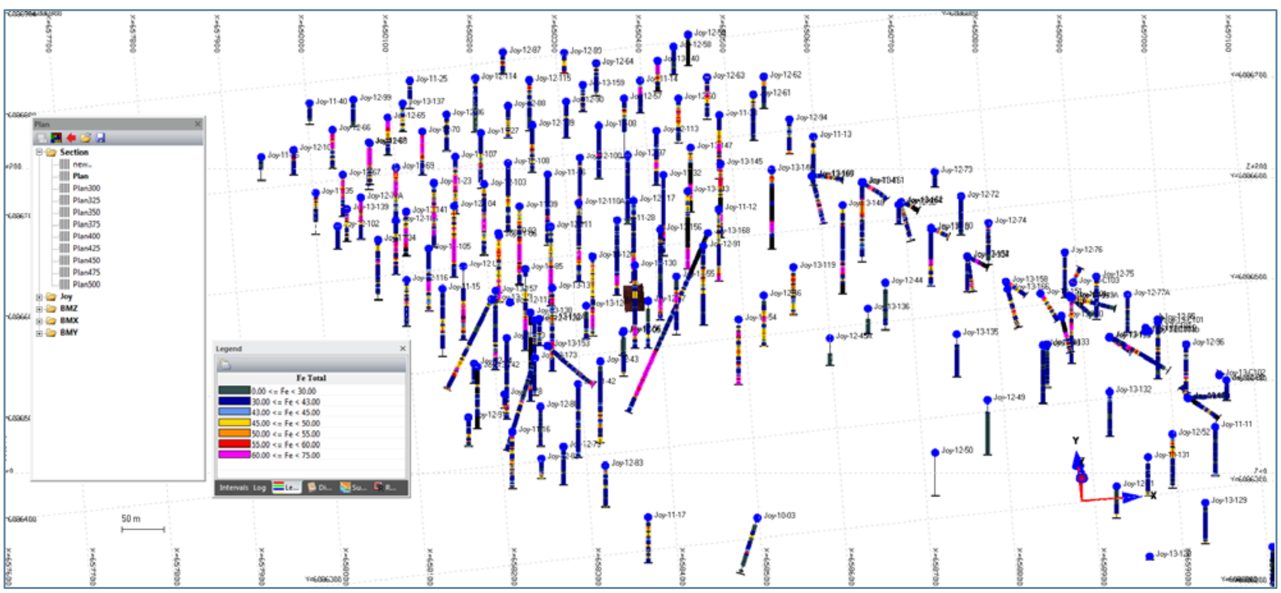


Figure 10-2: Isometric View, Looking North, of Drillhole and Channel Positions in Genesis

Figure 10-3 presents the Acker RC drill in action at Joyce Lake in 2013. The RC drilling produces cuttings and fines that are processed at the drill site with a rotary splitter attached to the RC system of the drill. The general sampling procedure is applied to each drill run. Each 3-metre run sample is collected using 3 five gallon pails, which are connected to the output of the drill splitter. A 5/16th portion (around 30 lbs / 12 kg) for Acker drill, a ½ portion (around 70 lbs /32 kg) for the Hornet, and an entire portion for the Discovery drills of the original sample are taken as the main drill sample (from pail SA & pail SB), the remaining 11/16th and ½ sample portions are rejects and are discarded at the drill. The SA & SB pails, such that SA is the coarse portion and SB the fines, are carried in bags within plastic pails to the core shack in Schefferville where they are blended into a concrete mixer, dried and passed afterwards through a riffle splitter to achieve a 1/8th mass reduction of the sample, where (SA+SB) reduced weighs between 3 to 8 kg. The Hornet drill bit has a diameter of 9 cm, while the Acker has 7.5 cm diameter bit.

Figure 10-3: Drill Rig at Joyce Lake in Operation at Hole Joy-13-130, Looking North West, March 2013 Field Visit

10.1 Drilling Program 2010 - 2012

In 2010, DSO targets were tested by LCIO in Joyce Lake. Four boreholes (362 metres) were drilled at the Joyce Lake syncline using conventional diamond core drilling. Blocky and sandy ground was encountered in boreholes resulting in poor core recovery. A total of 90 samples were sent to COREM for testing (78 samples and 12 QA/QC samples).

In 2011, to relieve the poor core recovery, a drilling program consisting of mainly RC drilling was planned. A total of 38 holes were drilled in Joyce Lake area, 32 RC holes (3,930 m) and 6 diamond drillholes (1,053.1 m). The resulting samples were sent to Activation Laboratories for X-Ray Fusion (XRF) analysis. LCIO identified a potential DSO target as a result of the RC drilling completed at Joyce Lake. Drillhole Joy-11-06 intersected 139.0 m grading 52.8% total iron (TFe), and drillhole Joy-11-07 intersected 91.0 m grading 52.5% TFe, including 42.0 m grading 65.3% TFe (see Table 10-3) close to true thickness.

Following the discovery of DSO type mineralization at Joyce Lake during the 2011 drill campaign, an exploration and definition drilling program was initiated in February 2012 to expand and better define the zone of high grade iron mineralization. In September 2012, a total of 7,618 metres of RC drilling was completed of which 78 holes were effectively drilled in 2012. Additionally, 30 tonnes of bulk samples were also collected from pits for metallurgical testing.

The area of high grade mineralization at shallow depth has been drilled on a 50×50 m grid. The higher grade mineralization occurs mostly within a synclinal fold closure and partly on both flanks. The synclinal structure has a shallow 15° plunge to the southeast. Bedding in the fold closure is sub horizontal to moderately dipping. All RC drillholes are vertical.

The mineralization reaches bedrock surface that is covered by 3 to 6 m of overburden. The first batch of assay results confirmed a zone of high grade iron mineralization at Joyce Lake with intercepts up to 54 metres over 60% total iron (TFe %) and with an average of 6.09% silica (SiO_2).

Between 2010 and 2012, a total of 120 holes (12,963.1 m) were drilled in the Joyce Lake area.

Table 10-2: Drill Length Summary between 2010 and 2012.

Historical	Core Hole	Reversed Circulation	Total Length
2010	4	-	362
2011	6	32	4983.1
2012	-	78	7618
TOTAL	10	110	12963.1

The numbers have slightly changed since the 2010 technical report due to corrections in drill length compilation by the client's technical team. Most of the holes being vertical holes, the length are not true thickness but are close to true thickness.

Table 10-3: High Grade Mineralization Occurrences 2010 – 2012 Drilling Program

Hole Number	From (m)	To (m)	Length (m)	Fe% Total
Joy-10-02	24	51	27	54.13
Includes	93	123	30	59.87
Joy-11-06	3	142	139	52.8
includes	96	138	42	64.19
Joy-11-07	12	93	91	52.46
includes	12	54	42	65.26
Joy-11-09	2	126	123	46.64
includes	9	18	9	61.26
and	54	69	15	64.8
Joy-12-46	30	102	72	48.25
Includes	45	57	12	61.13
Joy-12-53	27	81	54	49.83
Includes	27	39	12	61.37
Joy-12-55	30	87	57	50.62
Includes	42	57	15	64.56
Joy-12-65	3	45	42	58
includes	6	30	24	63.7
Joy-12-66	6	78	72	51.59
includes	6	42	36	63.5
Joy-12-68	6	87	81	54.25
includes	12	48	36	61.11
Joy-12-69	6	117	111	51.96
includes	9	63	54	61.59
Joy-12-70	6	93	87	52.75
includes	6	60	54	61.2
Joy-12-71A	6	90	84	51.62
includes	6	48	48	61.27
Joy-12-85	90	132	42	59.8
includes	108	132	24	66.33
Joy-12-100	87	93	6	64.49
Joy-12-103	63	102	39	61.02
Joy-12-104	57	123	66	62.75
Joy-12-105	72	93	21	66.4
Joy-12-106	45	72	27	60.47
Joy-12-107	39	75	36	63.52
Joy-12-110A	105	129	24	62.05
Joy-12-111	93	150	57	66.72
Joy-12-113	63	84	21	60.87
Joy-12-117	117	150	33	63.41

10.2 Drilling Program 2013

Figure 10-4: Drill Rig 'Acker' Joy-13-130, looking East, March 2013 Field Visit.

Based on the previous geological model, a detailed validation drilling and exploration program was undertaken in the Joyce Lake project during the year 2013. There were two phases of drilling in 2013. Phase I was managed by Cabo Drilling Corp., using Acker drill and Hornet drill. Phase II was managed by Forage Downing Drilling, mainly the triple Tube core drilling. The program was planned to validate and extend the existing geological model by adding holes in early 2013. These holes are located in the northwest end of the lake and on the north east flank of the lake.

The program started March 7 and ended November 15, 2013. During that period, 56 holes were drilled including 30 RC holes and 26 core holes with triple tube totalling 6,244.2 metres in length. The first phase consisted in drilling of 17 RC holes on the frozen lake during winter to validate iron ore body in the center of the syncline, test the gravity anomalous zone delineated by the ground gravity survey of February 2013 and extend it to the southeast. The second phase of drilling focused on the validation of the extension, core recovery in the main zone for density measurement and infill drilling for resources upgrade in the pit-shell area. Drill core holes were set up with specific azimuth and dip in order to intercept the iron formation.

The following assay results (Table 10-4) confirmed the continuity, extension down plunge and along strike of the high grade mineralization (>60% TFe) at Joyce Lake. The highlights of the 2013 campaign include (length along hole).

- Drillhole Joy-13-153 intersected 70.5 m of enriched iron mineralization with an average of 62.83% TFe;
- Drillhole Joy-13-120 intersected 30 m of enriched iron mineralization with an average of 66.80% TFe;
- Drillhole Joy-13-152 intersected 11.2 m of enriched iron mineralization with an average of 67.93% TFe.

Table 10-4: High Grade Mineralization Occurrences 2013 Drilling Program

Hole Name	From (m)	To (m)	Length (m)	Average TFe (%)
Joy-13-119	24	45	21	56.24
Joy-13-120	57	63	6	50.95
Joy-13-120	126	156	30	66.80
Including	132	135	3	69.2
Joy-13-127	9	21	12	53.67
Joy-13-130	33	39	6	53.19
Joy-13-130	132	159	27	62.82
Joy-13-134	21	36	15	58.76
Joy-13-134	117	147	30	65.08
Joy-13-138	159	168	9	58.73
Joy-13-139	0	12	12	57.08
Joy-13-139	18	27	9	56.17
Joy-13-140	3	30	27	63.71
Joy-13-141	33	48	15	62.02
Joy-13-141	54	78	24	62.46
Joy-13-143	123	144	21	62.84
Joy-13-143	150	168	18	64.99
Joy-13-145	21	57	36	56.05
Joy-13-145	108	126	18	66.12
Joy-13-146	15	27	12	54.85
Joy-13-146	111	135	24	63.08
Joy-13-147	78	96	18	61.98
Joy-13-147	102	111	9	56.40
Joy-13-148	135	150	15	64.88
Joy-13-149A	3	11	8	67.70
Joy-13-149A	20	35.5	15.5	55.27
Joy-13-150	45	60	15	66.12
Joy-13-151	12	24	12	66.30
Including	18	21	3	69.4
Joy-13-152	29.8	41	11.2	67.93

Hole Name	From (m)	To (m)	Length (m)	Average TFe (%)
Joy-13-153	129	199.5	70.5	62.83
Joy-13-154	57	63	6	53.35
Joy-13-155	29	38.5	9.5	58.90
Joy-13-156	152	183.7	31.7	63.60
Including	155	158	3	69.3
Joy-13-157	139.4	151.4	12	59.70
Joy-13-158	0.4	10.8	10.4	63.58
Joy-13-158	14.1	27	12.9	59.52
Joy-13-160	23	28.4	5.4	65.05
Joy-13-161	15.3	21.3	6	60.15
Joy-13-163	42.4	54.4	12	55.67
Joy-13-164	17.8	35.5	17.7	50.93
Joy-13-165	72	78	6	61.95
Joy-13-166	57.8	72.8	15	57.78
Joy-13-168	174	243	69	65.42
Joy-13-172	30.8	39.8	9	64.60

Figure 10-5: Downing Diamond Drills in Action during QP Site Visit Autumn 2013, Fresh Core Review from Both Drills

All collars, except for lake holes and those after Joy-12-113 sequentially, of the holes completed during the 2011-2012 seasons have been surveyed using differential GPS by Allnorth Engineering Consultants based out of Labrador City. The holes from the 2013 drilling program were surveyed using differential GPS by LCIO under the supervision of Zhihuan Wan, P. Geo, an employee of Century Iron Mines, except for the lake holes completed in the Phase I drilling in March to April, 2013.

10.3 Drilling Discussion and Additional Information

10.3.1 2010-2012 Drill Campaigns

In November of 2010, DSO targets were tested with conventional diamond core drilling by LCIO in Joyce Lake. Four boreholes (362 m) were drilled at the Joyce Lake Syncline. Drilling was conducted by Forages

Dibar Inc. of Sainte-Anne-des-Monts, QC. Blocky and sandy ground was encountered in boreholes resulting in poor core recovery. A total of 90 samples were sent to COREM for testing (78 samples and 12 QA/QC samples).

In 2011, to relieve poor recovery, LCIO applied RC drilling and conventional core drilling techniques. Drilling was conducted by Cabo Drilling Corp. of Kirkland Lake, ON from April to October, 2011 with a short break from April 28 – May 16 to honour local native goose hunting traditions. Thirty-eight holes were drilled in the Joyce Lake area for a total of 4,983.1 m; from which 1,425 samples and 164 QA/QC samples were sent for analysis. Among these holes, 32 holes totalling 3,930 m were drilled with a Acker RC drill, mainly at the nose and hinge zones of the Joyce syncline, while 6 holes totaling 1053.1 m using a diamond core drill were completed to test the flank and southern extension of the Joyce syncline. The proposed drillholes were spotted by field geologists using a handheld GPS unit. All completed drillholes were surveyed by Allnorth Consultants Ltd of Labrador City using Differential GPS (DGPS). Allnorth set 7 fixed references (nails driven into bedrock) around Joyce Lake proper in addition to the pre-existing Schefferville CACS station to calibrate the reported drillhole locations. Data collection was done using a Leica GS15 receiver with horizontal accuracy of 3 mm + 0.1 ppm. Drilling in 2011 was aimed at outlining the general geometry of the mineralized zone and extension along strike of the fold axis. The controlled mineralized zone was found to be over 1000 m long and up to 400 m wide, with highest grade zone > 60% TFe from 15 to 42 m thick true thickness.

Based on the drilling results from 2011, in 2012 LCIO drilled 78 vertical holes for a total measurement of 7,618 m. Drilling took place from March to September, 2012, with a short break from April 26 – May 14 to respect local native goose hunting traditions. These holes were drilled using two reverse RC drill rigs (Hornet and Acker) and drilling was once again conducted by Cabo Drilling Corp. of Kirkland Lake, ON. This program exposed DSO within the hinge and the northern limb of the syncline. Along with 264 QA/QC samples, 2,373 samples were sent to the lab giving a total measurement of 7,058 m. The area of high grade mineralization at shallow depth has been drilled on a 50 × 50 m grid and assay results confirmed the continuity and extension down plunge, along strike of the high grade mineralization (>60% TFe) at Joyce Lake with a thickness up to 66 m. The higher grade mineralization occurs mostly within a synclinal fold closure and partly on both flanks. The synclinal structure has a shallow 15° plunge to the southeast. Bedding in the fold closure is sub horizontal to moderately dipping. Additionally, 30 tonnes of bulk samples were also collected for metallurgical testing in pits.

10.3.2 2013 Drill Campaign

In the 2013 exploration season, two phases of drilling were completed. Phase I drilling took place from March to July, using the reverse circulation drilling to delineate the extension of the main mineralization zone at Joyce south and to test the gravity anomalies at lake area. Phase II drilling took place from September to November 2013 using triple tube HQ core drilling to test the DSO potential at the NE flank of the Joyce Lake syncline and explore the potential of the SW limb.

The Phase I drilling program was initiated on March 7, 2013. A break was taken during Goose Hunting season from April 28 to May 18, in respect to local community traditions, and restarted on May 23. This first phase of drilling ended on July 15, 2013. The drilling was conducted by Cabo Drilling Corp. of Kirkland Lake, Ontario, using one Acker RC (reverse circulation) rig and one Hornet drill (reverse circulation hammer) for the program. A total of 30 RC holes were drilled at depths ranging from 7-192 m, totalling 3,301.7 m. Holes were drilled to infill previous drilling information within the main ore body, to test the gravity anomalies delineated by the ground gravity survey in February 2013, as well as to test the DSO potential in the southern extension of high grade zone.

A 9 cm diameter drill bit and 7.5 cm diameter drill bit were used for the Hornet and Acker drill rigs respectively. Generally, sampling for a 3 m sample run uses three 5-gallon pails that are connected to the output of the drill cyclone-splitter. The main sample taken is 5/16^{ths} of the original sample – a coarse and fine sample and the remaining 11/16^{ths} is discarded as a reject sample. The samples were collected continuously once the bedrock-overburden contact was established by the on-site geologist who periodically checked the cuttings using a sieve to ascertain the bedrock geology.

The Phase II drilling program was targeted at the NE flank of Joyce Lake syncline, SE extension of high grade zone, and infill holes at main ore zones in efforts to upgrade the mineral resources in the main ore zones, and test the mineralization at NE and SW flank. The program consisted of 26 boreholes, totalling 2,942.5 m, and was completed between September 15, 2013 and November 15, 2013. Downing Drilling Ltd. from Grenville-sur-La-Rouge, QC was contracted to conduct the drilling program. The program used two triple tube HQ3 diamond core drilling rigs (LF-70), with drillhole depths ranging from 31.5-264 m, at angles between -50° to -90°, toward the NE or the SW on the section lines. A Reflex instrument was used for measuring the down hole deviation and provided accurate location of the holes in the deposits.

During the 2013 drilling season, 2011 samples were collected representing 5,921.2 m of sampled core, in addition to the duplicates, standards and blanks inserted as QA/QC samples to monitor laboratory performance. Nominal samples for core drilling length were 3 m, but ranged from 1.5 m to 4.5 m in order to honour the main lithological contacts. The core was cut in half using a diamond saw and hydraulic splitters. Half was sent to the lab, and half was kept for reference.

Regardless of the drilling technique, drillholes coordinates were spotted by a field geologist using a hand-held GPS (Garmin GPSmap 62s and Garmin Etrex 30 with 3-5 m accuracy-NAD 83 UTM 19). The field geologist monitored the set-up of the drill floor, ensuring that the drillhole met the proposed azimuth and dip. Once completed, a final collar location reading was taken using a Trimble GeoExplorer 6000 series GeoXH centimetre edition receiver with internal antenna. Terrasync centimetre edition firmware was also used. The Schefferville CACS station and several staked drillholes surveyed by Allnorth were used as reference to calibrate and validate the observations. After post-processing, the nominal accuracy of the GPS receiver is 2.5 cm +/- 1.2 ppm horizontally and 4 cm +/- 1.5 cm vertically and served as the final location measurement.

Prior drill site closure, all garbage was removed and environmental conditions were left as close to original state as possible. Lastly, the drillhole was covered and flagged for identification purposes.

10.3.3 Logging Procedures

Core logging was done directly by LCIO geologists into the dedicated software GeoticLog. Where applicable, field geologists logged for recovery, Rock Quality Designation (RQD), magnetic susceptibility, mineralogy and characteristics, geological structures, and specific gravity (S.G.). This task was supervised by Senior Exploration Manager Mr. Allan Gan, P. Geo. and Exploration Manager Miss Zhihuan Wan, P. Geo.

For RC drilling, a small portion of the mixed sample is collected and placed into muffin tins by the on-site geologist. The muffin tins containing the logging sample are placed into warm open area for drying. Once dried, the logging samples were examined under the microscope, mineral abundances are estimated using an abundance chart and mineralogy is logged by geologist. Based on the mineral abundances and characteristics, unit boundaries were identified. Magnetic susceptibility readings were taken using the MPP Probe from GDD Instrumentation.

For core diamond drilling, recovery and RQD were measured based on the 3 m tags marked by the drill help while all other procedures were logged based on sample tags marked by the logging geologist. The samples (approximately 3 m each) do not cross lithologies and are separated based on mineralogical and characteristic differences. Magnetic susceptibility readings were taken at every 20 cm using the KT-10 Magnetic Susceptibility Meter. These readings were then averaged to give one reading per sample. Structural readings were taken with respect to the core axis. Multiple S.G. measurements were taken for each sample using a fish scale or a graduated cylinder (depending on the nature of the material) based on water displacement and an average length-weighted value was calculated for each sample (different methods were used by LCIO and a detailed report was provided to the author, see section on Density Measurements for details).

10.3.4 QA/QC and Sampling Procedures

RC Drilling

The RC samples were collected at drill site using the 3 bucket system in which overflow from one bucket is flown into another, allowing fine samples to settle. Once each run is completed, the samples were transferred into plastic bags and put into plastic pails with the drillhole number, sample number, and sample intervals marked on both the plastic bags and the plastic pails. Subsequently, the plastic pails containing samples bags were transported to the core shack in Schefferville.

In the core shack, all samples from one sample interval were mixed using a concrete mixer and passed through a riffle splitter with a 1:7 splitting ratio in order to get a representative portion of the sample for sending to laboratory assay. The 1/8th portion of the sample is sent for lab assay and the 7/8th portion is saved and stored in Schefferville as reference samples.

Further to this, LCIO field geologists conducted a systematic QA/QC program consisting of inserting 2 sample blanks, 4 certified reference materials (SCH-1) and in-house reference materials (STD-1, STD-2 STD-3, STD-4), and 4 duplicate samples. For every 100 samples, 10 control samples were used. In addition to the 10 control samples per 100 samples, a reject for approximately every 15th sample was also sent to the core shack where it was split and sent for assay. All assay samples, together with the QA/QC samples, were sent to Activation Laboratories in Ancaster, ON for analysis.

Triple Tube Core Diamond Drilling

Triple tube diamond drill core is sampled approximately every 3 meters, where the sample interval is determined according to the uniformity of the iron mineralization and geological boundaries in order to constrain high grade zones. Once logged by LCIO field geologists, the core is split in half lengthwise by core shack helpers where half is stored for reference and the other half is sent by freight in rice bags tied with tamper resistant security tags for assay at Activation Laboratories. Similar to RC drilling, 10 control samples for every 100 samples were inserted for quality control measures. Duplicates for control samples were sampled by splitting witness core into quarters and leaving the remaining quarter as witness.

11 SAMPLE PREPARATION, ANALYSES AND SECURITY

The QA/QC protocol employed during the 2011-2013 exploration programs included procedures for monitoring the "chain-of-custody" of samples and the insertion of nine different types of reference material, four types of blanks and sample duplicates.

In 2011, all the collected Joyce Lake project samples were prepared and assayed by Activation Laboratories (Actlabs) Ltd in Ancaster, Ontario (independent laboratory); while a portion of samples from early 2012 drilling programs were prepared and assayed by SGS Canada Inc. in Lakefield, Ontario. In 2013, LCIO used Actlab for assaying samples.

The in situ preparation remained the same in 2013. Additionally, LCIO personnel weighed and packed every sample into a sealed bag under geologist supervision for shipping. Samples were tracked with security seals and logged into the drilling database. The laboratories received packing lists associating sample numbers with security seals via paper and electronic formats. In 2013, LCIO personnel recorded sample bag weights and requested the labs to provide a weight report for every sample received to track material lost or potential sample mix-ups.

After a review of the documents on QA/QC prepared by the technical team, the author believes the preparation of samples to be adequate in the context of HQ3 and RC drilling in DSO material, as well as security and analytical procedures at the laboratory.

11.1 Sample Analysis and Security by Actlabs (2011-2013)

To minimize the matrix effects of the samples, heavy absorber fusion technique (Norrish and Hutton 1969 Geochim Cosmochim Acta, volume 33, pp. 431-453) is used for major element oxide analysis. Prior to fusion, the loss on ignition (LOI), which includes H_2O+, CO_2, S and other volatiles, can be determined from the weight loss after roasting the sample at 1050°C for 2 hours. The fusion disk is made by mixing a 0.5g equivalent of the roasted sample with 6.5g of a combination of lithium metaborate and lithium tetraborate with lithium bromide as a releasing agent. Samples are fused in Pt crucibles using an AFT fluxer and automatically poured into Pt molds for casting. Samples are analyzed on a Panalytical-Axios Advanced XRF. The intensities are then measured and the concentrations are calculated against the standard G-16 provided by Dr. K. Norrish of CSIRO (Commonwealth Scientific and Industrial Research Organisation), Australia. Matrix corrections were done by using the oxide alpha – influence coefficients also provided by K. Norrish. In general, the limit of detection is about 0.01% for most of the elements.

- X-Ray Fluorescence Analysis Code: 4C used at Actlabs.
- Variables (%): SiO_2, Al_2O_3, Fe_2O_3, MgO, CaO, Na_2O, K_2O, P_2O_5, MnO, LOI.

Table 11-1: Table Borate Fusion Whole Rock XRF Reporting Limits for Actlabs

Element	Limit (%)	Element	Limit (%)	Element	Limit (%)
SiO_2	0.01	**Na_2O**	0.01	**CaO**	0.01
Al_2O_3	0.01	**TiO_2**	0.01	**MgO**	0.01
Fe total as Fe_2O_3	0.01	**Cr_2O_3**	0.01	**K_2O**	0.01
P_2O_5	0.01	**V_2O_5**	0.001	**MnO**	0.01
Also includes Loss on Ignition					

The following is a description of the quality assurance and quality control protocols used at the Actlabs facility. This description is based on input from Actlabs. A total of 34 standards are used in the calibration of the method and 28 standards are checked weekly to ensure that there are no problems with the calibration. Certified Standard Reference Materials (CSRMs) are used and the standards that are reported to the client vary depending on the concentration range of the samples.

The re-checks are done by checking the oxide total of the samples. If the total is less than 98% the samples are reweighed, fused and analyzed. The amount of duplicates done is decided by the Prep Department, their procedure is one for every 50 samples only if there is adequate material. If the work order is over 100 samples they will pick duplicates every 30 samples. General QC procedure for XRF is that the standards are checked by control charting the elements. The repeats and pulp duplicates are checked by using a statistical program highlighting any sample that fails the assigned criteria. These results are analyzed and any failures are investigated using their QCP Non-Conformance (error or omission made that was in contrast with a test method (QOP), Quality Control Method (QCP) or Quality Administrative Method (QAP).

Moreover, sample analysis codes remain the same, with a RX1 preparation code and 4C XRF fusion element package. Sample security has also remained largely unchanged in 2013, as LCIO technical team weighed and packed every shipped sample into a sealed bag under geologist supervision and tracked the security seals via their drilling database. The labs received box lists associating sample numbers with security seals in both paper and electronic formats. One change made to sample security was that the labs were requested to provide a weight report for every sample received. The technical team then compared this to the records to check for sample mix-ups, broken bags, etc.

11.2 Sample Analysis and Security at SGS-Lakefield (2012)

The analysis used was whole rock XRF by Borate fusion. The following is a description of the exploration drillhole analytical protocols used at the SGS-Lakefield laboratory facility in Lakefield, Ontario. This description was supplied by SGS-Lakefield.

- X-Ray Fluorescence Analysis Code: XRF76Z
- Variables (%): SiO_2, Al_2O_3, Fe_2O_3, MgO, CaO, Na_2O, K_2O, P_2O_5, MnO, LOI;
- Typical sample size: 0.2 to 0.5 g
- Type of sample applicable (media): Rocks, oxide ores and concentrates.
- Method of analysis used: The disk specimen is analyzed by Wavelength Dispersive XRF spectrometry.
- Data reduction by: the results are exported via computer, on line, data fed to the Laboratory Information Management System with secure audit trail.
- Corrections for dilution and summation with the LOI are made prior to reporting.

Table 11-2: Table Borate Fusion Whole Rock XRF Reporting Limits for SGS

Element	Limit (%)	Element	Limit (%)	Element	Limit (%)
SiO_2	0.01	**Na_2O**	0.01	**CaO**	0.01
Al_2O_3	0.01	**TiO_2**	0.01	**MgO**	0.01
TFe_{al} as Fe_2O_3	0.01	**Cr_2O_3**	0.01	**K_2O**	0.01
P_2O_5	0.01	**V_2O_5**	0.003	**MnO**	0.01
Also includes Loss on Ignition					

The following description of the quality assurance and quality control protocols used at the SGS-Lakefield laboratory facility in Lakefield, Ontario, was supplied by SGS-Lakefield. One blank, one duplicate and a matrix-suitable certified or in-house reference material per batch of 20 samples. The data approval steps are shown in the following table (Table 11-3).

Table 11-3: SGS-Lakefield Laboratory Data Approval Steps

Step	Approval Criteria
1. Sum of oxides	Majors 98 – 101% Majors + NO + CoO 98 –102%
2. Batch reagent blank	2 x LOQ
3. Inserted weighed reference material	Statistical Control Limits
4. Weighed Lab Duplicates	Statistical Control Limits by Range

12 DATA VERIFICATION

SGS conducted a verification of the entire database before resource estimation. The digital drillhole database supplied by LCIO was validated for the following fields: collar location, azimuth, dip, drillhole length, survey data, and analytical values. Claude Duplessis (QP) performed independent check sampling during his 2013 site visit for additional data verification.

12.1 Data Verification 2010 – 2012 Drill Programs

For the resource estimates, the data verification was done on the iron (Fe) and silica (SiO_2) assay results from the 2011 and 2012 drilling program. Assay analyses were performed by COREM in 2010, Actlabs in 2011-2012 and SGS in 2012. A series of quality control procedures including duplicates, standards and blanks were introduced. From 2011 to 2012 a total of 93 blanks were used, including 68 silica blanks and feldspar blanks, halite blanks or dolomite blanks were used for the rest. A total of 164 duplicates were used from the 2011 to 2012 program and one from 2010. From 2011 to 2012, 170 standards were analysed and six from 2010. Adequate correlation was demonstrated with high R^2 factors.

The limit of plus or minus 20% variation was chosen as an acceptable variance for the XRF analytical process. Most of the differences observed were within the 20% variance range throughout the QA/QC process, and only a few results were found outside these boundaries and considered as failures. For the 2011 to 2012 drilling program, results returned good correlation.

For the blanks, a 1% error line was set as an acceptable limit. However, several issues were found in iron and silicate values. The difference was too high to come from sampling contamination; after consultation with LCIO geologist it was determined that high iron values of blanks came from the blanks sampling process in Schefferville area and for that reason it did not affect the QA/QC results.

Reported results for the standards inserted in the 2011-2012 drill program have shown good correlation except for three samples where the compared values were higher than the expected mean values for those standards. It was not considered that these three values invalidated all the results.

As part of the Joyce Lake QA/QC protocol, 75 Actlabs samples were re-assayed by SGS in June 2012. To represent acceptable error limits of the values for the duplicates, the plus or minus 20% lines were added to the graphics. The following plotted values confirmed good correlation between both analyses. The sample re-analysis returned 51% of the values higher and likewise 49% lower; which was a distribution that indicated very little bias. The SGS iron grades showed a relative difference averaging 2.8% higher than Actlabs.

The term “lake hole” is a conceptual expression used to designate holes drilled during winter on the lake. A separate QA/QC process for “lake holes” was conducted at SGS to confirm their validity as required by the resources estimation. As a result, the variation between the three “lake holes” when comparing lab assays to Century’s internal XRF assays appeared to be the same as the other holes. Furthermore, “lake hole” duplicates were compared and a good correlation was observed for the duplicates indicating that all values were close to the median line.

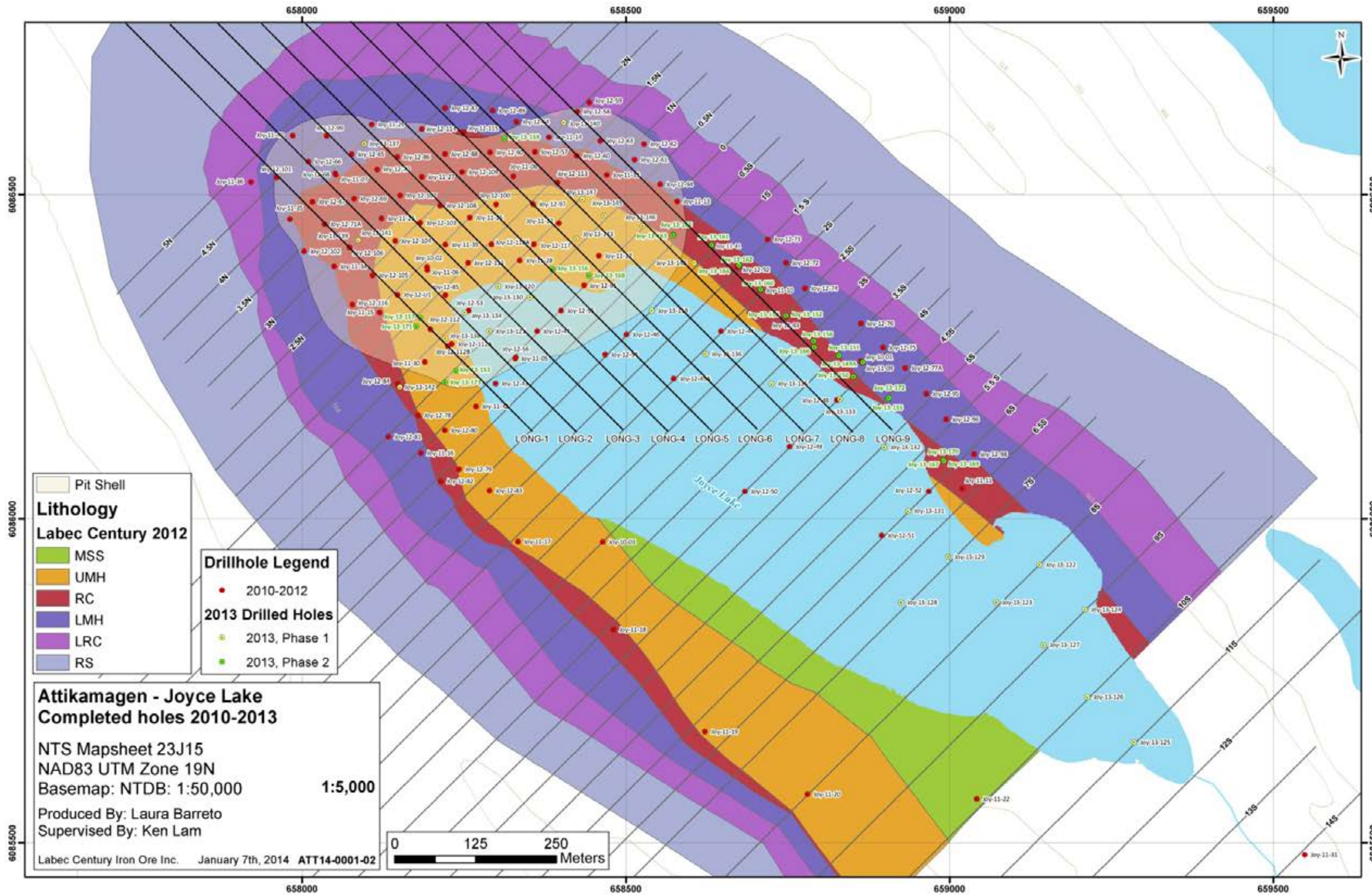


Figure 12-1: Map of Collar Locations with Lithological Formation (From LCIO)

12.2 2013 Drill Program

SGS Geostat conducted a verification of the entire database before resource estimation. The digital drillhole database supplied by LCIO was validated for the following fields: collar location, azimuth, dip, drillhole length, survey data, and analytical values. Some minor errors were found and were subsequently corrected to produce the final resource estimation.

The Joyce Lake database contains 176 drillholes, with the following distribution: 36 core drillholes, 140 RC drillholes dipping at -90°, and the database also includes 16 channels. The hole Joy-12-53 was considered by LCIO as not reliable due to the technical problem encountered in 2011 and was re-drilled in winter 2013 as Joy-13-134.

The assay coverage of Joyce Lake area is comprised of 5,657 assayed intervals totalling 17,030.42 m (of 17,800.22 m sampled, including un-assayed intervals). Joyce Lake holes were drilled in a 3.96 km^2 zone from 657900E/6084451N to 659700E/6086650N in the UTM Zone 19N reference system. Most holes are located on the north-western portion of the property and spaced approximately 50 m along the NW-SE trending and approximately 40 m along the NE-SW trending.

The 2013 year data contains 2,042 assay intervals totalling 5,998.32 m. The data verification was done on iron (Fe) and silica (SiO_2) assay results from the 2013 drilling program. A series of quality control procedures including duplicates, standards and blanks were introduced. A total of 336 quality control samples were inserted.

During 2013, a total of 44 blanks were used, all blanks used in 2013 were silica blanks (Type: BL). A total of 208 duplicates and 84 standards were analysed. Five types of standards were used. The correlation coefficients produced indicated adequate correlation between populations.

12.1.1 Duplicates

Comparisons of field duplicates are illustrated in Figure 12-2 and Figure 12-3. In Figure 12-3, the red-dotted lines represent the original plus 20% and minus 20% values. In Figure 12-2 the orange dots are the original values and the blue dots the duplicate values. The green circle and the red bar highlight the single value outside the ±20% limit.

Important: the hole Joy-13-130 was duplicated with reject stream at the drill and was treated as other duplicates.

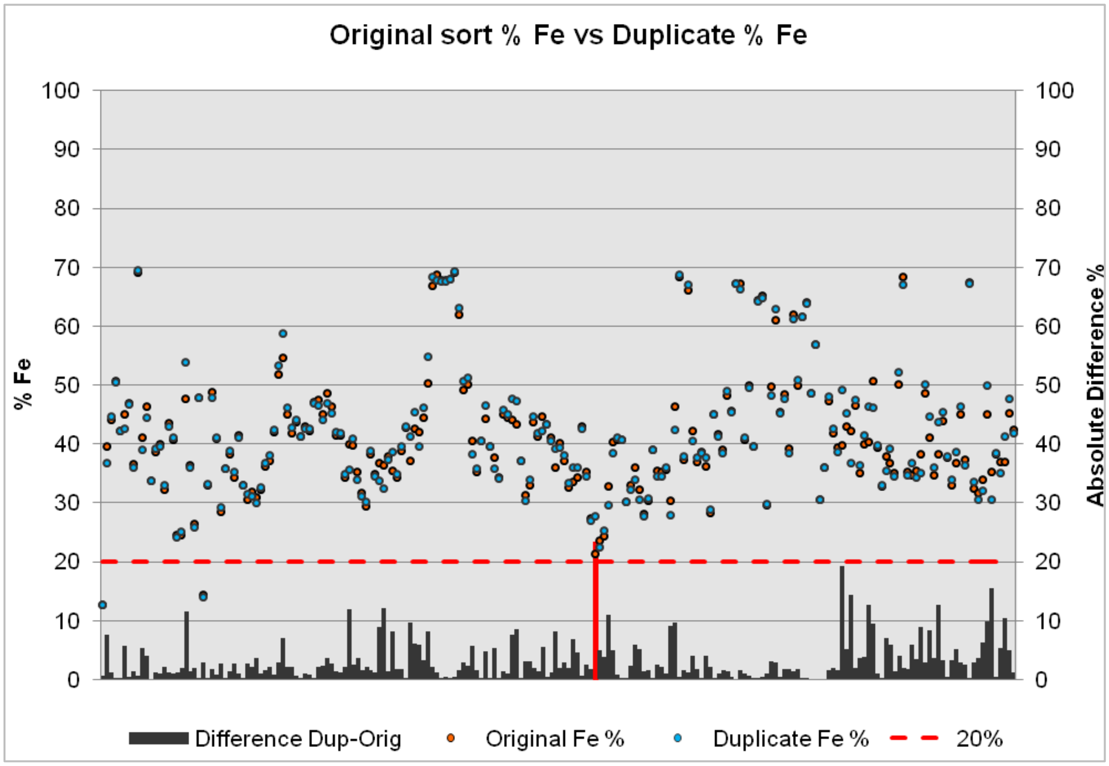


Figure 12-2: Original Samples vs Duplicate Samples with Differences in %

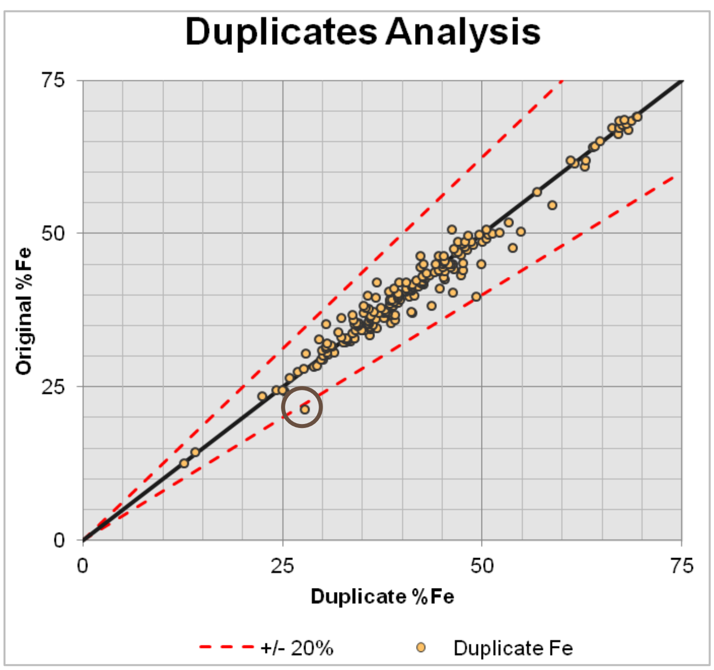


Figure 12-3: Assays Results for 2013 Drilling Program

12.1.2 Blanks

In 2013, one type of blank was used for the Joyce Lake QA/QC process. The blank used was the Silica (BL), with a total of 44 measurements. The average grade was for 0.48% Fe and 97.48% SiO_2. Blank values were considered acceptable when the value was less than 1% Fe. In general, blank analyses are acceptable. Figure 12-4 and Figure 12-5 show Fe and Silica blank values respectively and the acceptable control lines. Figure 12-4 does not show any failures for Fe% assays with the BL type blank. The silica blank (BL) is almost pure SiO_2, which is why it was decided to set the limit to three standard deviations. Even though one value was outside the 3σ limit, it was not considered relevant to invalidate the quality of the data.

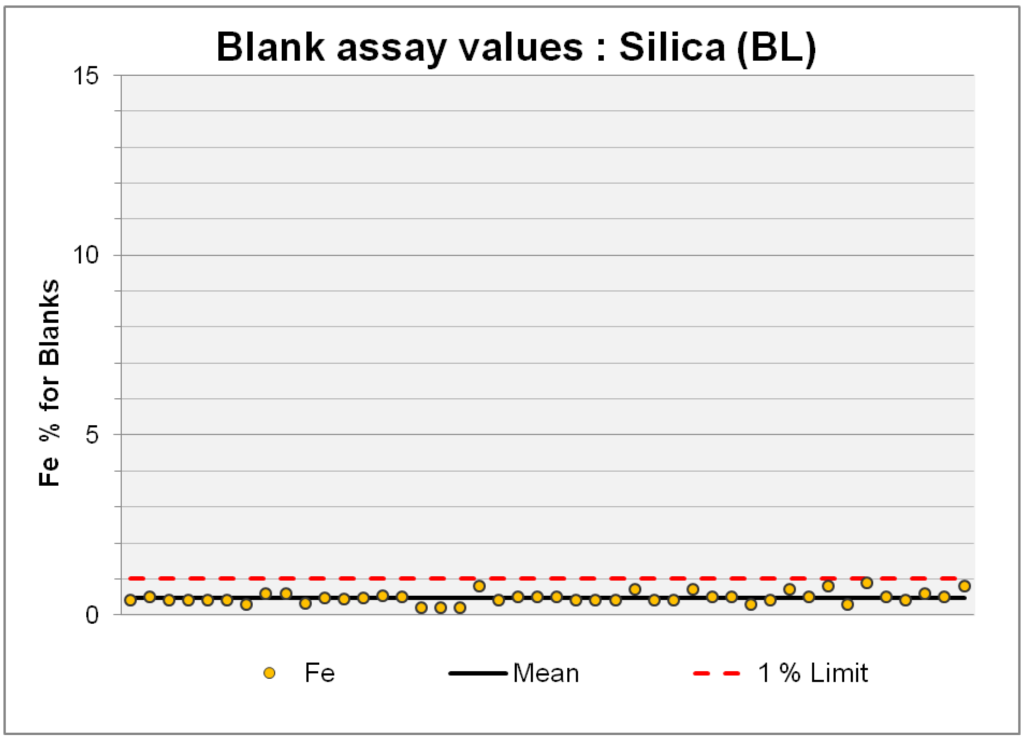


Figure 12-4: Fe Blank Comparison (2013 Drilling Program)

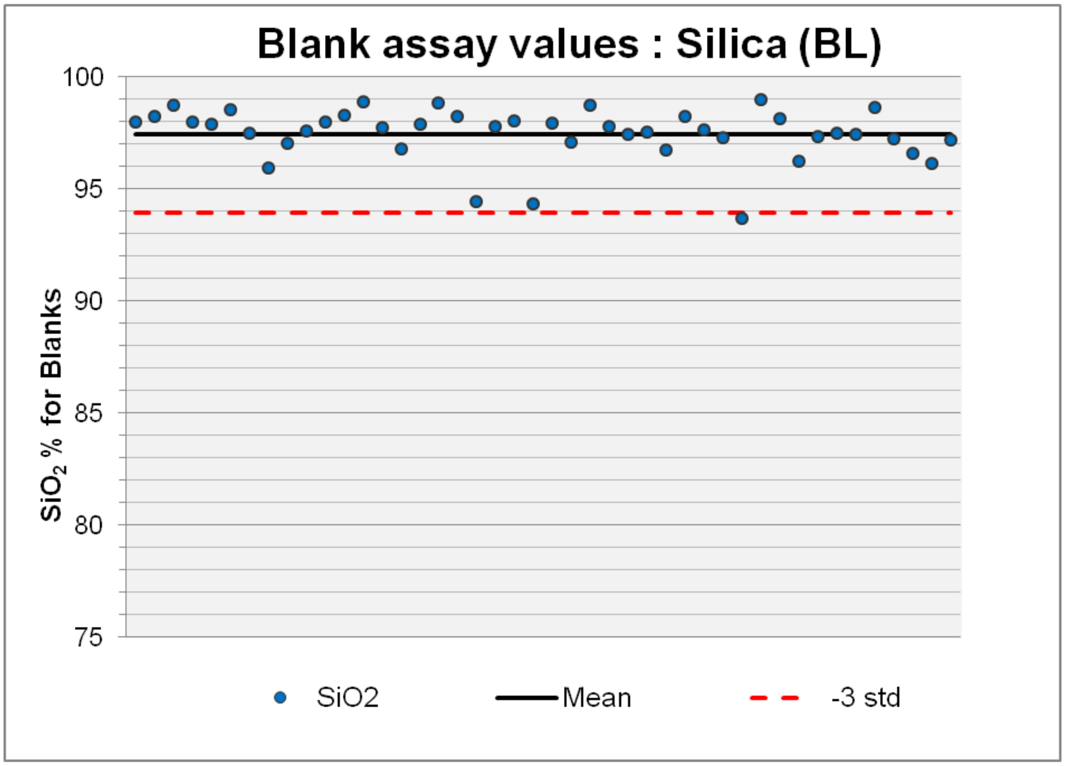


Figure 12-5: SiO_2 Blank Comparison (2013 Drilling Program)

The 2013 data verification did not encounter issues with blanks as had been encountered in the 2011-2012 verification. Thus, it appears that past contamination problems have been resolved and SGS encourages LCIO to keep this procedure, however continuing to monitor SiO_2 values closely.

12.1.3 Standards

In 2013, five different standards were used in the sampling process for a total of 84 reference material samples inserted during the sampling process. Table 12-1 shows a summary of drill database average values and quantity of standards used in the process.

Table 12-1: Standards Summary (2013 Drilling Program)

Standard	Count	%SiO_2 Mean	%SiO_2 Deviation	%Fe Mean	% Fe Deviation
SCH 1	14	8.03	0.29	60.62	0.56
STD 1	29	35.68	0.26	39.08	0.25
STD 2	16	44.33	0.18	31.86	0.20
STD 3	13	43.42	0.24	30.44	0.19
STD 4	12	45.30	0.14	27.66	0.12

The standard deviation (calculated from the population) was used to determine the quality of measurements. SGS considered that the values within two standard deviations of the mean were shown as valid, those between two and three standard deviations were characterized as acceptable. However, standard values outside of the plus or minus three standard deviations were judged as failures.

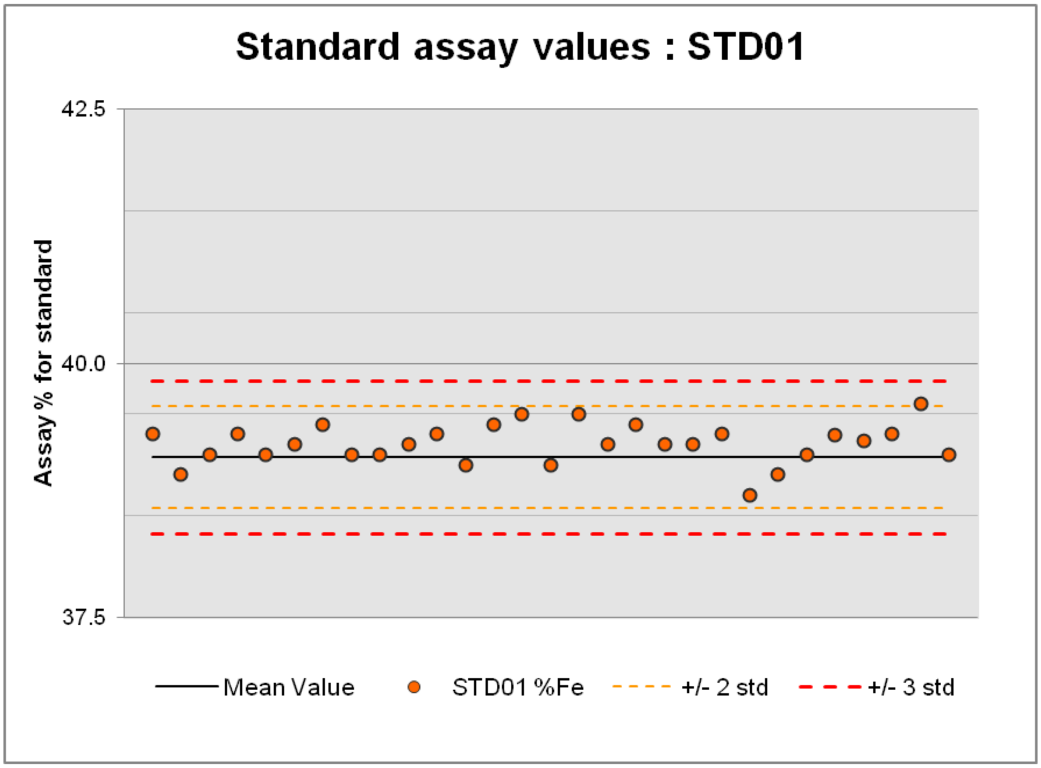


Figure 12-6: Standard Analysis STD01 - Fe

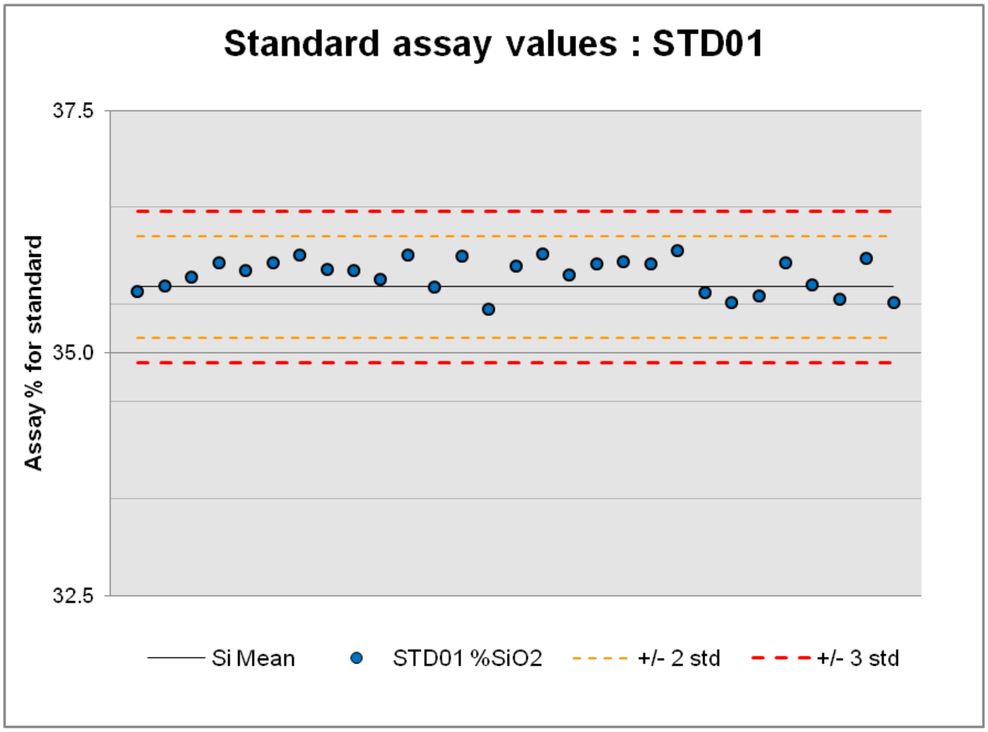


Figure 12-7: Standard Analysis STD01 - SiO_2

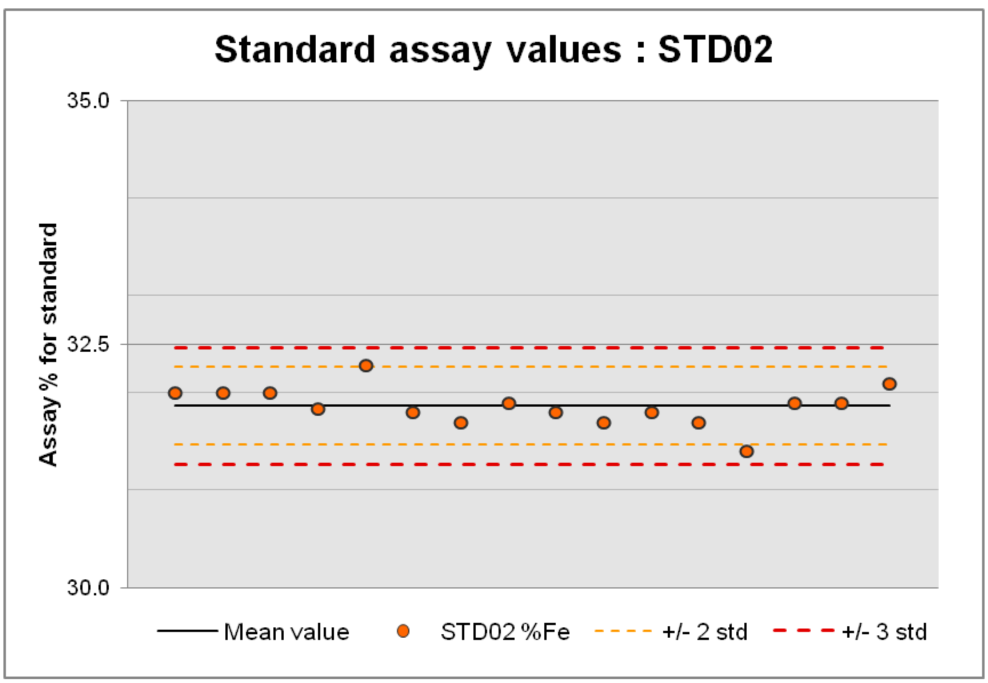


Figure 12-8: Standard Analysis STD02 – Fe

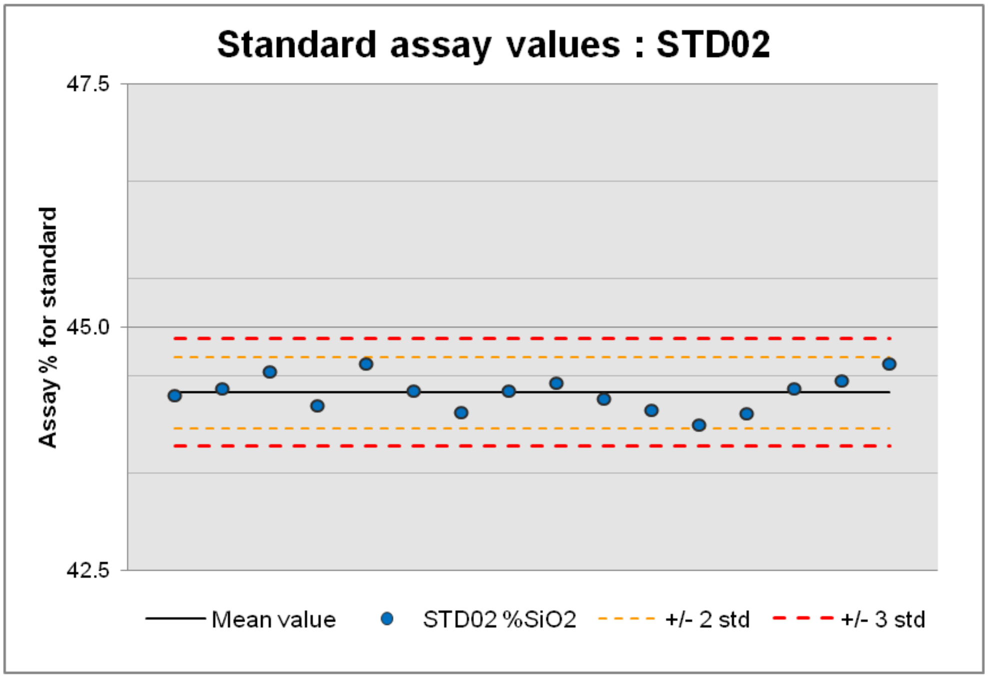


Figure 12-9: Standard Analysis STD02 - SiO_2

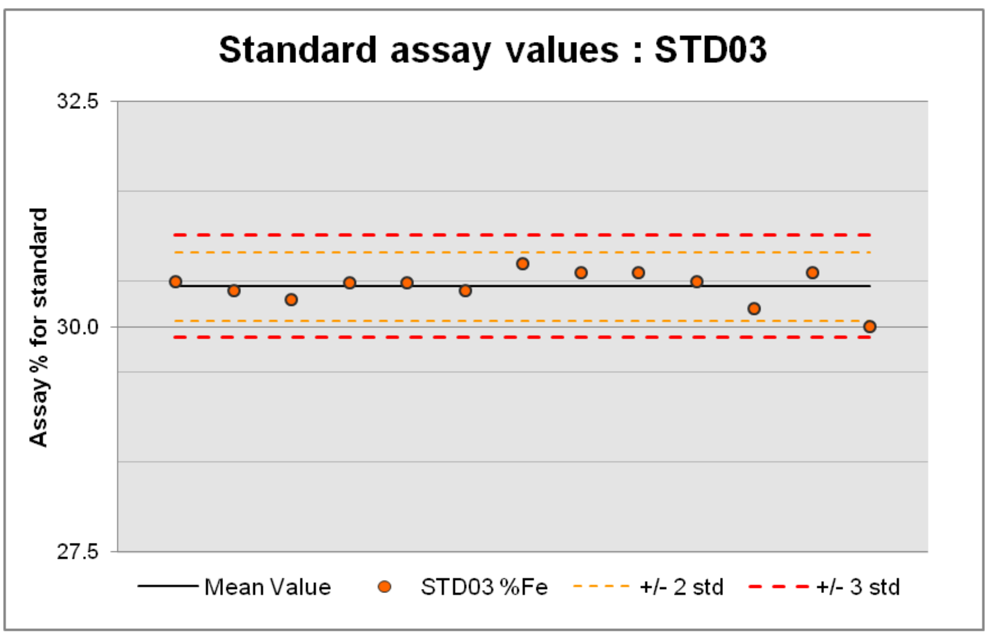


Figure 12-10: Standard Analysis STD03 – Fe

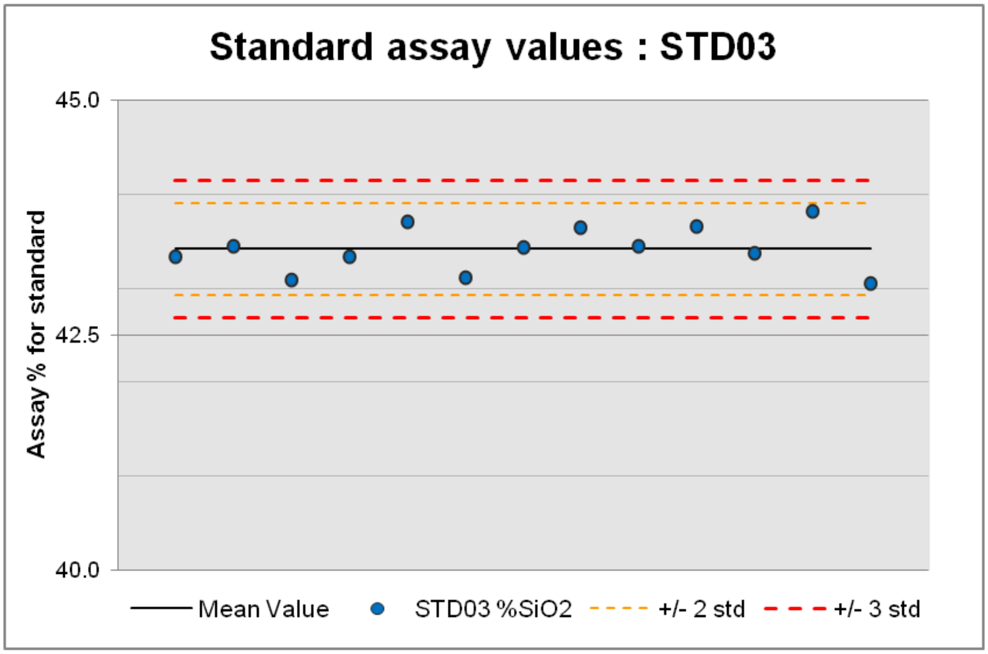


Figure 12-11: Standard Analysis STD03 - SiO_2

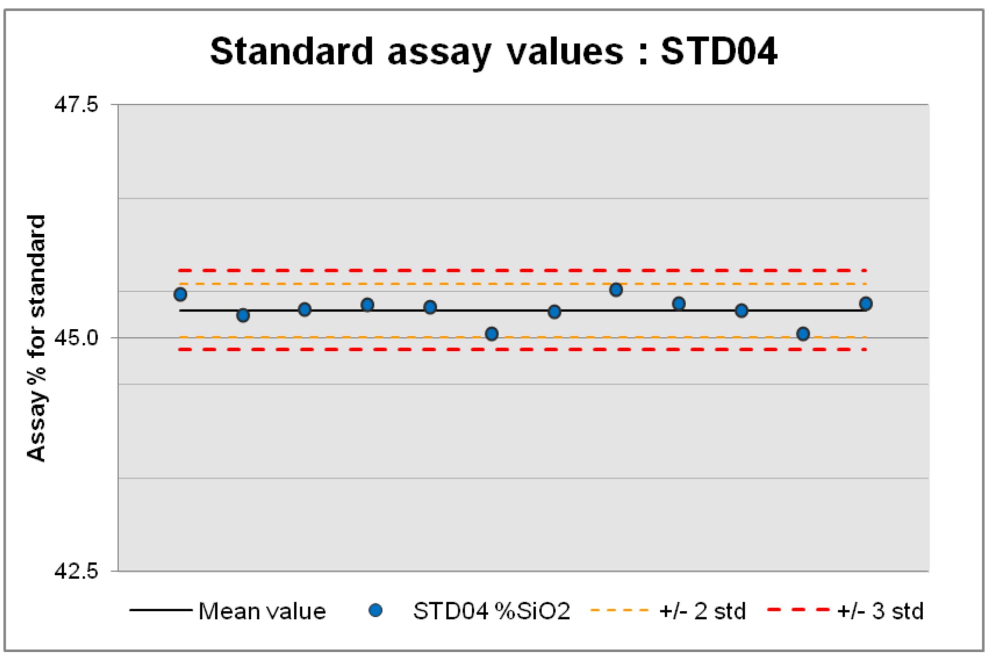


Figure 12-12: Standard Analysis STD04 - Fe

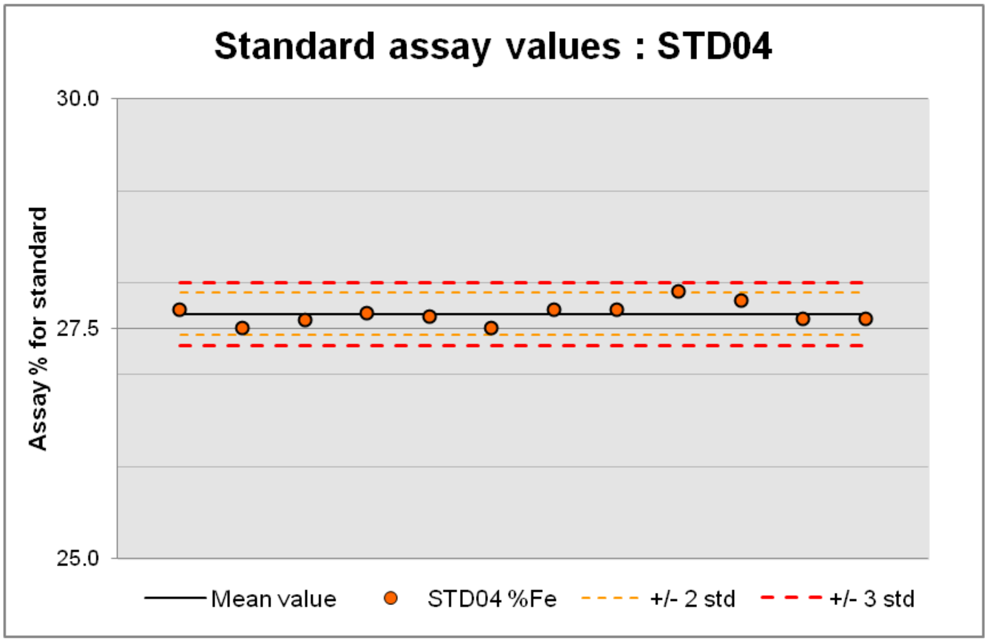


Figure 12-13: Standard Analysis STD04 - SiO_2

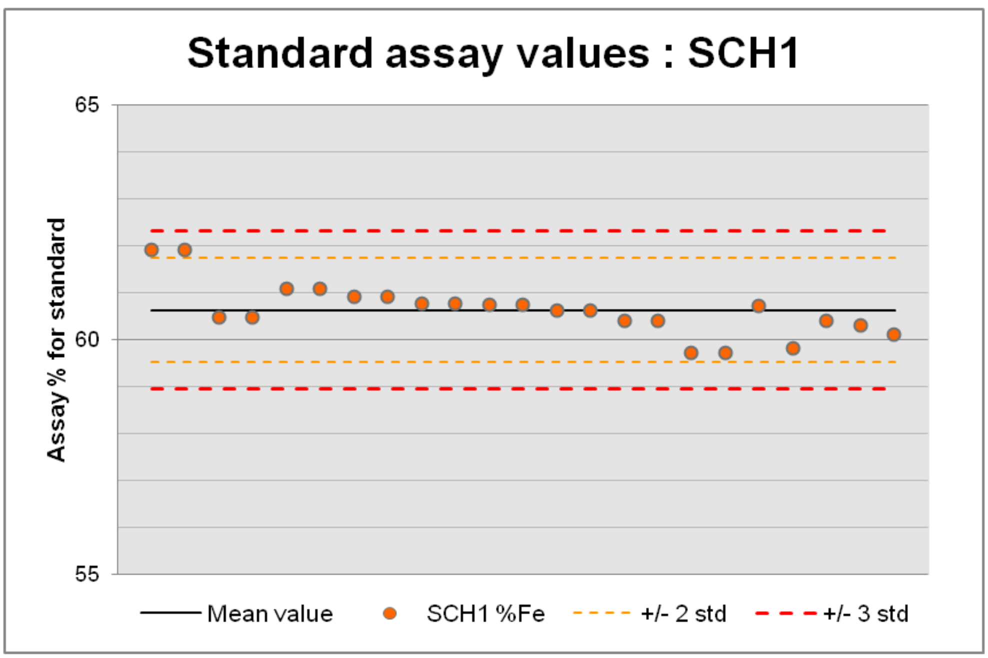


Figure 12-14: Standard Analysis SCH1 – Fe with Target Mean

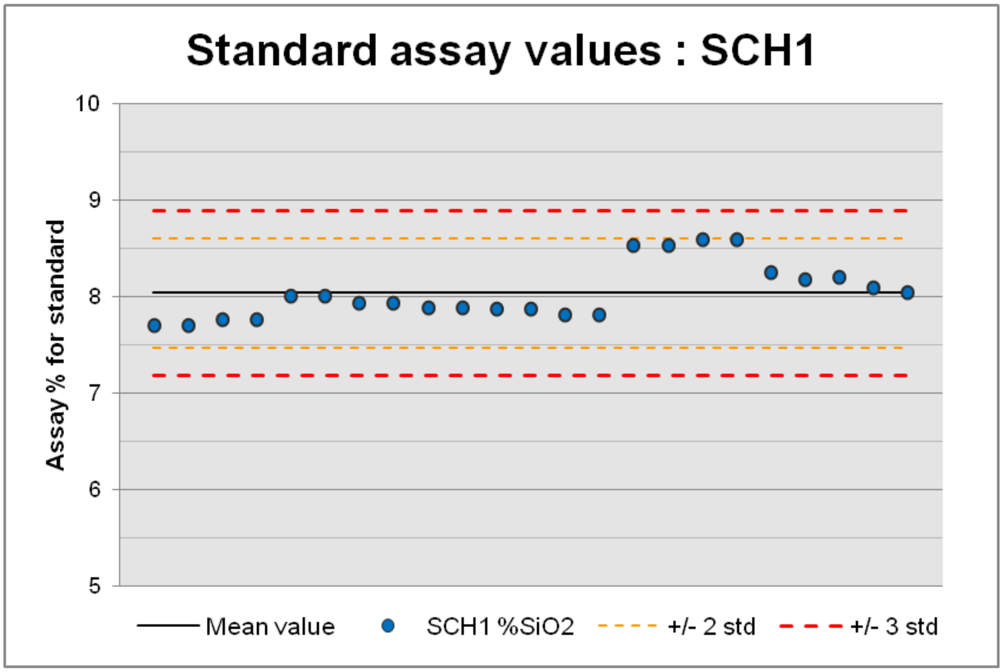


Figure 12-15: Standard Analysis SCH1 - SiO_2 with Target Mean

Reported results for the standards inserted into the 2013 drill program met the control limit requirements, which indicated the unknown samples were valid. Only seven samples returned values outside the two standard deviation limits of its population. Those seven values were not considered to have invalidated all the results considering that they were not out three standard deviations lines. It can be concluded the quality of the standard is better than the past exploration program, and as such, LCIO seems to have improved infield QA/QC.

12.1.4 Independent Sampling 2013

During the site visit, Claude Duplessis, Qualified Person selected independent samples. A total of 31 samples were taken from the hole Joy-13-120. The procedure consisted of a selection of 15 witness intervals of LCIO original samples and the 15 corresponding intervals from the rejects. Samples were divided using a splitter and bagged at the preparation laboratory of LCIO in Schefferville under SGS staff supervision. All samples were sent to SGS Lakefield for analysis. The following table summarizes the LCIO original sample numbers and SGS independent sample numbers.

Table 12-2: Standards Summary (2013 Drilling Program)

Independent Samples JOY-13-120					
		Sample Number		Reject Number	
From (m)	To (m)	Century	SGS	Century	SGS
114	117	490355	42451	-	42466
117	120	490356	42452	-	42467
120	123	490357	42453	-	42468
123	126	490358	42454	-	42469
126	129	490359	42455	-	42470
129	132	490360	42456	-	42471
132	135	490361	42457	-	42472
135	138	490363	42458	-	42473
138	141	490364	42459	-	42474
141	144	490365	42460	490366	42475
144	147	490368	42461	-	42476
147	150	490369	42462	-	42477
150	153	490370	42463	-	42478
153	156	490371	42464	-	42479
156	159	490372	42465	-	42480

In order to validate the correlation between the batches of samples, the following pairs were plotted:

- SGS independent samples versus LCIO original samples
- LCIO original samples versus Rejects
- SGS independent samples versus Rejects

The analytical results for Fe % and SiO_2 % plotted in the following diagrams show good correlation and reproducibility of the analytical samples for the %Fe. As expected, the best correlation appears to be between LCIO original samples and SGS independent samples. However, the SiO_2 reject results appear to be significantly different than both LCIO originals and SGS independent samples. We can see several results out of the +/-20% lines. For %Fe, the rejects appear to be systematically higher in %Fe and lower in %SiO_2 than the LCIO originals or the SGS independent results. This could be relevant to an existing bias in the reject values.

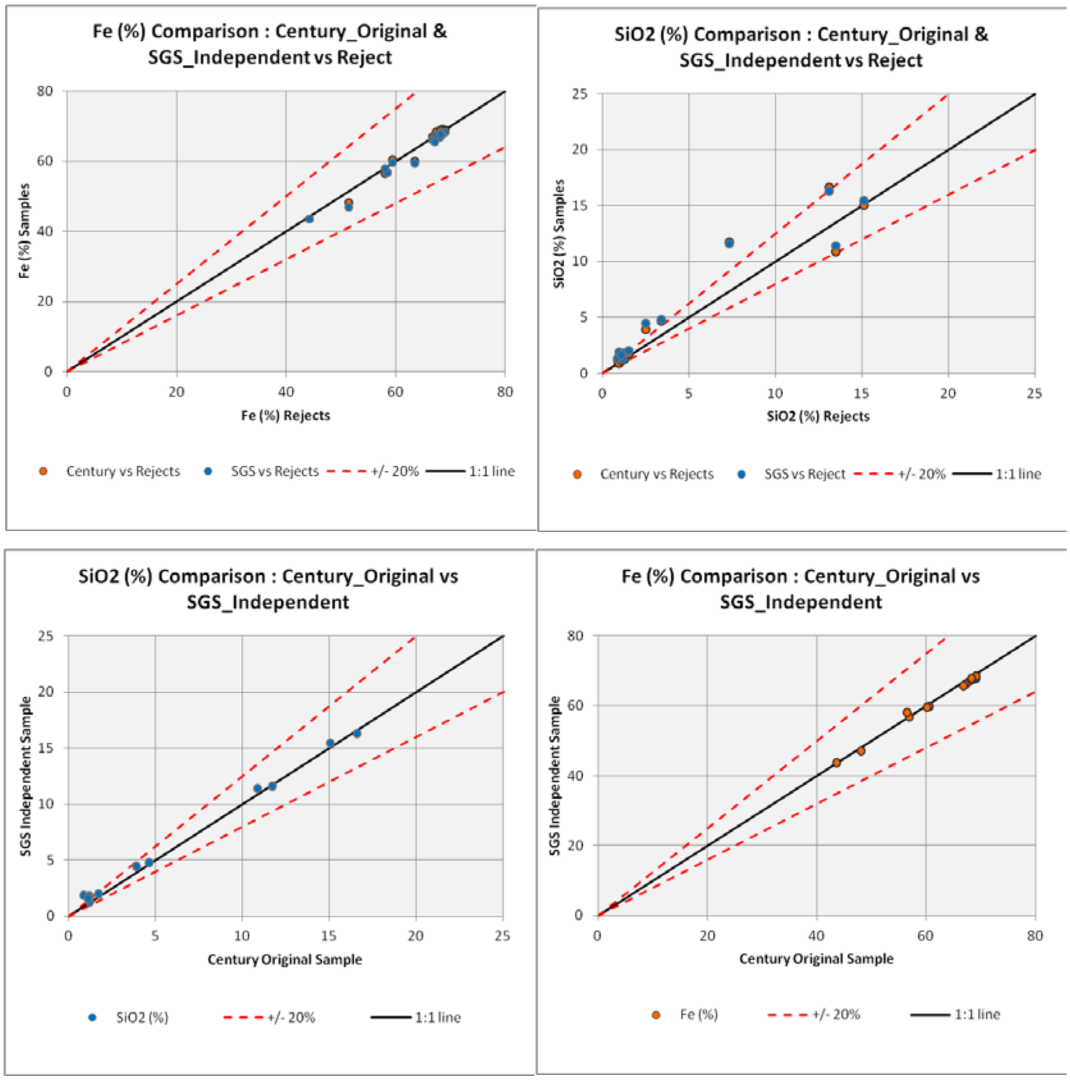


Figure 12-16: Comparison Correlation SGS Independent vs LCIO Fe % & SiO_2 %

In order to validate the possibility of a bias, a T-test was performed. The following table shows results.

Table 12-3: T-Test Analysis

N=15	SGS vs LCIO		SGS vs Reject	
Element	Bias	Estimated Difference	Bias	Estimated Difference
% Fe	99.9%	1.0%	98.5%	2.0%
% SiO_2	96.8%	-3.0%	96.0%	-16.0%

The T-test results show a bias at 99.9% for the Fe% values between SGS independent samples and LCIO original samples. The difference in %Fe of the SGS independent sample value is estimated at the original value +1%. For the SiO_2, the possibility of bias is 96.8% with an estimated difference of -3% in %SiO_2 of the SGS analysis. Those results show that the assay values from SGS Lakefield have systematically higher %Fe than the original data set and lower %SiO_2. However, the estimated differences are low and can be explained by differences between calibration curves, sample size used for analysis and sample division.

For the reject, the possibility of bias in regard to the SGS independent samples is 98.5 % with +2% Fe in the reject than in the SGS independent sample. The possibility of bias is 96% for the SiO_2 with an estimated difference of -16% of SiO_2 in the reject than in the SGS sample. The estimated differences are relatively high and required more investigation to find the origin of observed difference. The rejects were not used for the estimation and had not impacted the resources estimates.

The bias analyses concluded that the current data used for the resources estimation had systematically a lower %Fe grade and a higher SiO_2 value and as well for the rejects for the SGS independent samples. It can be concluded the actual resources estimate to be conservative based on original dataset.

12.1.5 Data Verification Conclusions and Recommendations

As part of the 2013 work program at Joyce Lake, LCIO implemented a QA/QC protocol that consisted of inserting reference materials into the sample series (including both standards and blanks). The QA/QC program also included analysis of duplicates on selected samples.

Actlabs proceeded to the 2013 assays analysis. The data verification was done on the iron grade (Fe %) assay results from 2013 drilling program. Visual analyses of duplicates of Actlabs assays showed satisfactory correlation. Only one result was outside the minus 20% boundary (indicated by a red bar and red circle in Figure 12-2 and Figure 12-3). The error was 23.32% in hole Joy-13-132 at the depth of 51 m (the duplicate sample number is 494369). This result could be related to the error either at sample collection in the field or sample preparation at the Lab, however there were not enough that failed to invalidate the results.

For the blanks, a 1% error line was set as an acceptable limit for iron. The verification did not return any relevant issues.

Reported results for the standards inserted in the 2013 drill program showed good correlation with the expected mean. Only seven sample values compared were outside of its respective two standard deviation limits. Those seven values were not considered to have invalidated all the results considering that they were not out three standard deviations lines.

Independent samples returned a good correlation between samples from SGS and LCIO with an existing bias in the SGS analysis having systematically higher %Fe and lower %SiO_2. However the bias cannot be considered as significant to have had an impact on the resources estimate qualities. The rejects analysis returned a strong bias for silica analysis. The SiO_2 was systematically under estimated in the rejects and the Fe overestimated. Considering these analyses, the data used for the estimation appear to be conservative and adequate for the purpose used in the Report.

13 MINERAL PROCESSING AND METALLURGICAL TESTWORK

Metallurgical testwork performed on the Joyce Lake mineral deposit samples is documented in three reports:

1. 'Mineralogical Characterization of Samples from Joyce Lake Deposit' by COREM, report number T1362, dated September 18, 2012.
2. 'Beneficiation of the Joyce Lake Deposit' by COREM, report number T1371, dated May 1, 2013.
3. 'Metallurgical Testing of Samples from the Joyce Lake Location at Attikamagen' by SGS Canada, report number 13609-002, dated December 10, 2013.

A battery of physical and metallurgical tests was performed on various composite and bulk samples extracted from the Joyce Lake deposit. The composite samples, used mainly for beneficiation testwork, generally covered the deposit and BBA believes them to be reasonably representative. With regard to the bulk samples, one of the three samples was deemed not to be representative of the general deposit nor of the mineralized material that will be processed due to its low iron and high manganese content. This testwork was performed as part of the Joyce Lake Project Preliminary Economic Assessment (PEA), having an effective date of May 8, 2013. No new testwork has been performed for the current Feasibility Study.

As part of the current Feasibility Study, BBA used these testwork results to perform a trade-off study to compare the merits of processing Joyce Lake material by wet processing entailing concentration versus the base case of dry processing consisting of crushing and screening material to produce a lump and a fine product without the generation of any concentration rejects. The results of this study will be discussed in Chapter 17 of this Report.

13.1 COREM Testwork Summary

The first phase of testwork performed by COREM consisted of mineral characterization on 13 composite samples prepared using 185 individual samples from various locations within the Joyce Lake deposit. The composite samples TFe grade varied from 33.4% to 62.2% and the predominant iron species is hematite. A few samples showed the presence of significant quantities of MnO. This characterization testwork showed that hematite is of fine and very fine grain and is often intimately associated with quartz. The composite samples grading lower in iron were characterized by very fine hematite intimately associated with fine quartz grains. Although such particles were also observed in the higher iron grade composite samples, these samples were characterized by a predominance of particles consisting mainly of very fine hematite and free coarse quartz. It was found that the liberation size of the fine hematite was less than

150 µm. The testwork concluded that it would be difficult to achieve a high grade concentrate using gravity or flotation processes due to the porous nature of the hematite reducing its apparent density and the presence of a very fine mix of iron and silica dust (<20 µm) coating the particles thus lowering selectivity in flotation.

In a second phase of testwork, COREM prepared three composite samples from approximately 190 samples based on instructions from LCIO. The composite samples were first homogenized and crushed to 100% passing 850 µm and were then subjected to gravity separation tests using Wilfley Tables and Dense Media Separation (DMS). Reverse Flotation tests and Wet High Intensity Magnetic Separation (WHIMS) tests were also performed on the composite samples. It was determined that test results were influenced by the presence of a significant amount of 'very fine orange dust' in the samples that negatively impacted the test results. Some of the testwork was subsequently repeated on samples that were pre-treated by a scrubbing step to remove very fine particles smaller than 25 µm.

The head analysis of the three composite samples was as follows:

Sample ID	%TFe	%SiO_2
# 1-3*	58.2%	13.6%
# 2	40.1%	40.4%
#4	39.7%	40.0%

*This is a single combined sample from 2 samples.

The general conclusions from the testwork were as follows:

- Wilfley Table test results on un-scrubbed samples showed a very poor weight and Fe recovery for all three samples.
- DMS test results on un-scrubbed samples also showed a poor upgrade result. Mineralogical testwork performed on the sink products of all three samples showed that iron oxide particles contained a significant quantity of very fine quartz inclusions suggesting that further upgrade would only be possible if samples were subjected to very fine grinding.
- Scrubbing removed very fine 'orange dust' of significant Fe content. It was not possible to remove all of this dust.
- The scrubbed high head grade sample, Sample #1-3 was subjected to repeats of various tests. Following scrubbing, the Fe and silica grade of the scrubbed sample were essentially the same as that of the un-scrubbed sample. Test results are summarized as follows:
  - DMS test results were similar to the results obtained with the un-scrubbed samples.
  - Wilfley Table test results were similar to the results obtained with the un-scrubbed samples.

  - Flotation and WHIMS tests were performed on Wilfley Table concentrate and middling. Good flotation results were only obtained after the Wilfley Table concentrate sample was reground. WHIMS results showed that Fe concentration of Wilfley Table middling product beyond a grade of about 50% Fe could not be achieved, suggesting that grinding would be required in order to upgrade further.
- The scrubbed low head grade sample, Sample #2, was subjected to a repeat of WHIMS and flotation tests. Test results for both were in line with what was observed with Sample #1-3.

This testwork by COREM was performed to evaluate the response of the samples to beneficiation. Although this testwork is of limited use for evaluating the potential of the Joyce Lake deposit as a Direct Ship Operation (DSO), it is however useful to assess the response of the mineralized material to various beneficiation processes and the challenges that would be encountered should such a route be considered. It was clearly shown that the lower head grade mineral (in the grade range of 40% Fe) iron liberation would require very fine grinding in order to upgrade to an acceptable iron grade.

13.2 SGS Testwork Summary

Testwork at SGS was performed on three bulk samples and three composite samples that were submitted for various characterization and beneficiation tests. All samples were submitted for particle size distribution, direct head assays, while the three as-received bulk samples (at minus 8" or 200 mm) were also submitted to bulk density and angle of repose determination. The average angle of repose for the three bulk samples was found to be between 35^{o} and 38^{o}. The bulk density for Bulk Sample #1 and for Bulk Sample #2 was identical at 2.55 t/m^3 whereas for Bulk Sample #3 the bulk density was measured at 2.21 t/m^3.

The three bulk samples were subsequently crushed to minus 1-1/4 inch (31.5mm) and they, along with the composite samples that were composed of assay reject material previously crushed to minus 10 mesh (1.7 mm) were submitted to full Particle Size Analysis and head assay. One of the three bulk samples (Bulk #3), taken from a localized, low grade zone of the Joyce Lake deposit, had a relatively low iron grade and a very high MnO level. This sample was deemed as non-representative, as confirmed following review of MnO distribution in the geological block model. Consequently, testwork performed on this sample will not be discussed. The head analyses of the two remaining bulk samples and three composite samples used for testing by SGS are indicated in Table 13-1.

Table 13-1: Sample Head Assays

Sample ID	%Fe	$\%SiO_2$
Bulk #1	68.5%	1.3%
Bulk #2	63.6%	7.0%
47-53% Fe Comp	50.6%	25.5%
53-57% Fe Comp	55.0%	18.5%
57-62% Fe Comp	59.4%	11.4%

The results also showed that, in general, the iron grade decreased with the particle size, and this was noted particularly in the three composites at sizes finer than 100 microns. This also suggests that in producing a coarser lump product and a fine product, a slight iron concentration in the lump product can be expected. The testwork generally supports this as seen in Table 13-2. The bulk densities and angle of repose measured for both the lump and fines products are presented in Table 13-3.

Table 13-2: Head and Product Assays for Bulk Samples #1 and #2

Sample	Bulk Sample #1A	Bulk Sample #1B	Bulk Sample #2A	Bulk Sample #2B
Head Assay				
Fe (%)	68.4	68.4	63.1	63.7
SiO_2 (%)	1.2	1.2	7.4	6.7
Lump (+6.7mm)				
Fe (%)	69.2	69.1	64.3	66.9
SiO_2 (%)	0.6	0.7	6.3	3.3
Wt fraction (%)	51.4	52.2	17.4	20.1
Fines (-6.7mm)				
Fe (%)	67.6	67.5	62.8	62.9
SiO_2 (%)	1.8	1.9	7.6	7.6
Wt fraction (%)	48.6	47.8	82.6	79.9

Table 13-3: Angle of Repose and Bulk Density Measurements for Bulk Samples #1 and #2

Sample ID	Product	Angle of Repose (°)	Bulk Density (t/m^3)
Bulk #1	Lump (+6.3mm)	28	2.34
	Fines (-6.3mm)	28	2.68
Bulk #2	Lump (+6.3mm)	33	2.14
	Fines (-6.3mm)	32	2.27

The bulk samples were prepared in order to be subjected to some grindability testwork such as Bond Crusher Work Index (CWi) and Bond Abrasion Tests. These parameters were used for this Feasibility Study to provide crushing circuit design criteria. The average CWi for the two representative bulk samples was 9.6 kWh/t for Bulk Sample #1 and 10.7 kWh/t for Bulk Sample #2, with overall variation between 8.6 kWh/t and 11.4 kWh/t. Testwork also indicated that samples from the two representative bulk samples were of relatively high abrasiveness and quite variable. The average Bond abrasion index for Bulk Sample #1 was 0.374g and for Bulk Sample #2 the index was 0.555g.

Mineralogical testwork was performed on the minus 10 mesh (1.7 mm) fractions of each of the bulk samples. Results indicated that the iron in both Bulk Sample #1 and Bulk Sample #2 was present predominantly as goethite, followed by hematite.

Scrubbing tests were performed on each sample and results did not show any significant improvement compared to wet screening with the exception of Bulk Sample #1, which showed Fe distribution to be slightly finer than wet screening suggesting that some attrition took place. A series of beneficiation tests were conducted on the samples with the objective of reaching a target grade of 64% Fe.

Heavy Liquid Separation (HLS) tests were first performed. Bulk Sample #1, having a head grade of 68% Fe, as expected, showed a very high weight recovery to the sink product. Bulk Sample #2 achieved a grade of 66% Fe. None of the size fractions of the composite samples 47-53% Comp and 53-57% Comp reached the targeted Fe grade of 64%, however some upgrading was observed. The 57-62% Comp did reach 64% Fe at the finer size fractions.

A sub-sample of Bulk Sample #2 at minus 850 µm was submitted for WHIMS testing. Results were the same for scrubbed and wet screened material. A grade of 64.5% Fe and 5.3% SiO_2 was achieved with an 80% weight recovery and an 85% Fe recovery. The concentrates were significantly coarser than the tailings, showing that the finer fractions were higher in liberated silica. The 47-53% Comp was also submitted for WHIMS testing. The best results were obtained at the lowest magnetic intensity where a grade of 60.5% Fe and 11% SiO_2 were achieved, but with only a 50% weight recovery a 62% Fe recovery. As the magnetic field intensity was increased, weight recovery increased at the detriment of Fe grade.

Wilfley Table tests were conducted on Bulk Sample #2, as well as on the three composite samples. Test results for the bulk sample generally indicated that an Fe grade of 63% was achieved with weight recovery between 77% and 81% and an Fe recovery between 79% and 83%. Tailings Fe grade was high at 57%. Of the three composite samples at minus 1.7 mm subjected to Wilfley Table tests, only the 57-62% Comp sample achieved the targeted 64% Fe grade, albeit at only 60% Fe recovery. The tests performed on the 47-53% Comp sample at minus 850 µm however, showed that the targeted 64% Fe grade was achieved but Fe recovery was only 43%.

Testwork performed with a hydroseparator showed negligible Fe concentration to the underflow and very high weight recovery for all samples.

13.3 Conclusions from the Testwork

The testwork performed during the PEA provided some general orientation for predicting performance of a DSO project using dry processing. Some material characteristics such as bulk density and angle of repose were measured for as-received bulk samples, as well as for lump and fines products, which are used in this Feasibility Study for developing design criteria for stockpile design. Also, some key grindability parameters, including CWi and Bond Abrasion Index, were measured that are required design criteria for sizing of the crushing circuit for producing lump and fines products.

More importantly, the beneficiation testwork performed by both Corem and SGS highlights the challenges to be expected if wet processing and beneficiation of lower grade ore were to be considered in the Joyce Lake process flowsheet.

BBA used these testwork results to perform a trade-off study to compare the merits of processing Joyce Lake material by wet processing entailing concentration versus the base case of dry processing consisting of crushing and screening material to produce a lump and an fine product without the generation of any concentration rejects. The results of this study will be discussed in Chapter 17 of this Report along with a description of the recommended processing route that BBA adopted for this Feasibility Study.

Although BBA is of the opinion that no further testwork was required for this Feasibility Study, BBA makes the following recommendations for the next phase of the Project development that are aimed at reducing project risks and better predicting future operations:

- Following the completion of this Feasibility Study and prior to confirmation of final design, a new bulk sample should be prepared grading 60% to 62% Fe. The Particle Size Distribution of the sample should firstly be such that it is reasonably representative of run of mine ore expected from the mining operation. Secondly, the material should be crushed to produce lump and fines products reasonably representative of the final product expected from the dry processing plant. Considering that lump product attracts a premium over fines product, there is value in better predicting the lump to fines ratio of the operation. Also, this type of testwork would confirm the degree of iron upgrading to the lump product determined from the previous testwork.

- The bulk density and angle of repose for lump and fines products have been characterized in the previous testwork. Although these are not critical parameters, it would be beneficial to have additional data from a representative sample for confirmation.

Based on the beneficiation testwork performed to date and the results obtained, BBA is of the opinion that, if a wet processing route were to be followed to upgrade lower iron grade ore for this Feasibility Study, the testwork performed to date is insufficient to make a proper assessment of the metallurgical performance and cut-off grade for the development of a definitive wet processing flowsheet.

14 MINERAL RESOURCE ESTIMATE

14.1 Mineral Resources Estimation Result and Conclusion

Mineral resource reporting was completed in GENESIS using the conceptual iron envelope. Mineral resources were estimated in conformity with generally accepted CIM Estimation of Mineral Resources and Mineral Reserves Best Practices Guidelines. The updated Mineral Resource Statement for the Joyce Lake Iron DSO deposit is repeated here as of March 2014:

The mineral resource estimate, based on the drilling results from the 2011-2013 drilling programs show 24.29 million tonnes of Measured and Indicated mineral resources at an average grade of 58.55% total Iron (TFe) plus an additional 0.84 million tonnes of Inferred mineral resources, at cut-off grade of 50% TFe. The results at a 55% cut-off grade are also shown in Table 14-1. The resource estimate shown below is not constrained by the open pit that was designed in the 2013 PEA.

Table 14-1: Summary of NI 43-101 Mineral Resource Estimate at Joyce Lake DSO Project (SGS March 2014)

Joyce Lake (DSO) Resources					
55% Fe Cut-off	Tonnes	% Fe	% SiO_2	% Al_2O_3	% Mn
Measured (M)	12,880,000	61.45	9.02	0.54	0.86
Indicated (I)	3,600,000	61.54	9.38	0.49	0.64
M+I	16,480,000	61.47	9.10	0.53	0.81
Inferred	800,000	62.47	7.73	0.43	0.80
50% Fe Cut-off	Tonnes	% Fe	% SiO_2	% Al_2O_3	% Mn
Measured (M)	18,650,000	58.67	13.02	0.55	0.81
Indicated (I)	5,640,000	58.14	14.39	0.51	0.54
M+I	24,290,000	58.55	13.34	0.54	0.75
Inferred	840,000	62.00	8.43	0.43	0.78

Within a mineralized envelope, % Fe Cut-Off on individual blocks

Variable Density (equation derived from core measurements), tonnes rounded to nearest 10,000.

In the opinion of the qualified person, the geological interpretation, sample location, assay intervals, drillhole spacing, QA/QC, specific gravity measurements on core and grade continuity of the Joyce Lake DSO deposit are adequate for this resource estimation and classification.

For comparison purposes with previous tabulations for 2013, without applying a cut-off grade, materials within the geologically determined mineralized envelopes are presented in Table 14-2.

Table 14-2: Summary of Joyce Lake Mineral Resources with No Cut-Off Grade (SGS, March 2014)

(Envelope)	Tonnes	% Fe	% SiO_2	% Al_2O_3	% Mn
Measured	25,800,000	55.41	17.84	0.52	0.75
Indicated	8,520,000	54.41	19.97	0.48	0.44
M+I	34,320,000	55.16	18.37	0.51	0.67
Inferred	870,000	61.57	9.08	0.44	0.75

14.2 Geological Interpretation and Modeling

The Joyce Lake iron deposit is held in folded and fractured banded iron formations of the Proterozoic Sokoman formation. The iron mineralization is stratabound, sedimentary in origin, and occurs within a synclinal structure plunging shallowly to the southeast. The main DSO enrichment is within the nose of the syncline.

LCIO provided a three dimensional model to SGS for the main stratigraphic rock units as GEMS wireframes interpreted from the drilling data.

- **UMH** (Upper Massive Hematite)
- **RC** (Red Chert)
- **LMH** (Lower Massive Hematite)
- **LRC** (Lower Red Chert)

Each stratigraphic unit exhibits different iron content and variable magnetite and hematite proportions. The UMH and LMH are generally the DSO bearing units. For resource modelling, a three dimensional model for the interpreted DSO was generated, hereafter referred to as the "*mineralized envelope*". The geological model has changed slightly from the last estimates and the new interpretation takes into account new logs indicating a potential thrust fault as evidenced by fractured zones resulting in a splitting of the UMH deposit along the azimuth 135.

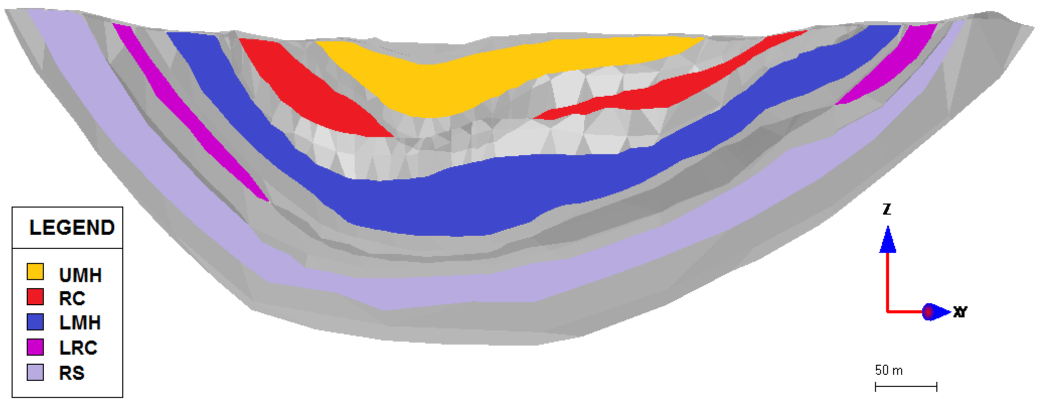


Figure 14-1: Lithological layers of Joyce Lake Property (Section Joy_1.5N)

Because the deposit folds NW-SE and slopes SE, transverse sections were used rather than longitudinal sections. A total of 18 interpretations on sections (prisms) were used with a spacing of about 50 m.

14.3 Mineral Resources Estimation Methodology and Geological Modeling

The resources estimation and classification sections of this Feasibility Report on the Joyce Lake project mineral resource estimate were prepared by Claude Duplessis, P.Eng.

The current reported classified resources of the Joyce Lake Deposit are compliant with standards as outlined in the National Instrument 43-101.

14.3.1 Resource Estimation

As usual, Joyce Lake DSO resources were estimated through the construction of a resource block model with fixed size blocks on a regular grid filling an interpreted mineralized envelope and with grades interpolated from measured grades of composited drillhole samples around the blocks and within the same envelope. Blocks were then assigned to resource categories according to average proximity to samples.

14.3.2 Envelopes and Block Model Definition

The block model coordinates were based on the local UTM grid observations recorded in the North American Datum 1983 (NAD83) Canadian Spatial Reference System (CSRS). It was made using 5,657 assayed intervals totalling 17,030.42 m. The Block Model was defined by blocks measuring 5 m long by 5 m wide by 3 m thick. The blocks were confined to the wireframe described above, as well as a surface defining the base of overburden. The block model was computed by block percentage within envelopes in order to avoid over estimation of the tonnage. The base of overburden was defined by a wireframe joining the base of drillhole casings across the area and rock outcroppings. A total of 1,315 composites, totalling 3,945 m from 111 holes, and one channel were used to make the block model estimation.

Limits of mineralized zones were interpreted from drillhole assay information available on sections. A minimum assay value of 45% Fe was used to delineate potentially mineralized material applied to original (3 m) assay intervals with a minimum sample length of 1.5 m. The mineralized intervals were also verified and revised individually to limit the high SiO_2 values. The current mineralized solid models include local internal waste with grades less than 45% Fe cut-off, which is necessary for geological continuity. The main iron deposit called LMH is located in the Lower Massive Hematite (LMH) lithological layer between the Red Chert (RC) and the Lower Red Chert (LRC). Two other block models, UMH_1 and UMH_2, were also created in the Upper Massive Hematite Layer.

Table 14-3: Block Model Parameters and Block Counts

	X (m)	Y (m)	Z (m)
Size	5	5	-3[1]
Discretization	1	1	1
Starting Coordinate	657900mE	6085310mN	590
Ending Coordinate	659175mE	6086685mN	302
	LMH	**UMH_1**	**UMH_2**
Total number of blocks	106,935 (100%)	9,549 (100%)	22,891 (100%)
Total estimated blocks	106,935 (100%)	9,549 (100%)	22,891 (100%)
Volume	6,135,525 m^3	716,175 m^3	791,475 m^3

1. The (-) indicates that the block index elevation gradually increases from the surface to the bottom extent of the deposit block model. Please note that the starting Z coordinates are greater than the ending Z coordinates.

The mineral resource estimate was completed using the three dimensional wireframe modelling of DSO followed by block model interpolation methodology.

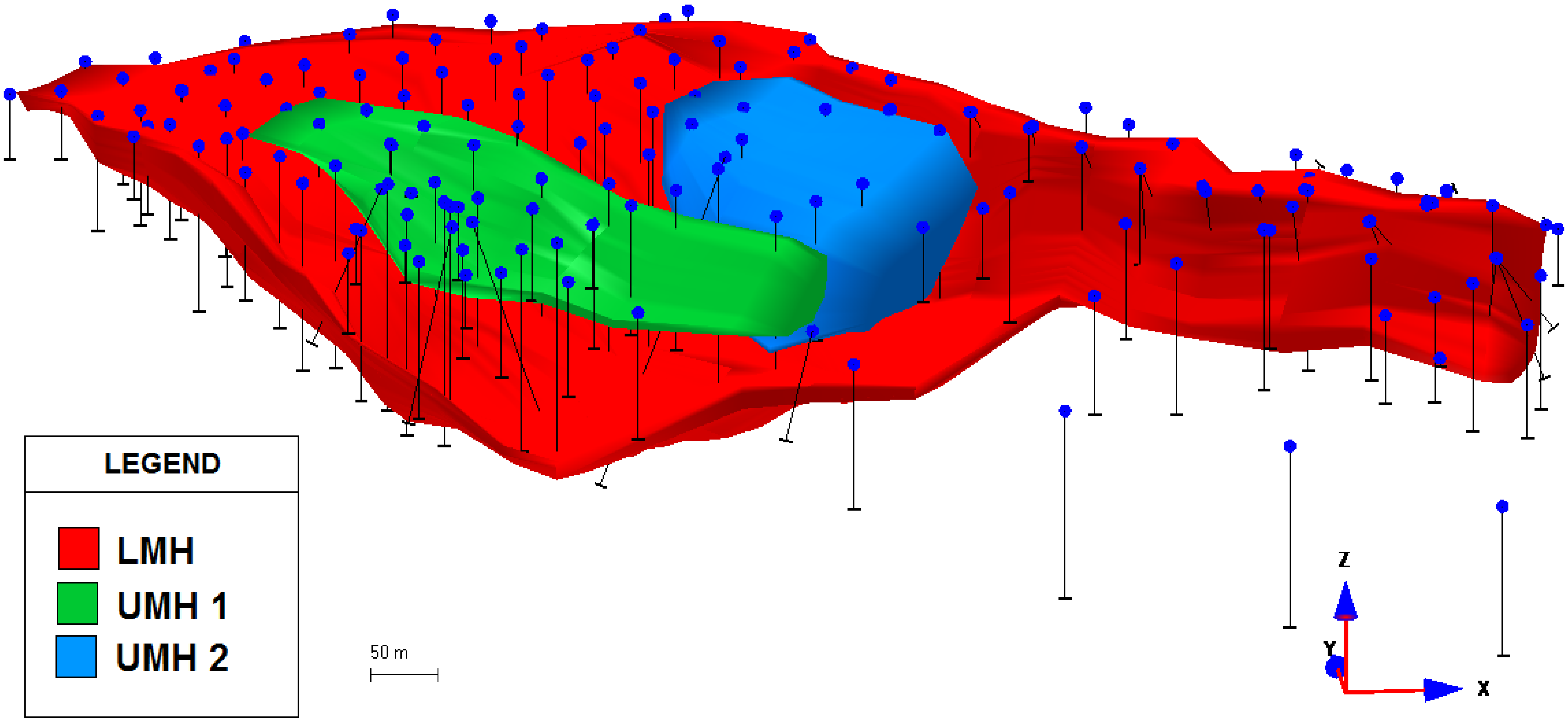


Figure 14-2: Oblique View of Joyce Lake Mineralized Envelopes for Block Modeling (2014), Looking North (Y) in GENESIS

14.3.3 In-Situ Density Correlation

Density measurement was only conducted on the drill core samples from the 2013 Phase II drilling program, while the samples from other drilling seasons, mostly the RC drilling, cannot be used for the Density measurement due to nature of drilling methods. This section presents analysis results and conclusions of available Density measurements on core. For reader information, density is used to convert volume into tonnage, the specific gravity of the material cannot be used directly since presence of voids are observed in the core, which is typical of DSO iron deposits in the region.

Basic univariate statistics (Table 14-4) have been performed on the total density population (N=752), the population within the envelope LMH (N=147), the population of holes Joy-13-153 and Joy-13-155 (N=53) and finally the mineralized zone of holes Joy-13-153 and Joy-13-155 (N=13).

Table 14-4: Univariate Statistics on Density Populations

	Entire Population	LMH Envelope	Joy-13-153 and Joy-13-155	Mineralized Zone
Count	752	147	53	13
Min	1.90	2.53	2.42	2.75
Average	3.25	3.59	3.12	3.48
Median	3.20	3.54	3.06	3.54
Max	6.00*	6.00[1]	4.30	4.30
StDev	0.44	0.56	0.37	0.41

1. Entire Population and LMH both have a high density measurement of 6.0 and pure hematite has an S.G. of 5.24, which indicates there may be measurement error on the sample.

The entire population and the Joy-13-153 and Joy-13-155 holes have similar averages as per the LMH zone and the ore zone, however it appears that there is some anomalous data in the larger populations and as evidence by lower standard deviations and calculated densities. It appears that the Joy-13-153 and Joy-13-155 holes are a reasonable proxy for the total population and the ore zone for the LMH envelope. The Joy-13-153 and Joy-13-155 holes have been selected by the author for use as a reduced data set for our determination of density due to higher confidence in the density measurements; but not without first investigating all populations as tedious work has been done by the technical team to gather the density measurements. High recovery was observed at the core shack during the site visit which is very positive.

It must be stated that the relationship between analysis of oxides (especially iron) and the density measurement on core was investigated since the author's goal was to use the grades of the RC analysis and associate a calculated density. This was why several mathematical tests were performed to get comfortable on the regression to be used.

Figure 14-3: Well Recovered Drill Core Showing Voids at the Core Shack During Visit October 3rd & 4th, 2013.

Method 1: Density Correlation – Within the LMH Envelope

A linear regression of all the Density data available within the LMH envelope using both the Fe% and the Si% values was conducted. All the samples were found within the LMH envelope that contained Density measurements. These samples were from 19 holes as shown in Table 14-5.

Table 14-5: Holes and Count of Density Observations

Hole ID	# of Tests
Joy-13-153	5
Joy-13-155	9
Joy-13-156	11
Joy-13-157	4
Joy-13-158	11
Joy-13-159	1
Joy-13-160	5
Joy-13-161	5
Joy-13-162	2
Joy-13-163	9
Joy-13-164	7
Joy-13-165	10

Hole ID	# of Tests
Joy-13-166	14
Joy-13-167	4
Joy-13-168	24
Joy-13-169	3
Joy-13-170	3
Joy-13-171	8
Joy-13-172	12
TOTAL	147

At first it was decided to use only Fe as a proxy for Density in the linear regression, however the following correlation matrix (Table 14-6) indicates that silica also has a strong correlation to the density albeit negative. As well, silica and iron are (negatively) very strongly correlated.

Table 14-6: Correlation Matrix

	Density observed	Si	Fe
Density observed	1		
Si	-0.5475	1	
Fe	0.5744	-0.9904	1

After running the regression package, the following results were achieved:

Table 14-7: Regression Statistics

Regression Statistics	
Multiple R	0.59
R Square	0.35
Adjusted R Square	0.34
Standard Error	0.46
Observations	147

ANOVA					
	DF	SS	MS	F	Significance F
Regression	2	16.44	8.22	39.43	0.00
Residual	144.00	30.03	0.21		
Total	146.00	46.47			
	Coefficients	Standard Error	t Stat	P-value	
Intercept	-2.1349	1.77	-1.21	0.23	
SiO_2	0.0418	0.02	2.31	0.02	
Fe	0.0898	0.03	3.47	0.00	

We can see from the Multiple R stat 0.59 that the regression of Si and Fe is superior to Si or Fe alone, since 0.59 is larger than either correlation from Table 14-6; however the gain is marginal. An S.G. calculation formula can be created from the coefficients such that**:**

Calculated Density = %SiO_2 * 0.0418 + %Fe * 0.0898 - 2.1349

A plot of the pairs; observed density versus calculated, was created (Figure 14-4) to examine the regression formula. Though the bulk of the data is around the 1:1 line, there appears to be an abnormal population, for the high iron samples.

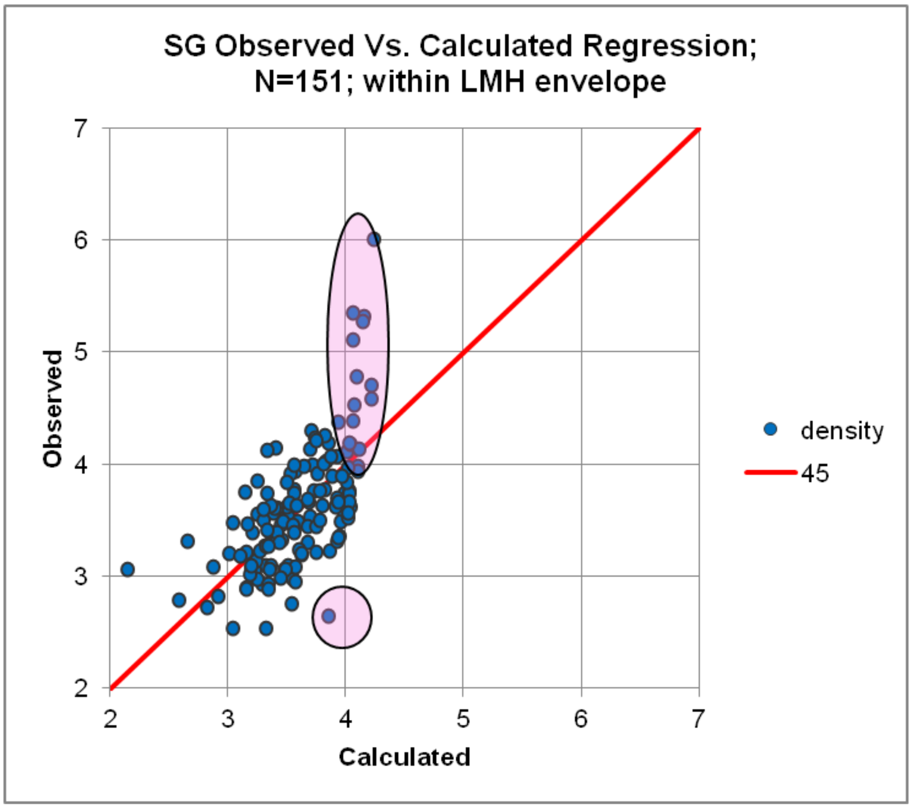


Figure 14-4: Density Observed within the LMH Envelope vs. Calculated

The non-conclusive correlation for these samples may indicate an error with either the calculation or the observations. It is possible because the observations were on sub samples within a run and not done on a complete run (3 m), that the porosity and average density is not adequately reflected for these samples if the run is not homogeneous. So it was decided to conduct further tests using two holes Joy-13-155 and Joy-13-153 to test the hypothesis and these holes had Density tests on complete run intervals.

Method 2: Density Correlation – Complete Intervals for Joy-13-155 and Joy-13-153

A new correlation matrix (Table 14-8) was created for the 53 samples in Joy-13-153 and -155, and they are more strongly correlated than the previous population, as evidenced in Table 14-7.

Table 14-8: Comparison Correlation Matrices

	N=53 [Joy-13-153 and -155]			N=143 Within LMH Envelope		
	Density	SiO_2	Fe	Density	SiO_2	Fe
Density	1			1		
SiO_2	-0.6492	1		-0.5475	1	
Fe	0.6590	-0.9974	1	0.5744	-0.9904	1

Two linear regressions were done with Fe and Si, one on the complete 53 samples, and a subset of 13 samples within the ore zone. The results are in Table 14-9.

Table 14-9: Regression Statistics – Joy-13-153 and -155 Density: All Samples vs Ore* Min Zone Samples

N = 53; Joy-13-153 and Joy-13-155 S.G. samples

Regression Statistics	
Multiple R	0.6687
R Square	0.4471
Adjusted R Square	0.4250
Standard Error	0.2782
Observations	53

ANOVA	*df*	*SS*	*MS*	*F*	*Significance F*
Regression	2	3.1297	1.5649	20.2160	0.0000
Residual	50	3.8704	0.0774		
Total	52	7.0001			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.9542	3.0214	-0.3158	0.7535
% Fe	0.0676	0.0444	1.5236	0.1339
% SiO_2	0.0328	0.0305	1.0764	0.2869

N = 13; Joy-13-153 and Joy-13-155 [Ore Zone] S.G. samples

Regression Statistics	
Multiple R	0.5403
R Square	0.2919
Adjusted R Square	0.1503
Standard Error	0.3800
Observations	13

ANOVA	*df*	*SS*	*MS*	*F*	*Significance F*
Regression	2	0.5951	0.2975	2.0610	0.1780
Residual	10	1.4437	0.1444		
Total	12	2.0388			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.1586	8.8207	0.0180	0.9860
% Fe	0.0522	0.1292	0.4038	0.6949
% SiO_2	0.0204	0.0887	0.2302	0.8226

The multiple regressions of both Fe and SiO_2 illustrate a correlation factor higher than either individual element. The Multiple R for the 53 samples is higher than that of the 153 samples within the LMH envelope, whereas the ore zone samples Multiple R is lower; however it is decided that it comes from a more reliable dataset, that of holes Joy-13-153 and Joy-13-155.

By inspection of Figure 14-5, the observed Density versus calculated Density for the two populations can be compared.

*The term Ore zone is used here to specify it is a mineralized intercept and it has not yet been identified as Ore in the terms of NI 43-101 (Min for Mineralized).

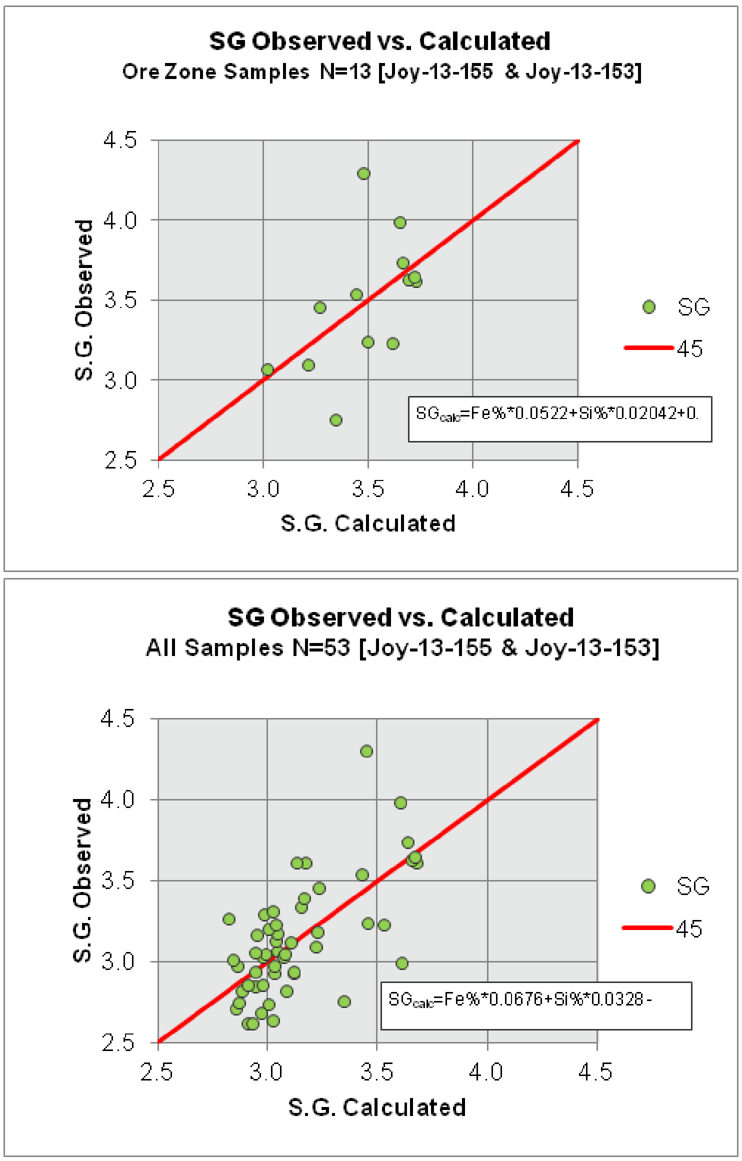


Figure 14-5: Scatter-Plots Comparing Density Observed Versus Regressed

Table 14-10: Multivariable Linear Regression Equations

Zone	Population	Formula
All Samples	53	$Dens = Fe\% \cdot 0.0676 + SiO2\% \cdot 0.0328 - 0.9542$
Min Zone	13	$Dens = Fe\% \cdot 0.0522 + SiO2\% \cdot 0.0204 + 0.1586$
Low Grade	40	$Dens = Fe\% \cdot 0.0521 + SiO2\% \cdot 0.0282 - 0.2972$

It can be observed that the formula for the ore zone has a positive component compared to the other two equations; this is simply related to the difference in the sub population. Decision was made by the author that these holes have the most reliable information, and thus the author checked the regression on the full population, which provides reasonable global confidence. To formulate an equation suited to the Mineralized (ore) zone and the grades, a regression formula has been calculated from that demonstrated group of data (population), even-though it does not have the highest amount of data.

It can be seen in the following table (Table 14-11), that there is a negative correlation of similar magnitude between Fe and Si for all populations, and that individually Fe and Si have a similar but opposite correlation with Density that is best demonstrated for the full population and for the ore zone. This correlation appears weaker in the low grade zone of Joy-13-155 and Joy-13-153. It can also be seen that the mineralized (ore) zone population is slightly different where the median is higher than the average.

Table 14-11: Correlation Matrices for Joy-13-155 & -153 and Statistics for S.G. Total Iron, and SiO_2.

Correlation Matrices											
Full N = 53				Ore Zone N = 13				Low Grade Zone N = 40			
	Dens	%TFe	%Si		Dens	%TFe	%Si		Dens	%TFe	%Si
Dens	100%			Dens	100%			Dens	100%		
%TFe	65.9%	100%		%TFe	53.6%	100%		%TFe	35.1%	100%	
Si	-64.9%	-99.7%	100%	Si	-52.9%	-99.6%	100%	Si	-33.3%	-99.3%	100%
Descriptive Statistics											
Count	53	53	53	Count	13	13	13	Count	40	40	40
Min	2.42	26.70	0.86	Min	2.75	36.60	0.86	Min	2.42	26.70	3.32
Average	3.12	41.55	38.64	Average	3.48	57.75	15.38	Average	3.01	36.28	46.20
Median	3.06	38.00	43.82	Median	3.54	58.60	13.65	Median	3.00	34.50	48.90
Max	4.30	68.00	59.88	Max	4.30	68.00	46.32	Max	3.61	65.90	59.88
StDev	0.37	12.11	17.61	StDev	0.41	9.82	14.29	StDev	0.26	7.07	10.57

Table 14-12: Verifying the Regression Coefficients with the Means

	Coefficients		Ratios		Average from Table 14-10			Calculated	
	Fe	Si	Si:Fe	Fe:Si	Ave_{Fe}	Ave_{Si}	Ave_{Dens}	Calc Dens	-Int
Full N = 53	0.0676	0.0328	0.4852	2.061	41.55	38.64	3.12	4.08	-0.9562
Mineralized zone N = 13	0.0522	0.0204	0.3908	2.559	57.75	15.38	3.48	3.33	0.1517
LGZ N = 40	0.0521	0.0282	0.5413	1.848	36.28	46.20	3.01	3.19	-0.1830

Through a simple verification, the coefficients and their ratios can be seen. The mineralized (Ore) zone places a higher importance on the iron value. Additionally the means of the population calculated Density without including the intercept was used. The calculated Density was then subtracted from the average Density to determine an intercept and when compared to the intercepts from the regression algorithm, there is reasonable correlation.

It is not the intention to indicate or emphasize much meaning into the group of data; as in this case it is a way to bring the formula into reality (Density observed), but does not have any other significant meaning. If 0% Fe and 0% Si existed, a negative Density would not exist. That being said, without all the factors including porosity and humidity, the statistical validity of a negative intercept would not be rejected.

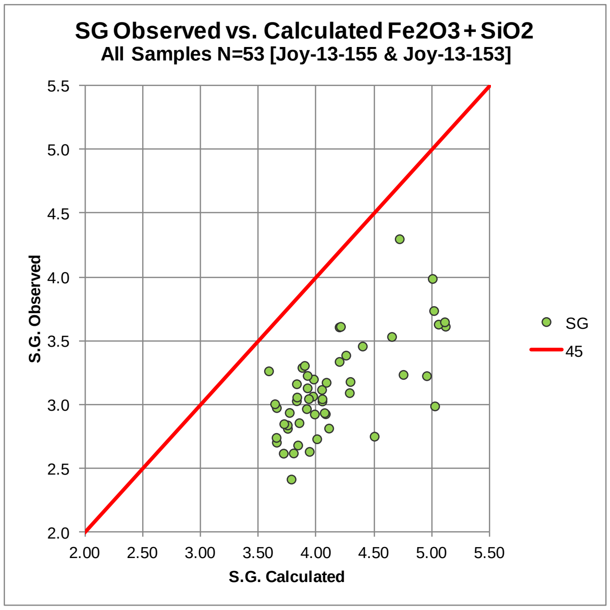
Method 3: Density Correlation – Calculating Density Based On Idealized Mineral Properties.

For this method, the following assumptions were made:

- The Fe is entirely in the form of hematite and has an S.G. of 5.24.
- The Si is entirely in the form of quartz and has an S.G. of 2.65.
- The porosity is 100% (%Hematite + %Quartz) and has a density of zero.

Fe total was converted to % hematite by using a conversion factor of $\%_{hem} = \%_{Fe} * 1.4297$.

There is an inherent problem with assumption 3 in that this will not effectively normalize or predict the porosity; as such porosity is not properly accounted.



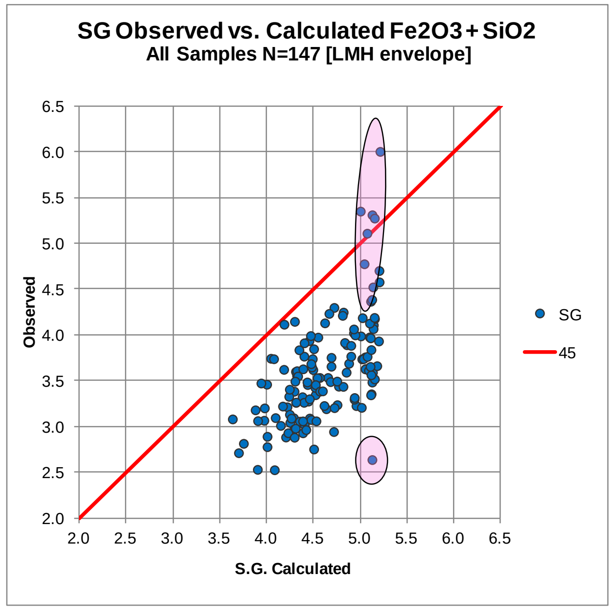


Figure 14-6: Density observed vs mineral calculated (hematite and quartz)

Because this method does not properly account for the porosity of the rock all the calculated densities are high. If a constant porosity of about 25% is arbitrarily selected, then the population would reasonably match the given data.

Applying the Formulas to the Block Model

We checked different density formulas and compared them when applied to the entire block model. The following results were obtained.

Table 14-13: Table of results after adding the formulas to the block model

	SiO_2	Fe	Original	Dens Joy-13 N=53	Dens Joy Ore Zone	Dens LMH zone	Idealized $Fe_2O_3 + SiO_2$
Block Count	143769	143769	143769	143769	143769	143769	143769
Min	0.49	32.31	2.91	2.77	2.85	2.75	3.75
Average	18.69	54.93	3.45	3.37	3.41	3.58	4.61
Median	19.56	54.17	3.44	3.35	3.39	3.55	4.58
Max	51.82	69.30	3.86	3.75	3.79	4.11	5.21
StDev	10.26	6.95	0.15	0.15	0.16	0.22	0.26

Using the idealized hematite formula produces false high densities, especially since it does not adequately account for porosity. From past experience, the rocks of the Schefferville area have highly variable porosities, and tests would be required to determine a sufficient average. The in-situ square excavation is usually used, but in our case it is not possible to do this test as it is under the lake. Possibly additional density tests could be completed in the coming summer season.

Because this model is entirely in the ore envelope there is no worry in applying the formula derived from mineralized (ore) zone samples, it is believed that the previous density formula may be conservative, as is also the density from the LMH since there are few false high values included in the data set.

Conclusions

Because of the low distribution of the appropriate method for measurement of density data in Joyce Lake, the specific gravity correlation with iron was made using the only two holes fully tested with Canadian standard of the industry method. The two drillholes available are Joy-13-153 and Joy-13-155. A multivariable linear regression was completed using the regression feature of the data analysis tool pack in Microsoft Excel. From the coefficients table, the following regression formulas were created. Density versus regression density was plotted to visually inspect the results, they are sufficient, but a larger population would be preferable, particularly within the mineralized (ore) zone.

It is recommended to use the population of density samples for Joy-13-155 and Joy-13-153 as the more reliable population, because it is believed those holes have improved quality control, and no major outliers.

It is not recommended to use the theoretical hematite and quartz formula, because it produces more values significantly above the mean, unless additional parameters can be determined.

For the time being, it is recommended to use the SiO_2 and Fe regression of method two until more reliable density data becomes available.

According to the fact that the modelled envelops are in the mineralized (ore) zone, the equation from Mineralized (Ore) zone was judged as a better estimation for Density in block models and was inserted as a calculated variable.

$$\textbf{Density} = \textbf{Fe\%} * 0.0522 + \textbf{SiO}_2\textbf{\%} * 0.0204 + 0.1586$$

The average density value returned after whole block model estimation was ***3.41*** and was considered as a reasonable estimation of this type of DSO iron deposit. The author is aware that measurement of DSO iron is not an easy task in the region. The process of enrichment creates voids and sometimes they are not real voids as they are filled with sandy to clayish iron silica material. The contractor has succeeded in recovering the core and pieces of material in the triple tube core barrel and one cannot guarantee material was not washed away and/or a real void was encountered.

As the author of the Mineral Resource Estimate, it is necessary to present the best reliable estimator to convert the volume to tonnage in the context. It is better to stay on the safe side than over estimating the amount. It must also be stated that mining and processing methods on the material will have an impact on the yield of the iron ore that could go to market.

The author suggests the trial of a down the hole Gamma Ray measurement used in coal (geophysical log) could provide a good reading of the in-situ density. (It is used for seam location and Density measurement).

When unconsolidated material is encountered (sandy pebbles, clayish material), the wax method could be used, however it is extremely tedious and may not come with a better appraisal than a visual estimation of the core recovered for the sampling length and application of the density from the geologist logging the core.

Additionally the author recommended the use of Ground Penetration Radar (GPR) survey for localization of caverns, if any, if production is to occur it could help to position any voids or caverns within an 8 m depth.

In conclusion, one must note that the equation incorporates a certain amount of cavity as high grade iron samples show a lower density than the direct conversion of mass. The author considers the equation to be adequate for the conversion of volume in-situ into in-situ tonnes.

14.3.4 Composites Used for Estimation

Block model grade interpolation was conducted on composited assay data. A composite length of 3 m was chosen to reflect the 3 m drill sampling intervals used on the Joyce Lake deposit. Compositing was done on the complete drillholes and channels. A total of 1,315 composited assay intervals totalling 3,945 m from 111 holes and one channel were used to make the block model.

Geostatistical analysis was done with the composite set to validate the continuity of the % Fe within the mineralized envelope. The following graph shows good continuity along the deposit following directions with a range of around 200 m:

- ✓ Down Plunge of the deposit : Az 135 Dip -25
- ✓ Down Northeast Flank: Az 225 Dip -55

We have less continuity in the downhole direction, which is expected given the stratiform geometry of the deposit. This illustrates the very low nugget effect of around 10%.

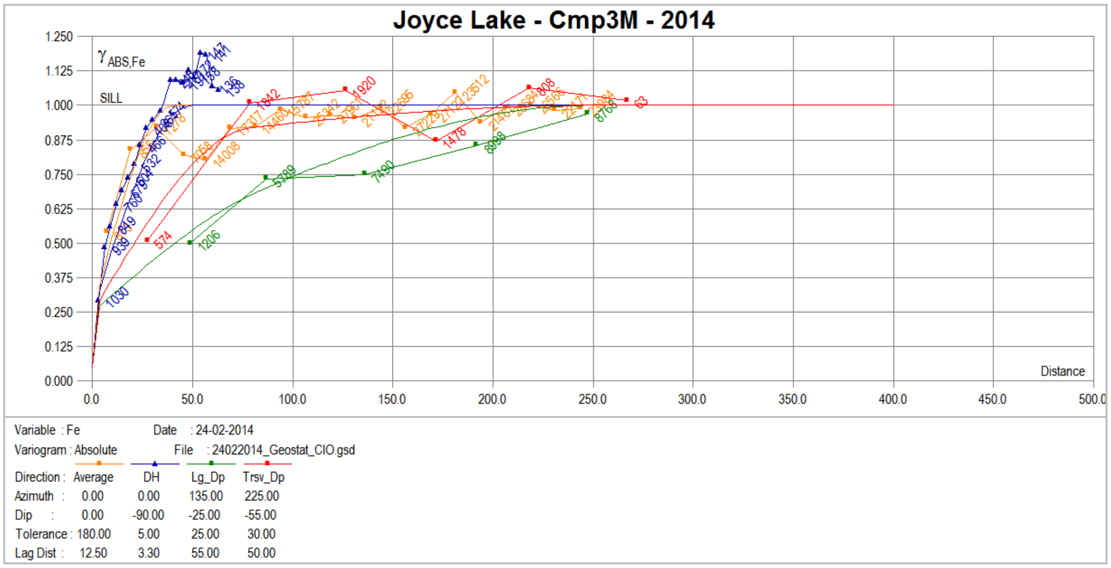


Figure 14-7: Joyce Lake DSO 3 m Composites Variography

14.3.5 Block Model Estimation with Variable Ellipsoids

Block Model Estimation

For block model estimation, 3 m regular length composites were used to generate the point composites within the mineralized intervals. Interpolation of the average grade of blocks within interpreted mineralized solids from nearby mineralized composites was accomplished by an inverse distance square interpolation, with ***three sequentially larger variable ellipsoids***. The procedure was run in several passes with search conditions (size of search ellipsoid, minimum data in search ellipsoid) relaxed from one pass to the next until all blocks within the mineralized solid were interpolated. The variable ellipsoid method establishes an orientation for each individual block according to the trend of the modeled geological interpretation. This method was chosen to accommodate the folded structure of the deposit. The following table summarizes the variable ellipsoid parameters used for estimation.

Table 14-14: Ellipsoid Parameters

Ellipsoid	Shape	X/Y/Z (m)	Min Composites	Max Composites	Limit/Sample/Hole
A	Saucer	75/60/5	6	9	3
B	Saucer	150/120/10	6	9	3
C	Saucer	150/150/75	3	9	3

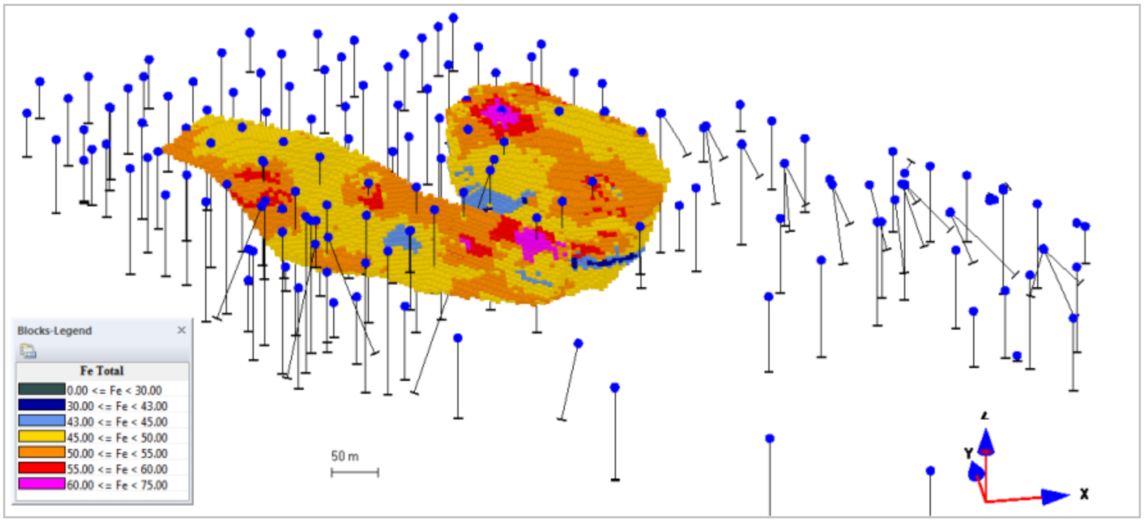


Figure 14-8: Oblique View of Block Grade Estimation Joyce Lake DSO Iron Deposit (SGS), UMH_1 and UMH_2, Looking North(Y) (~30 Degree Plunge).

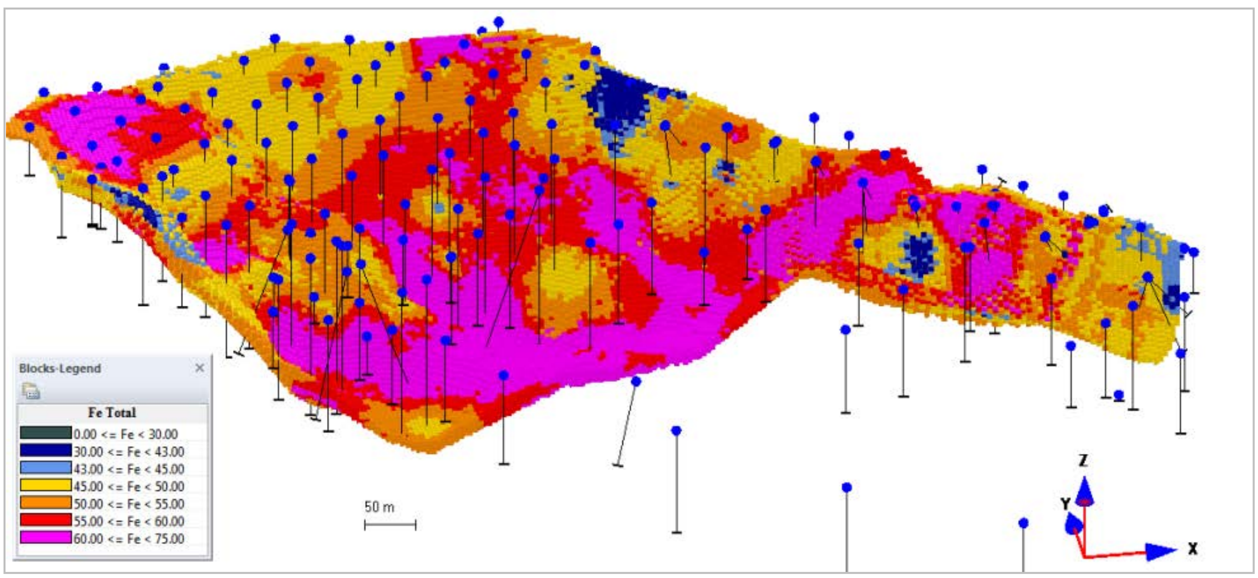


Figure 14-9: Oblique View of Block Grade Estimation, Joyce Lake DSO Iron Deposit (SGS), LMH, Looking North(Y) (~30 Degree Plunge).

Variable Ellipsoids

The Genesis variable ellipsoid feature involves using geology geometry as the parameter source for the ellipsoid orientation at the coordinates of each block. To do so, a wireframe using the drill grid was created with geolines (3d polylines) following the geometry of the deposit. These geolines, as illustrated in Figure 14-10, are divided into two sets, a UMH set in orange and a LMH set in blue, these sets help avoid the effects of interaction between the two deposits. This feature appears to be particularly appropriate in the case of the Joyce Lake folded and fractured banded deposit.

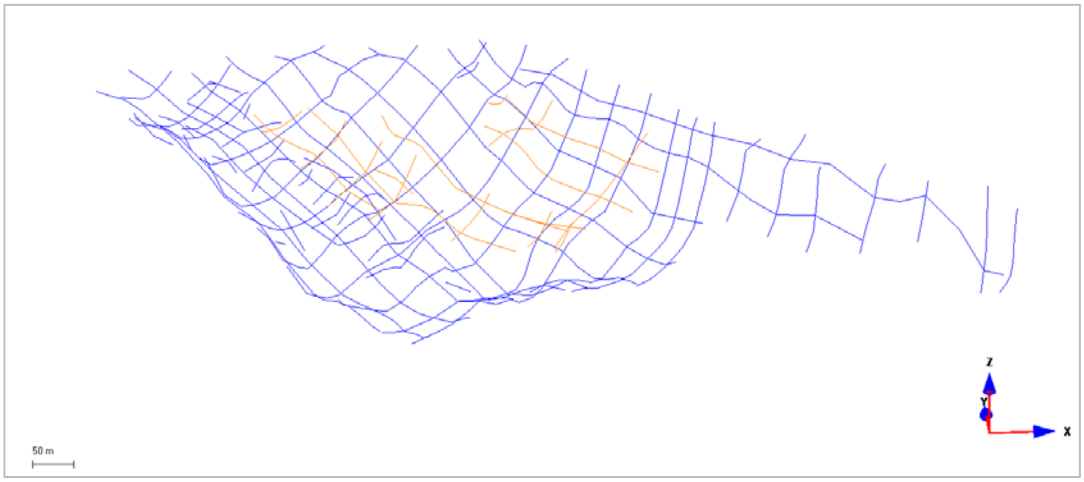
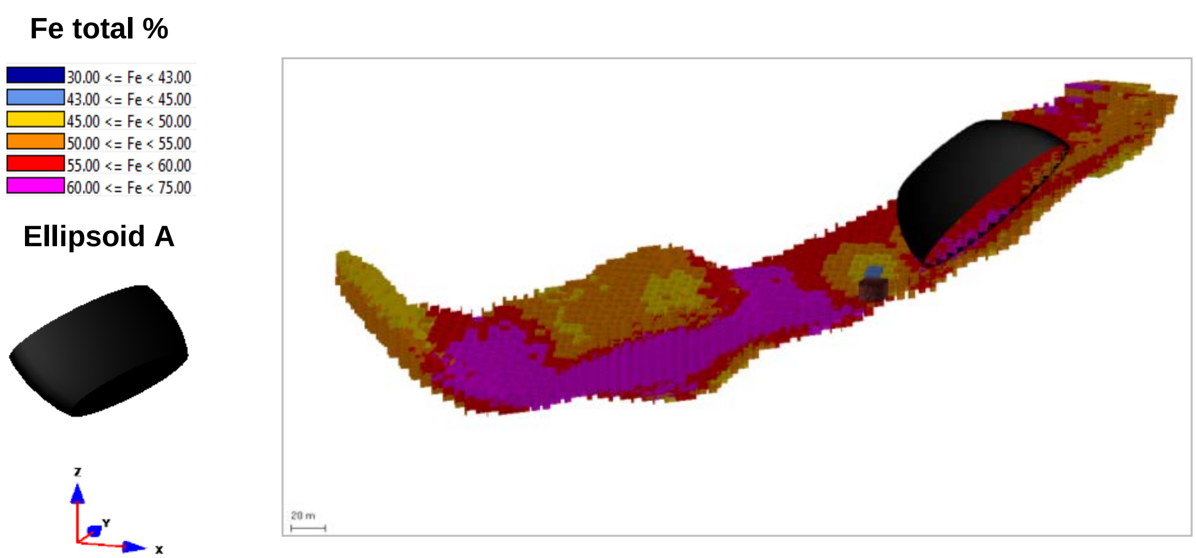
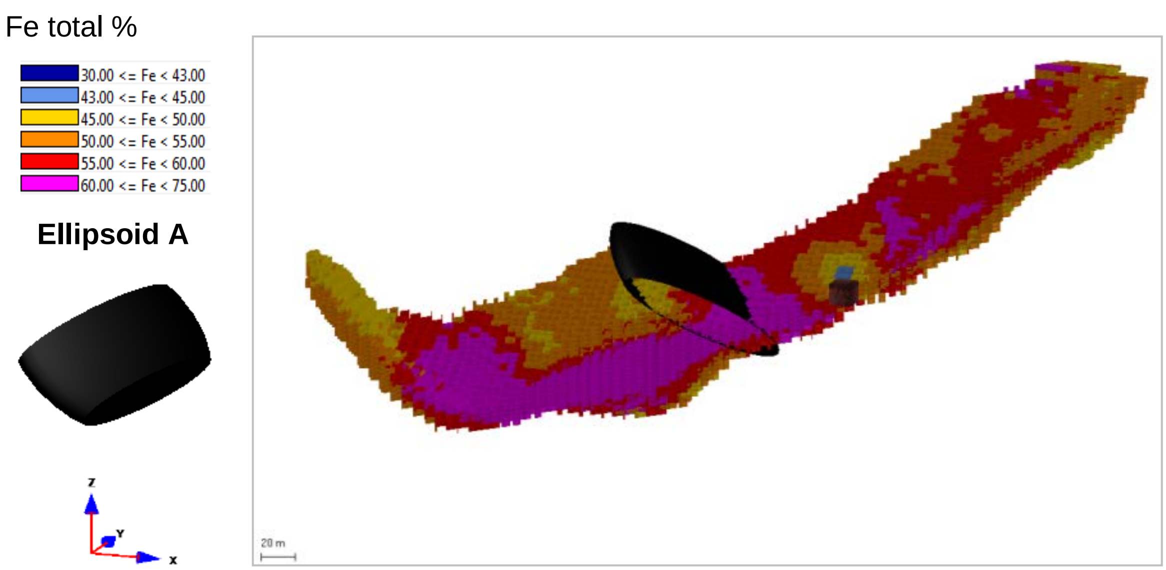


Figure 14-10: Geolines Grid for Variable Ellipsoids Looking North (~30 Degree Plunge)

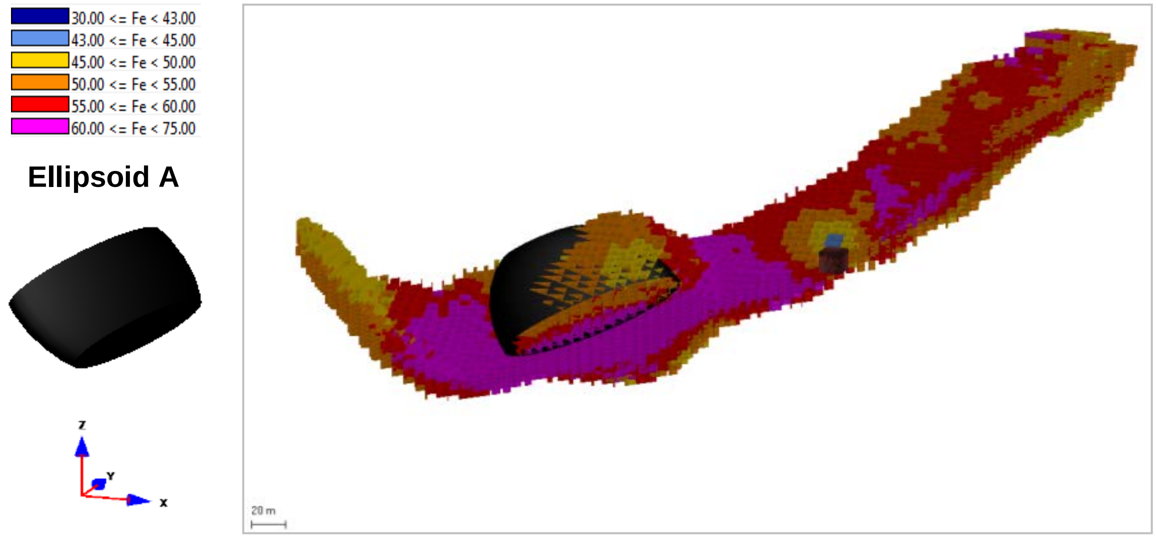
The following figures show the evolution of ellipsoid A along the section 1.5N.



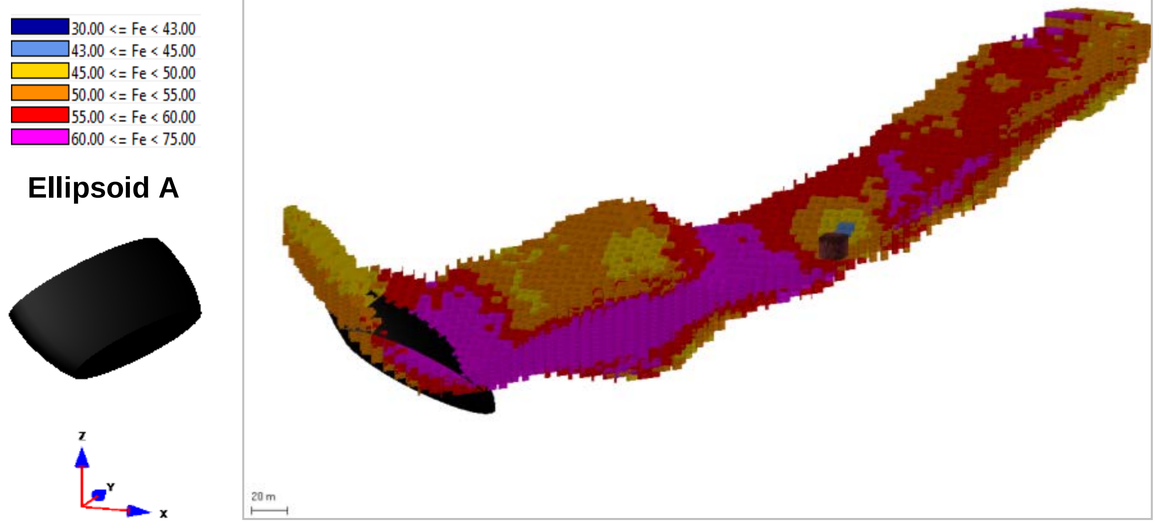

Fe total %
30.00 <= Fe < 43.00
43.00 <= Fe < 45.00
45.00 <= Fe < 50.00
50.00 <= Fe < 55.00
55.00 <= Fe < 60.00
60.00 <= Fe < 75.00
Ellipsoid A
Z
Y
X


Fe total %
30.00 <= Fe < 43.00
43.00 <= Fe < 45.00
45.00 <= Fe < 50.00
50.00 <= Fe < 55.00
55.00 <= Fe < 60.00
60.00 <= Fe < 75.00
Ellipsoid A
Z
Y
X
20 m

Fe total %



Fe total %



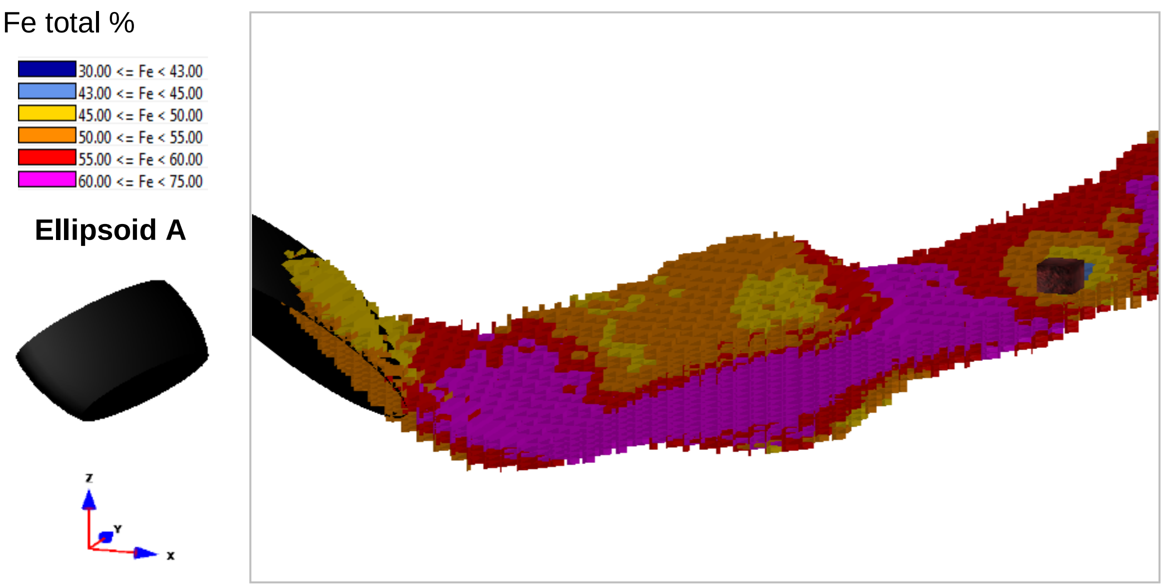


Figure 14-11: Evolution of Ellipsoid A along the Section 1.5N-Oblique View North is Y

14.3.6 Block Model Classification

Similar to estimation, the classification procedure was run in several passes with search conditions (size of search ellipsoid, minimum data in search ellipsoid) relaxed from one pass to the next until most blocks within the mineralized solid were interpolated. The orientation of variable ellipsoid is fixed by geolines. Moreover, the size of variable ellipsoids and the minimum/maximum numbers of data used in the ellipsoid are fixed to nine composites. In this case, three variable ellipsoids were used with fixed radii (Table 14-15). As a result, blank blocks were not estimated. The variable ellipsoid method establishes an orientation for each individual block according to the trend of the modeled geological interpretation. This method was chosen to accommodate the folded structure of the deposit. The following table summarizes the variable ellipsoid parameters used for classification.

Table 14-15: Classification Parameters

Ellipsoid	Shape	X	Min Composites	Max Composites	Limit/Sample/Hole
A Measured	Saucer	75/60/5	6	9	3
B Indicated	Saucer	150/120/10	6	9	3
C Inferred	Saucer	150/150/75	3	9	3

14.4 Mineral Resources Estimation Result and Conclusion

Mineral resource reporting was completed in GENESIS using the conceptual iron envelope. Mineral resources were estimated in conformity with generally accepted CIM Estimation of Mineral Resource and Mineral Reserve Best Practices Guidelines. The updated Mineral Resource Statement for the Joyce Lake iron DSO deposit is repeated here:

The mineral resource estimate, based on the drilling results from the 2011-2013 drilling program show 24.29 million tonnes of Measured and Indicated mineral resources at an average grade of 58.55% total Iron (TFe) plus an additional 0.84 million tonnes of Inferred mineral resources, at cut-off grade of 50% TFe. The results at a 55% cut-off grade are also shown in (Table 14-16). The resource estimate shown below is not constrained by the open pit that was designed in the 2013 PEA.

Table 14-16: Summary of Mineral Resource Estimate at Joyce Lake DSO Project March 2014

Joyce Lake (DSO) Resources					
55% Fe Cut-off	**Tonnes**	**% Fe**	**% SiO_2**	**% Al_2O_3**	**% Mn**
Measured (M)	12,880,000	61.45	9.02	0.54	0.86
Indicated (I)	3,600,000	61.54	9.38	0.49	0.64
M+I	16,480,000	61.47	9.10	0.53	0.81
Inferred	800,000	62.47	7.73	0.43	0.80
50% Fe Cut-off	**Tonnes**	**% Fe**	**% SiO_2**	**% Al_2O_3**	**% Mn**
Measured (M)	18,650,000	58.67	13.02	0.55	0.81
Indicated (I)	5,640,000	58.14	14.39	0.51	0.54
M+I	24,290,000	58.55	13.34	0.54	0.75
Inferred	840,000	62.00	8.43	0.43	0.78

Within mineralized envelope, % Fe Cut-Off on individual blocks
Variable Density (equation derived from core measurements), tonnes rounded to nearest 10,000.

In the opinion of the qualified person, the geological interpretation, sample location, assay intervals, drillhole spacing, QA/QC, specific gravity measurements on core and grade continuity of the Joyce Lake DSO deposit are adequate for this resource estimation and classification.

For comparison purposes with previous tabulations of 2013 without applying a cut-off grade, materials within the geologically determined mineralized envelope are:

(Envelope)	Tonnes	% Fe	% SiO_2	% Al_2O_3	% Mn
Measured	25,800,000	55.41	17.84	0.52	0.75
Indicated	8,520,000	54.41	19.97	0.48	0.44
M+I	34,320,000	55.16	18.37	0.51	0.67
Inferred	870,000	61.57	9.08	0.44	0.75

15 MINERAL RESERVE ESTIMATE

This section of the report presents the pit optimization and the detailed engineered pit design carried out to convert Mineral Resources to Mineral Reserves for the Joyce Lake deposit.

15.1 Resource Block Model

15.1.1 Resource Block Model and Model Surfaces

SGS Geostat (SGS) was engaged by LCIO for the preparation of the resource block model for the Project. The block size used in the model is X=5 m by Y=5 m by Z=3 m. The model was transferred to BBA as Comma Separated Value files (CSV) for input into the MineSight software suite.

SGS provided the following variables in the resource block model:

- Mineralized block centers in UTM coordinates (x, y, z);
- Density of blocks (mineralized blocks only);
- Percentage of block inside mineralized envelope;
- CLASSIFICATION is the resource category (1=Measured, 2=Indicated, 3=Inferred);
- Grades: %Fe, %SiO_2, %Al_2O_3, %Mn.

It should be noted that the SGS resource model, as provided to BBA, contained only mineralized blocks under the bedrock surface, thus all blocks that were not included in the resource block model were coded as being non-mineralized.

Following the transfer of the block model into MineSight, a verification of the global mineral resources by category was performed in order to ensure consistency with the results provided by SGS.

In addition to the block model file, three surface files were provided to BBA in the form of DXF files in the UTM coordinate system:

- Topography surface with Joyce Lake bathymetry;
- Topography surface with Joyce Lake surface; and
- Overburden surface (interface bedrock/overburden).

15.1.2 Model Density

The densities for mineralized blocks were provided by SGS in the resource block model. The density for material within the mineralized units changes as a function of variations in the model mineralogy. Section 14 of the report presents more detail on the estimation of block densities. The density values for mineralized material ranged from 2.85 t/m^3 to 3.79 t/m^3.

The average densities for waste and overburden blocks, are 2.85 t/m^3 and 2.1 t/m^3, respectively.

15.2 Pit Optimization

All work presented in this section is based on the Joyce Lake model files produced by SGS with the associated report date of March 3, 2014, and summarized in Chapter 14 of the present FS.

The optimization follows the geotechnical parameters presented in LVM's report concerning the open pit design (LVM 2014a), dated December 19, 2014. LVM's final pit slope recommendations are also summarized in this section.

15.2.1 Methodology

Pit optimizations were carried out using the MineSight Economic Planner Module and the Lerchs-Grossman 3D algorithm. The pit optimization algorithm is used to produce pit shells that are physical representations of the optimal pit to be mined, assuming a given set of parameters and 3D block model. Using a variety of input parameters such as mining costs, processing costs, transportation costs and pit slopes, the algorithm maximizes the undiscounted value of the pit shell. These shells are devoid of geotechnical and operational features such as ramps and proper benching arrangements, and are to be used as a basis and guide for the design of an engineered open pit. No capital expenses, such as those required for waste pile construction, are considered by the pit optimization tool.

In accordance with the guidelines of the National Instrument 43-101 on Standards of Disclosure for Mineral Projects, and the Canadian Institute of Mine, Metallurgy and Petroleum Definition Standards for Mineral Resources and Mineral Reserves, and the US Securities and Exchange Commission's Industry Guide 7 (SEC Guide 7), only those ore blocks classified in the Measured and Indicated categories are allowed to drive the pit optimizer for a feasibility study. No economic value is attributed to Inferred blocks and, as such, these blocks are treated as waste blocks by the pit optimization routine.

A series of pit optimizations are produced using a range of revenue factors (reduction factors on selling price) from 1% to 100% in order to produce the industry standard pit-by-pit graph. The revenue factor is used to measure the sensitivity of the pit optimizations to changes in mineral selling prices, as well as to evaluate the effect of the pit size and stripping ratios on the project NPV. It should be noted that pit shells created by using the revenue factor were performed for all economic blocks above a minimum Fe grade of 50%. The reason for using a minimum Fe grade is to ensure that the material in the pit shells can meet the product specification for grade. The optimization pit shells will produce a series of nested pit shells that will prioritize the mining of the most economic material and progressively increase in size, while less profitable material is mined as the revenue factor increases. The results of the pit optimizations are subsequently compared on the basis of the estimated NPV and calculated undiscounted value and tonnes of ore and waste material. From these results, a final pit optimization shell is selected that meets project requirements and maximizes project NPV. Examples of the important project requirements include the overall pit stripping ratio, pit depth, mine life and average grade.

15.2.2 Pit Optimization Parameters

The pit optimization parameters for the FS are selected on the best available information including results of the PEA and geotechnical parameters developed in the FS. All parameters, with the exception of the overall pit slope, remain unchanged compared to the results of the PEA. The overall pit slope has been changed to 47 degrees (PEA used an overall pit slope of 50 degrees). The cost parameters used for the pit optimizations can be found in the Operating Costs section of the PEA study, dated May 2013.

The major costs and other parameters used for the pit optimization runs are detailed in Table 15-1.

Table 15-1: Pit Optimization Cost and General Parameters

Parameters	Value
Ore Mining Cost	$4.34/t mined
Waste and Overburden Mining Cost	$3.22/t mined
Transportation, Port and Rail Cost	$26.60/t product
Processing Costs	$4.35/t product
General and Administration (G/A) Cost	$6.85/t product
Optimization Pit Slope	47 degrees
Processing Recovery	100%
Sales Price (FOB Sept-Îles)	$95.65/t product

The selling price of C$95.65/t FOB Sept-Îles used for the pit optimization work was based on preliminary FS prices for fines and lump products, including estimated penalties and premiums considering production of 35% lump and 65% fines.

15.2.3 Cut-Off Grade

For this project, in order to achieve a product grade of 62% Fe, the ore cut-off grade was determined based on technical considerations which are more restrictive than normal economic considerations for determining the cut-off grade. Metallurgical testwork and a processing trade off study examining two options for ore processing have indicated the following:

- Material having less than about 50% Fe grade is not easily (nor economically) concentrated using simple methods.
- For a DSO operation based on dry processing (simple crushing and screening) the targeted average Fe grade is 62%. At this grade, penalties relating to Fe and silica are minimal. To achieve the average grade of 62% Fe, the cut-off grade for the Joyce Lake deposit is 55%.
- Considering that there is a substantial amount of ore grading between 52% Fe and 55% Fe generated during the mining of >55%Fe ore, LCIO will stockpile this material and process it at the end of the mine life to generate additional revenues. This cut-off was selected while keeping average Fe at 53.3% for lump and fines projects considered to be saleable.

As such, the ore cut-off grade for producing an economic product for the feasibility study was determined to be 52% Fe.

15.2.4 Pit Optimization Results

As previously mentioned, a series of pit optimizations were run using revenue factors ranging from 1% to 100% of the base case selling price for the FS ($95.65/t product). These optimizations are then compared on an industry standard pit-by-pit graph that plots pit optimization resources and the estimated pit NPV (at a discount rate of 8%) on the same graph. The NPV is estimated assuming a constant stripping ratio and product for sale on an annual basis and does not account for capital expenditures. A cut-off grade of 55% Fe has been used to present the results. The pit-by-pit graph for the base case FS selling price pit optimizations can be found in Figure 15-1.

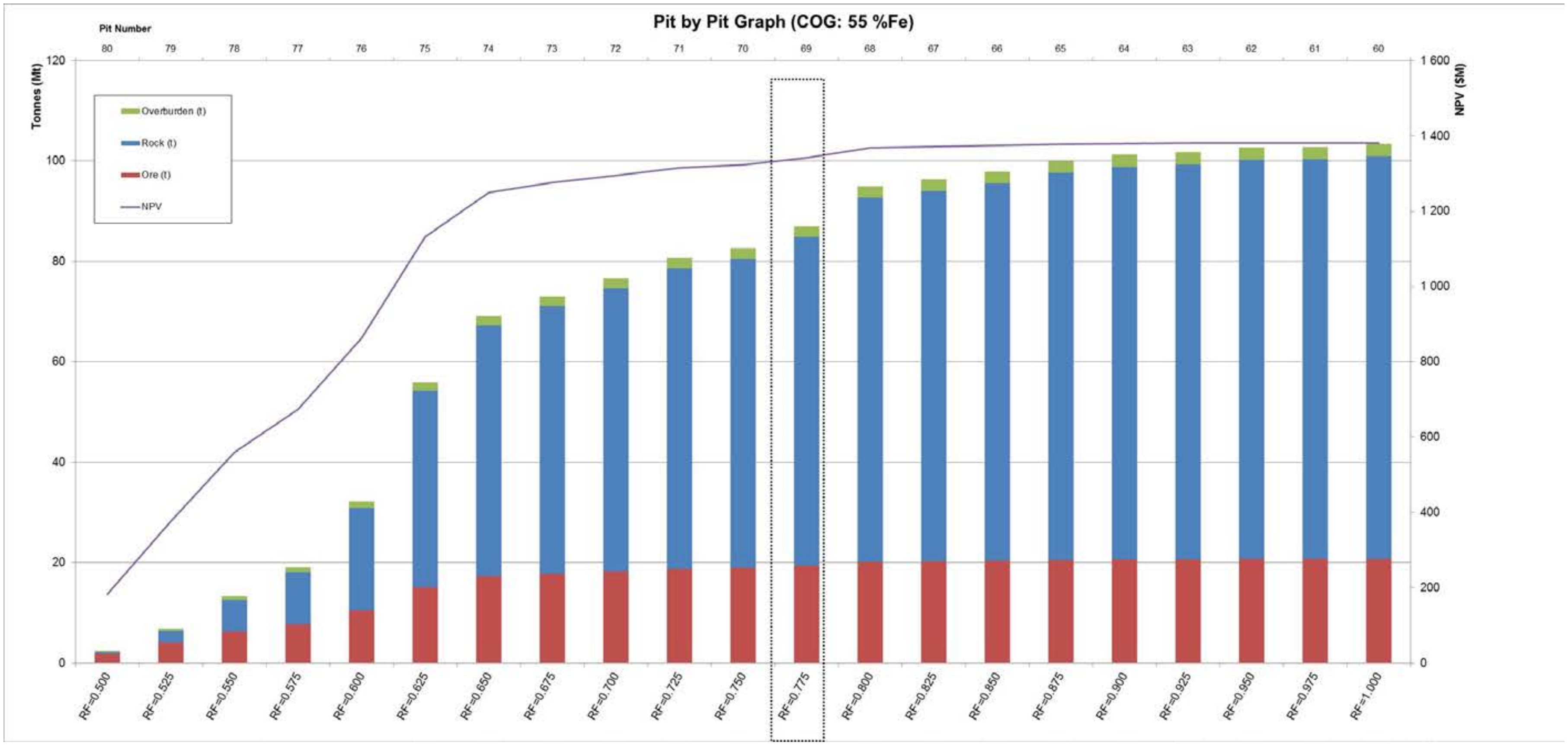


Figure 15-1: Base Case FS Selling Price Pit Optimization Pit-by-Pit Graph

15.2.5 Selected Pit Optimization Results

The selection of the pit shell for the FS was based on the following criteria:

- In-pit ore resources;
- Stripping ratio and incremental stripping ratio;
- Mine life;
- Estimated pit NPV and incremental NPV per tonne of ore.

Following a review of all pit shells produced, BBA has recommended that the optimization with a revenue factor of 0.775 be selected (PIT 69). The pit shell generated by applying a 0.775 factor (resulting in a selling price of C$74/t FOB Sept-Îles) represents the point of the NPV curve on the pit-by-pit graph, where the NPV of the subsequent pit does not increase significantly while providing sufficient in-pit resources to be converted into reserves for a seven-year mine life. In other words, the subsequent pits would require additional waste stripping only to obtain a very small increase in ore mined.

The mineral resources contained within the selected pit optimization are reported in Table 15-2.

Table 15-2: Selected Pit Shell (RF = 0.775, COG 52% Fe)

Mineral Category	Tonnage (000s t)	Grade (%Fe)	Grade (%SiO_2)	Grade (%Al_2O_3)	Grade (%Mn)
Measured	15,724	59.86	11.26	0.55	0.84
Indicated	3,673	59.91	11.73	0.52	0.61
Total	**19,396**	**59.87**	**11.35**	**0.55**	**0.80**
Inferred	262	60.75	10.01	0.48	0.86
Overburden	2,129	-	-	-	-
Rock	65,236	-	-	-	-
Total Waste	**67,627**	**-**	**-**	**Strip Ratio**	**3.49**

The selected pit optimization has a total in-pit resource of 19.40 Mt of ore at 59.87% Fe. The total waste in the pit, including overburden and Inferred material, is 67.63 Mt, resulting in a stripping ratio of 3.49. Figure 15-2 shows the selected pit shell in a 3-dimensional view with the Measured and Indicated ore blocks above 52% Fe.

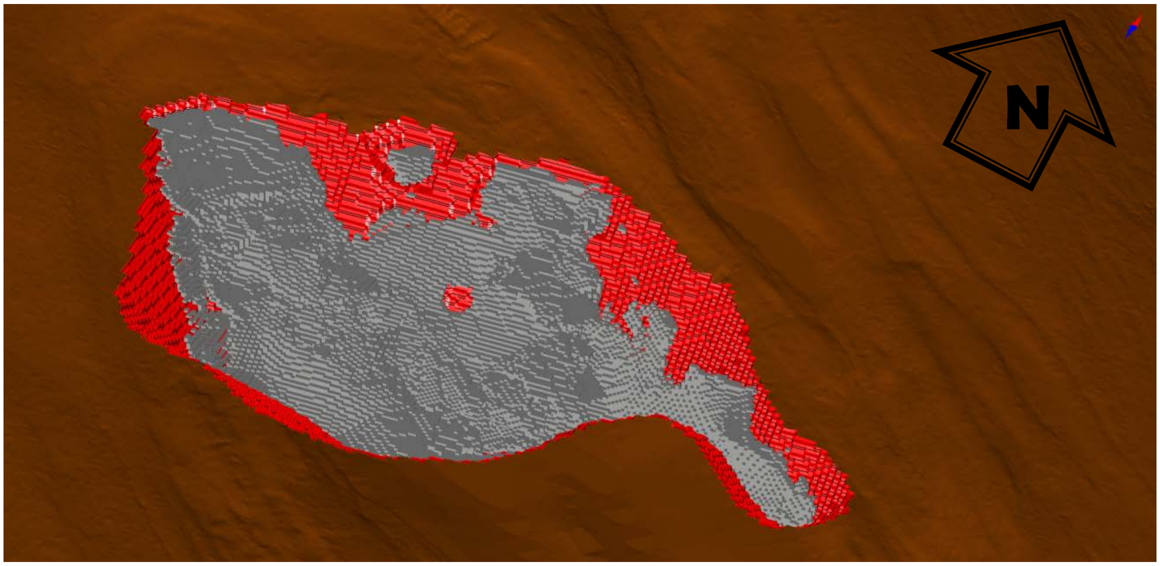


Figure 15-2: Selected Optimized Pit Shell - 3D Isometric View with Ore Blocks Above 52% Fe (grey)

15.3 Pit Design – Mineral Reserves

This reserve statement was prepared according to the guidelines set out under the requirements of the NI 43-101 and US SEC Industry Guide 7. The mineral reserves were reported within the ultimate engineered pit design produced for the FS, which includes all aspects of a functional pit (main haul roads, geotechnical berms, etc.). The engineered open pit was designed following the pit shell selected during the open pit optimization exercise.

15.3.1 Definitions

The following definitions were obtained from the CIM Definition standards on Mineral Resources and Mineral Reserves. A mineral resource is a concentration or occurrence of diamonds, natural solid inorganic material, or natural solid fossilized organic material, including base and precious metals, coal, and industrial minerals in or on the earth's crust in such form and quantity and of such a grade or quality that it has reasonable prospects for economic extraction. The location, quantity, grade, geological characteristics and continuity of a mineral resource are known, estimated or interpreted from specific geological evidence and knowledge. Mineral resources are subdivided, in order of increasing geological confidence, into Inferred, Indicated and Measured categories. Mineral resources that are not mineral reserves do not have demonstrated economic and technical viability.

A Proven mineral reserve is the economically mineable part of the Measured mineral resources demonstrated by at least a Preliminary Feasibility Study. A Probable mineral reserve is the economically mineable part of the Indicated mineral resources demonstrated by at least a Preliminary Feasibility Study. The reported mineral reserves are determined using appropriate information on mining, processing, metallurgy, economy, and other relevant factors to demonstrate that economic extraction is justified. A mineral reserve includes diluting materials and allowances for losses that can occur when the material is mined. Mineral reserves are sub-divided in order of increasing confidence into Probable mineral reserves and Proven mineral reserves.

It is important to note that US SEC Industry Guide 7 does not generally permit companies to disclose any estimates of mineral quantities, other than those that can be considered as Proven or Probable reserves, unless these estimates are otherwise required by foreign or state law. SEC does permit the reporting of so called mineralized material. Mineralized material is defined as a mineralized body that has been delineated by appropriate sampling to establish continuity and support an estimate of tonnage with an average grade of the selected metals, minerals or quality.

This section uses the terms Measured, Indicated and Inferred resources as defined by NI 43-101 guidelines in order to categorize mineralized material inside and/or outside the ultimate pit shell that cannot be classified as Proven or Probable.

15.3.2 Pit Design Parameters

The engineered mine design was carried out using the selected pit shell as a guide. This ultimate pit design includes all the practical geometry that will be required in an operational mine, including haul roads to access all the benches, pit slopes, bench configuration, smoothed pit walls and geotechnical berms. The major design parameters used are listed in Table 15-3.

Table 15-3: Detailed Open Pit Mine Design Parameters

Parameter	Value
Benching Arrangement	1 x 9 m
Berm Width	6.0 m
Inter-Ramp Angle (IRA)	47°
Bench Face Angle (BFA)	75°
Ramp Width (1-lane)	13 m
Ramp Width (2-lane)	21 m
Ramp Grade	10%

The open pit mine design was created following the geotechnical parameter presented in LVM's report concerning pit slopes. Figure 15-3 shows the benching arrangements proposed by LVM for the FS.

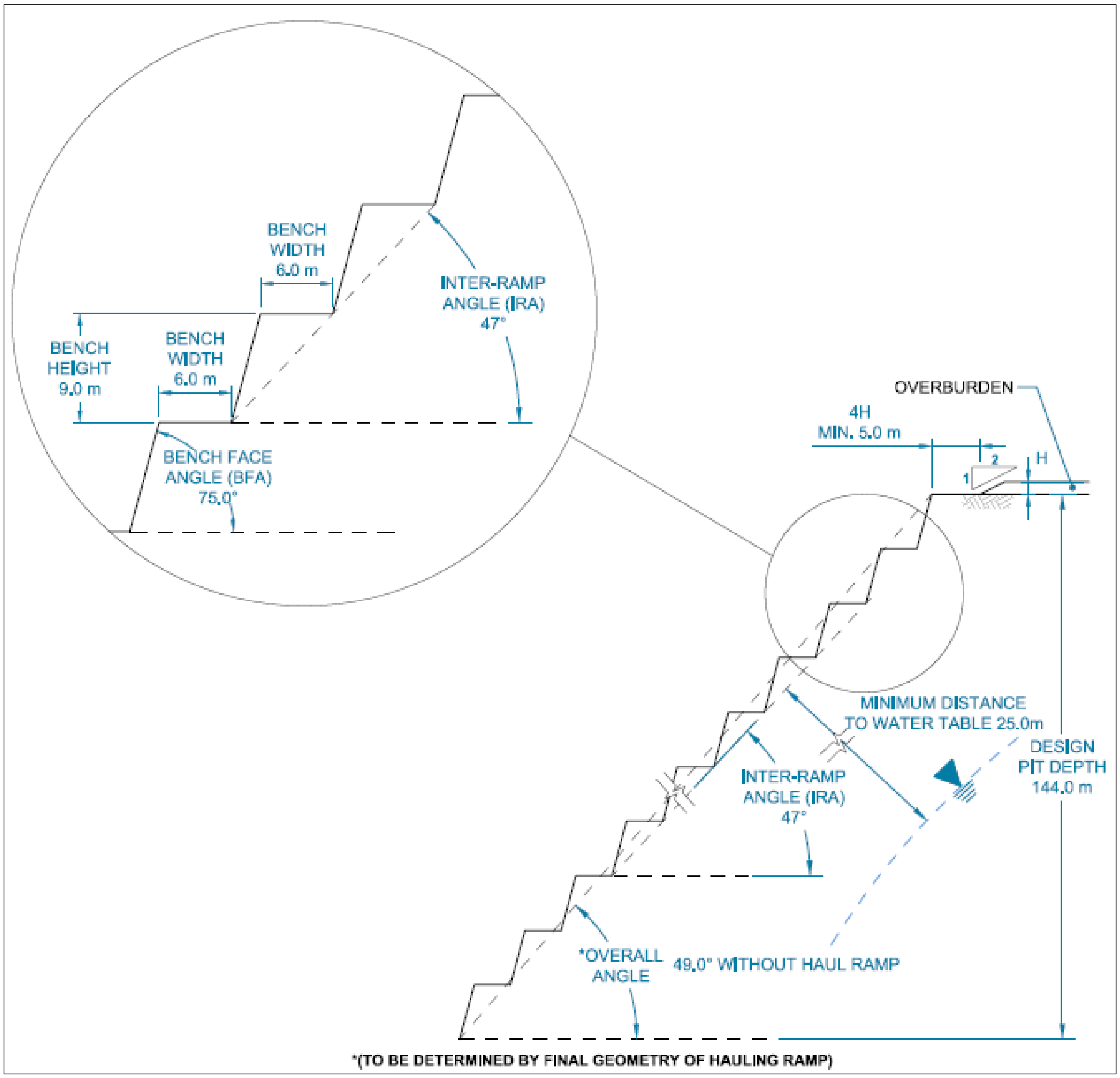


Figure 15-3: Pit Design Parameters (LVM)

The in-pit haulage roads used for the design were 21 m wide to accommodate 65 t class haul trucks. A single-lane ramp, 13 m wide, will be placed towards the bottom of the pit design in order to minimize the overall stripping ratio of the pit. A typical haul road cross-section is presented in Figure 15-4. Provisions for truck meeting points were made where the haul roads transition from double lane to single lane traffic. All in-pit ramps have been restricted to a 10% maximum gradient. Ramp exits were positioned so as to minimize haulage distances to the various waste dumps and the crusher. It should be noted that a trade-off study comparing 65 t and 96 t haul trucks was conducted and the latter was selected for costing purposes, however no adjustment to the initial design using 65 t trucks was made. The results of this trade-off study and the impact to the mine design are discussed further in Chapter 16.

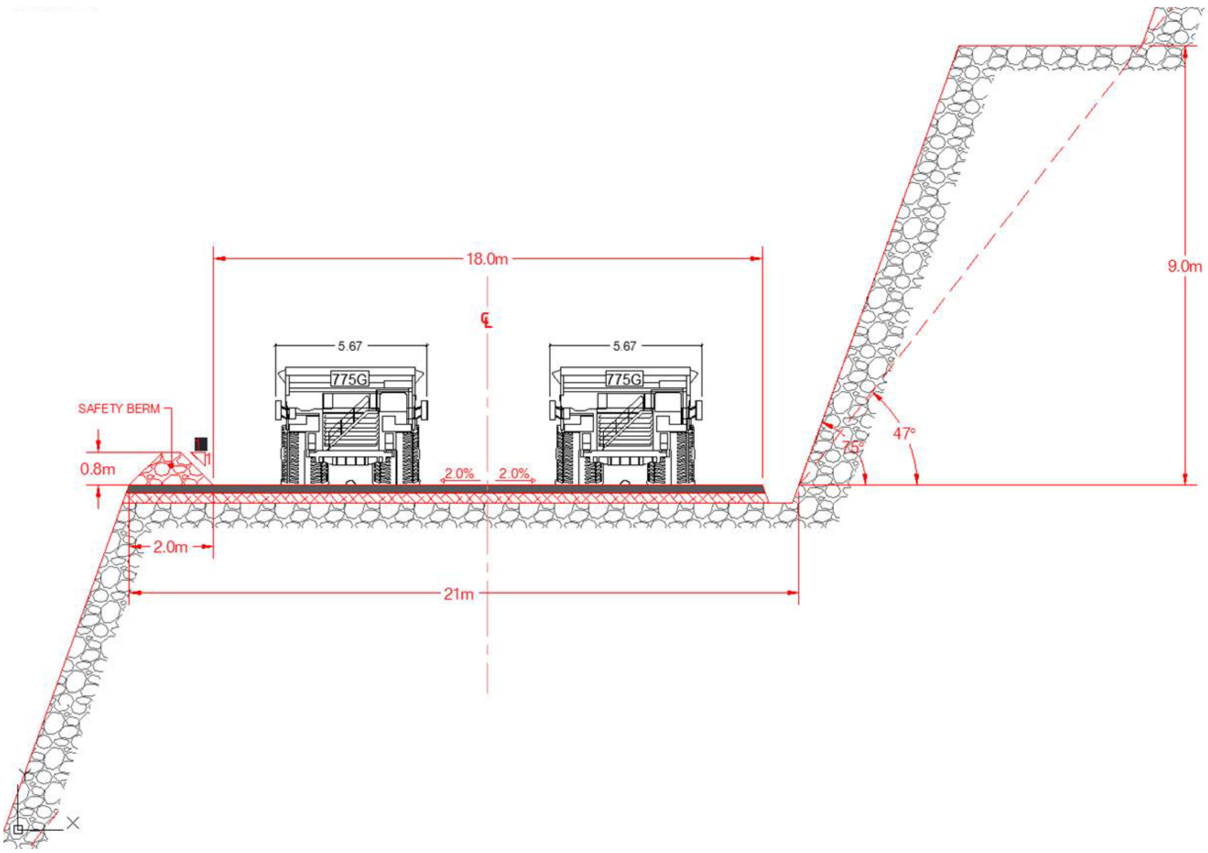


Figure 15-4: Typical Haul-Road Cross-Section

15.3.3 Dilution and Mining Ore Loss Estimation

Dilution and ore loss factors were estimated by simulating actual mining methodology and equipment limitations, such as bucket size. The BBA mining polygon method for dilution estimation simulates actual mining conditions by digitizing a series of mining polygons around the ore blocks that would be delivered to the crusher as crusher feed. This method follows a set of guidelines to ensure that the dilution and ore loss estimate work is consistent and systematic throughout the selected benches. The following describes the guidelines used to estimate the expected dilution and ore loss:

- Mining dilution simulations included only admissible Measured and Indicated ore classes;
- When mining widths were less than 6 m (1 block row), the mining polygons were moved 0.50 m outside the ore/waste contact (external dilution);
- When mining widths were greater than 6 m, the mining polygons were drawn approximately on the ore/waste contact and adjusted to take into account variations in ore body width and realistic mining recovery;
- Internal waste blocks less than 2 m x 2 m blocks in size are assumed to be inseparable and are included within the mining polygons (internal dilution);
- Minimum blocks to be mined in a single cut were two blocks in length;
- Mining cuts were taken within the pit optimization shell;
- Cut-off grade used was 55% Fe.

In order to obtain a fair representation of the dilution and ore loss, the mining dilution estimations were performed on 5 benches. The following are the selected benches:

- Bench 336.50 m
- Bench 372.50 m
- Bench 408.50 m
- Bench 444.50 m
- Bench 480.50 m

The mining dilution and ore loss estimations will be based on the assumption that the mining will be completed in ideal conditions, where ore loss and mining dilution will be kept to a minimum. It is anticipated that the mining operation will employ control blasting techniques and select the mining equipment in order to minimize dilution.

The ore loss used in the reserve calculation is 4% and the mining dilution is 1% at a diluting grade of 35% Fe and 46.96% SiO_2.

15.3.4 Open Pit Mineral Reserves

The designed pit is approximately 1,100 m in length by 575 m wide and 200 m deep. The lowest bench is at an elevation of 321.5 m above sea level. Figure 15-5 presents a detailed plan view of the proposed open pit mine (final pit).

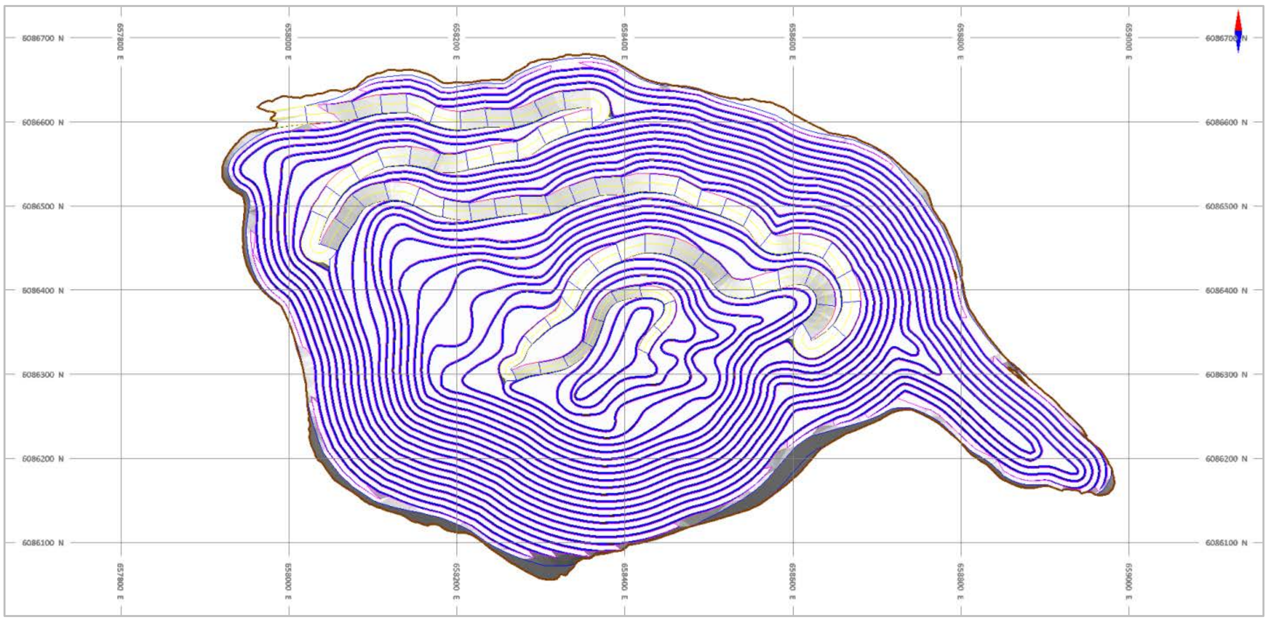


Figure 15-5: Engineered Pit Design – Plan View

The Joyce Lake open pit mine contains 17.72 Mt of iron ore reserves in the Proven and Probable categories at an average grade of 59.71% Fe, 11.62% SiO_2, 0.55% Al_2O_3 and 0.76% Mn. Total waste material amounts to 70.08 Mt of waste rock (including 2.69 Mt of low grade material that will not be processed) and 2.33 Mt of overburden resulting in an overall open pit strip ratio of 4.09 (tonnes of waste rock and overburden per tonne of ore). Table 15-4 presents the final open pit Mineral Reserves for the Joyce Lake DSO pit.

Table 15-4: Joyce Lake Mineral Reserves at 52% Fe Cut-Off Grade

Mineral Reserves Mineral Category	Tonnage (t)	Grade (%Fe)	Grade (%SiO_2)	Grade (%Al_2O_3)	Grade (%Mn)
High Grade Proven (Above 55% Fe)	11.63 M	61.35	9.16	0.54	0.84
Low Grade Proven (52% - 55% Fe)	2.89 M	53.31	20.70	0.60	0.70
Total Proven (Above 52% Fe)	**14.52 M**	**59.75**	**11.45**	**0.55**	**0.81**
High Grade Probable (Above 55% Fe)	2.45 M	61.50	9.48	0.50	0.61
Low Grade Probable (52% - 55% Fe)	0.75 M	53.09	21.90	0.58	0.30
Total Probable (Above 52% Fe)	**3.20 M**	**59.52**	**12.40**	**0.52**	**0.54**
Total Reserve (Above 52% Fe)	**17.72 M**	**59.71**	**11.62**	**0.55**	**0.76**
Waste Measured (50% - 52% Fe)	1.91 M	50.85	24.49	0.56	0.59
Waste Indicated (50% - 52% Fe)	0.78 M	50.81	25.44	0.56	0.19
Total Segregated Waste (50% - 52% Fe)	**2.69 M**	**50.84**	**24.76**	**0.56**	**0.48**
Overburden	2.33 M	-	-	-	-
Waste Rock (<50% Fe)	67.39 M	-	-	-	-
Total Waste	**72.42 M**				
Total Material	**90.14 M**			**Strip Ratio**	**4.09**

1. The Low Grade Measured and Indicated Resources are all blocks inside the engineered pit design in the Measured and Indicated categories that fall between 50% and 52% Fe. The Low Grade Measured and Indicated Resources are reported for information only and are considered as waste.
2. Proven Reserves are all blocks inside the engineered pit design in the Measured category.
3. Probable Reserves are all blocks inside the engineered pit design in the Indicated category.
4. Open pit Mineral Reserves have been estimated using a cut-off grade of 52% Fe and a process recovery of 100%.
5. Open pit Mineral Reserves have been estimated using a dilution of 1% at 35%Fe and 46.96% SiO_2 and an ore loss of 4%.

The sketches from Figure 15-6 to Figure 15-13 present typical bench plans and cross-sections of the detailed pit versus the selected optimized pit (PIT 69) and two pit optimizations generated with a lower revenue factor. These optimizations will serve as a guide for the mining phase design presented in Chapter 16.

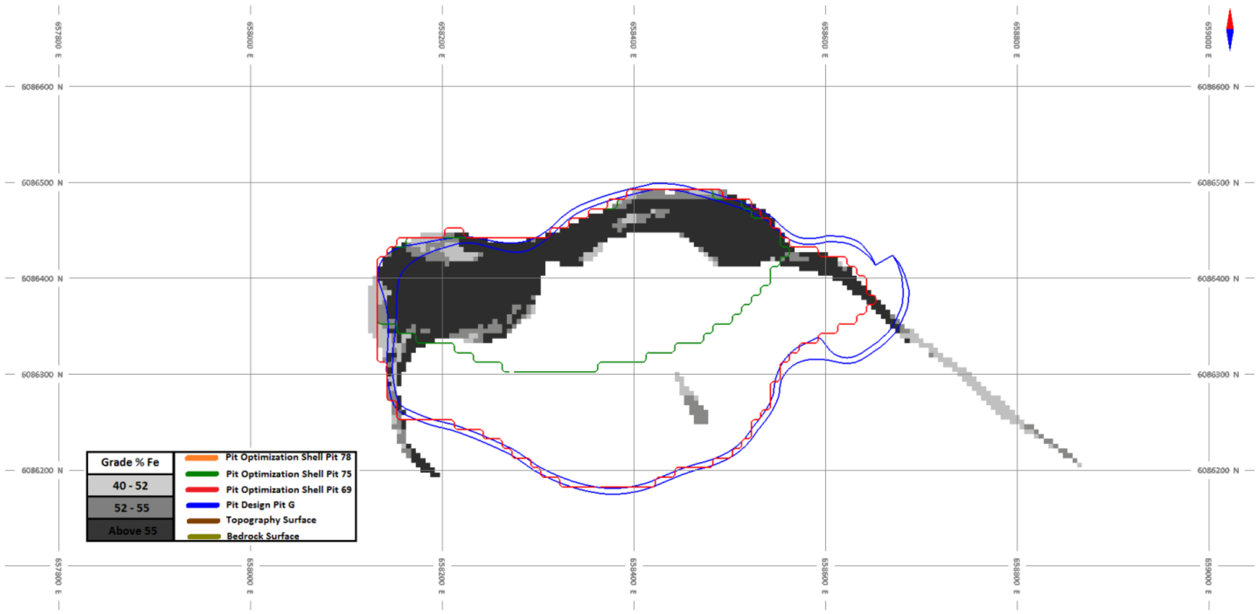


Figure 15-6: Pit Optimizations and Design at Elevation Plan View 402.50 EL

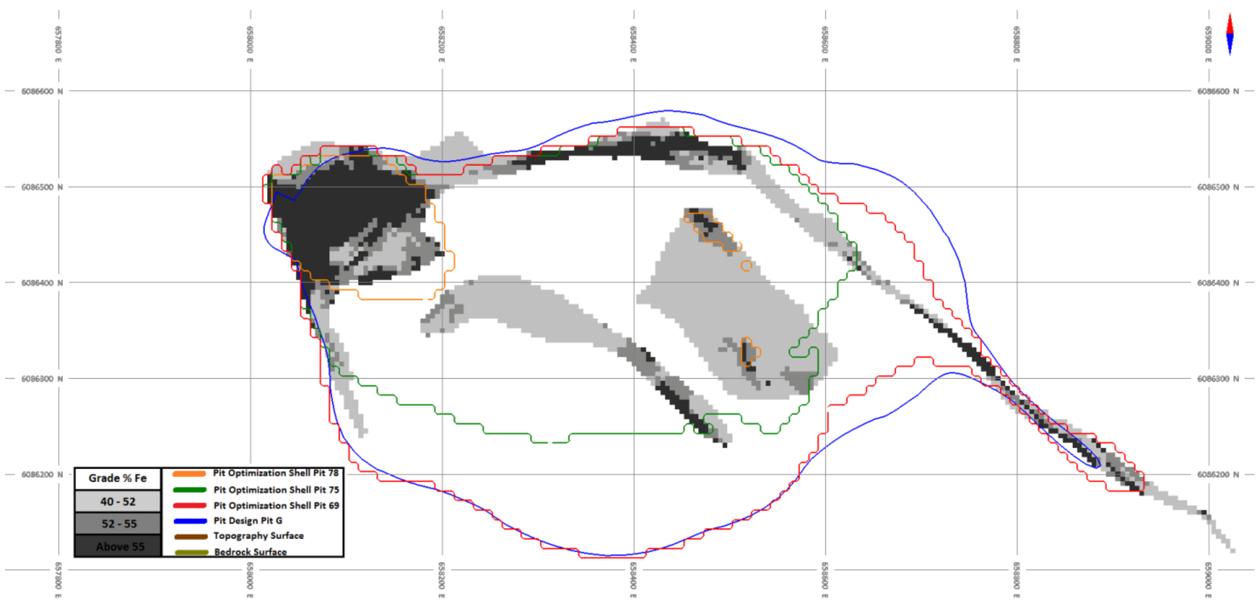


Figure 15-7: Pit Optimizations and Design at Elevation Plan View 468.50 EL

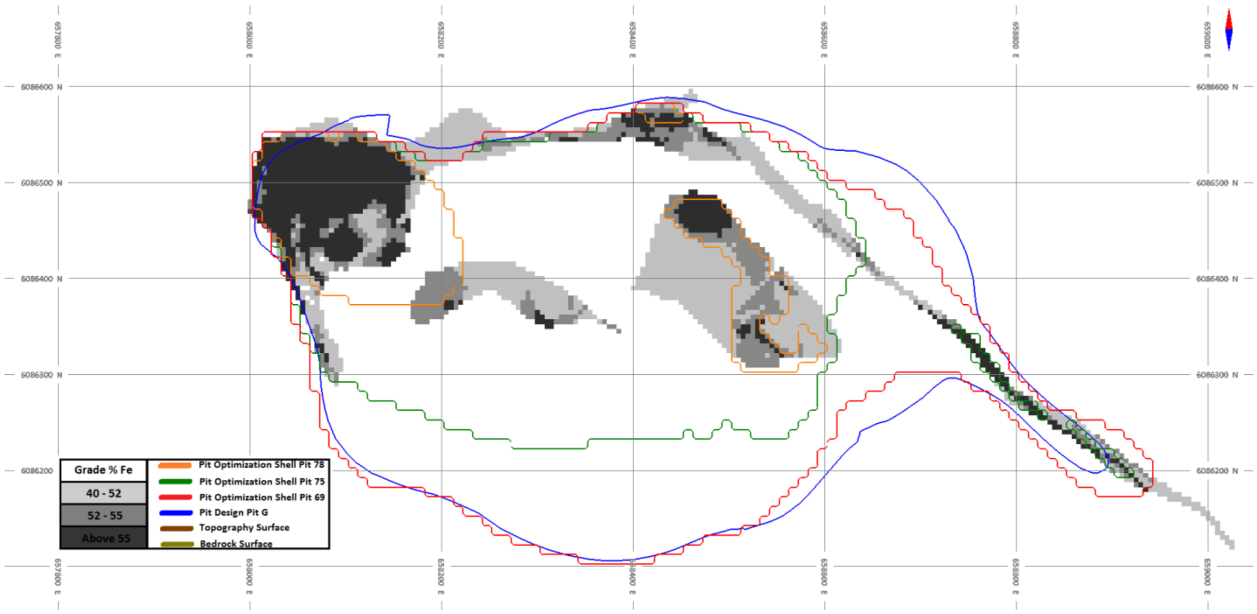


Figure 15-8: Pit Optimizations and Design at Elevation Plan View 480.50 EL

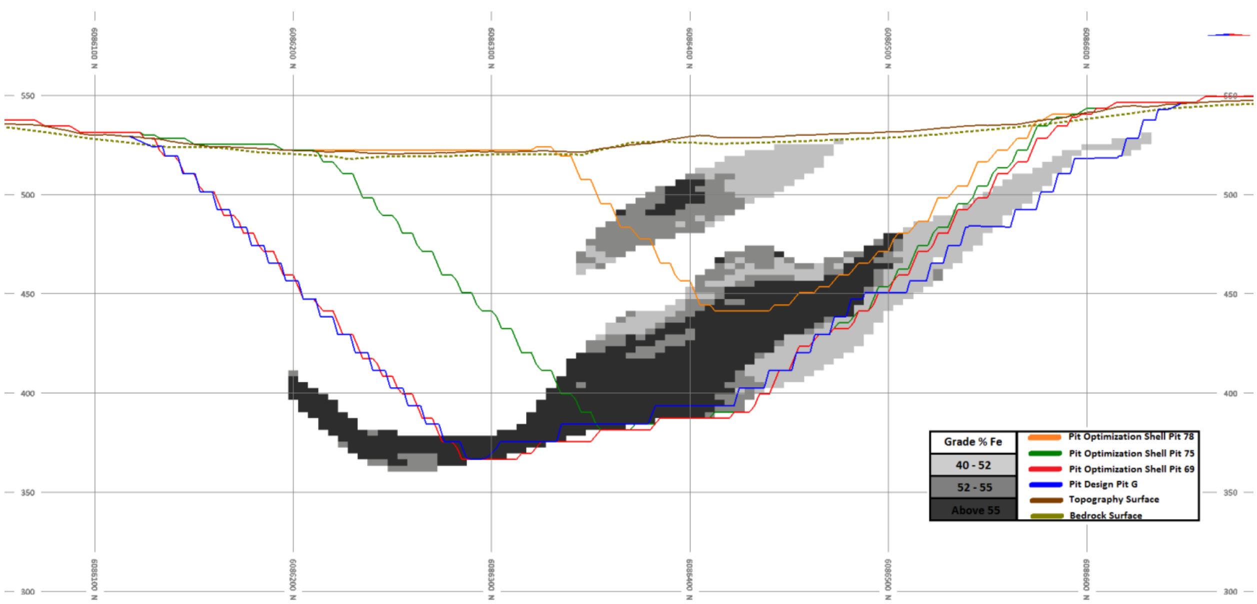


Figure 15-9: Pit Optimizations and Design at Section View 658183 East

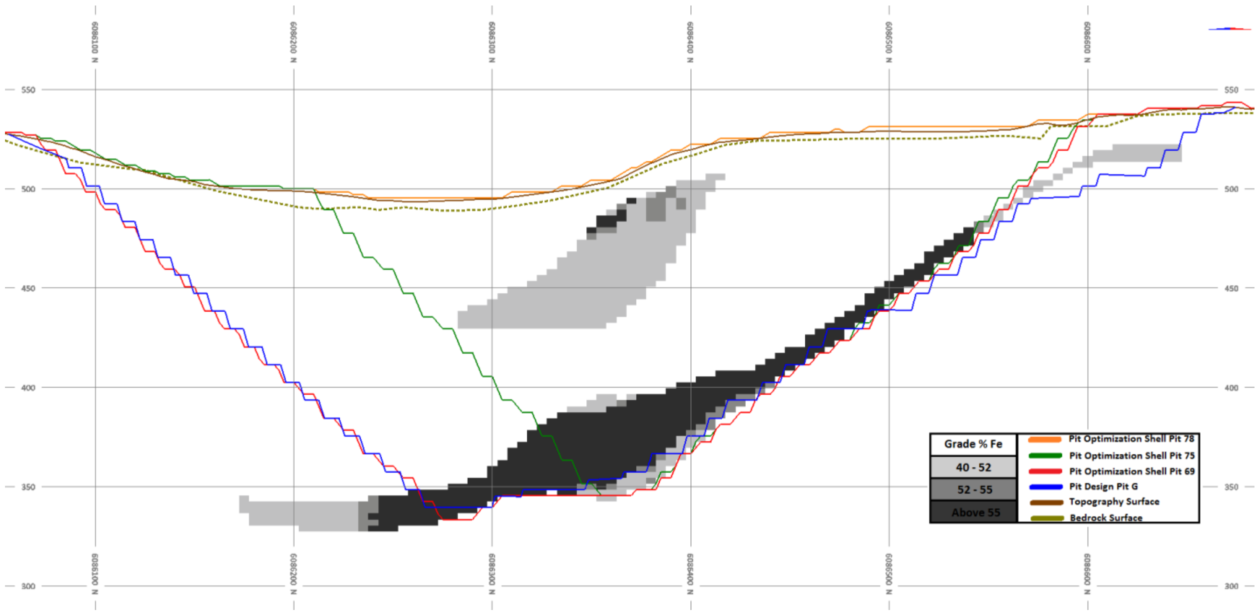


Figure 15-10: Pit Optimizations and Design at Section View 658303 East

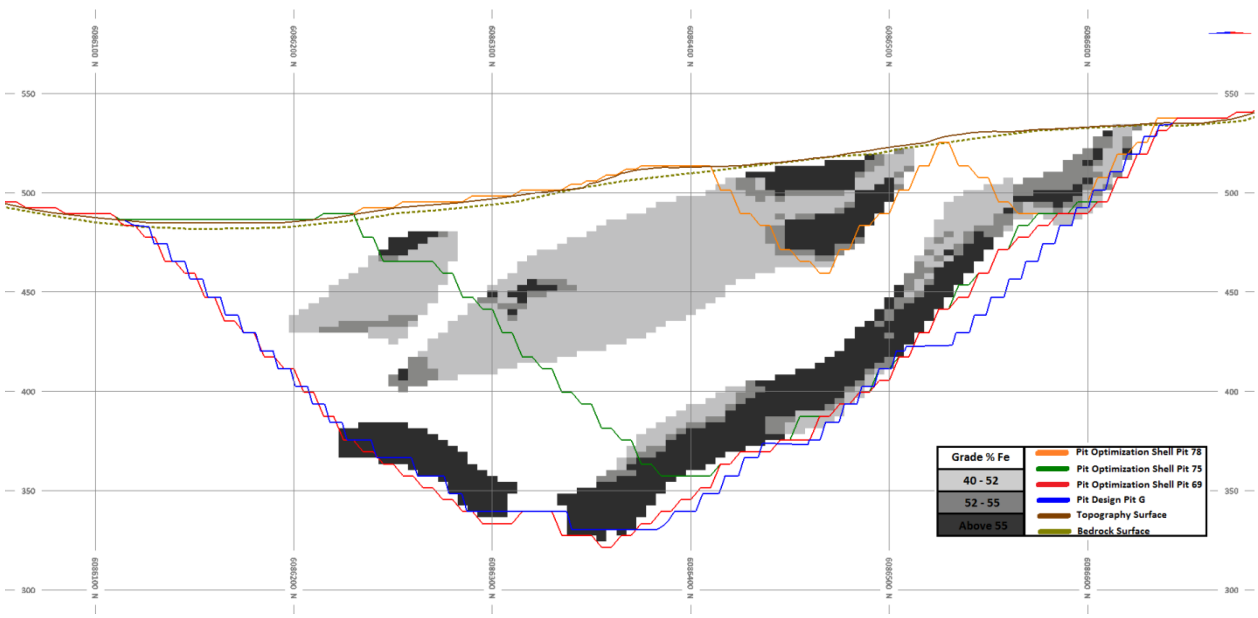


Figure 15-11: Pit Optimizations and Design at Section View 658468 East

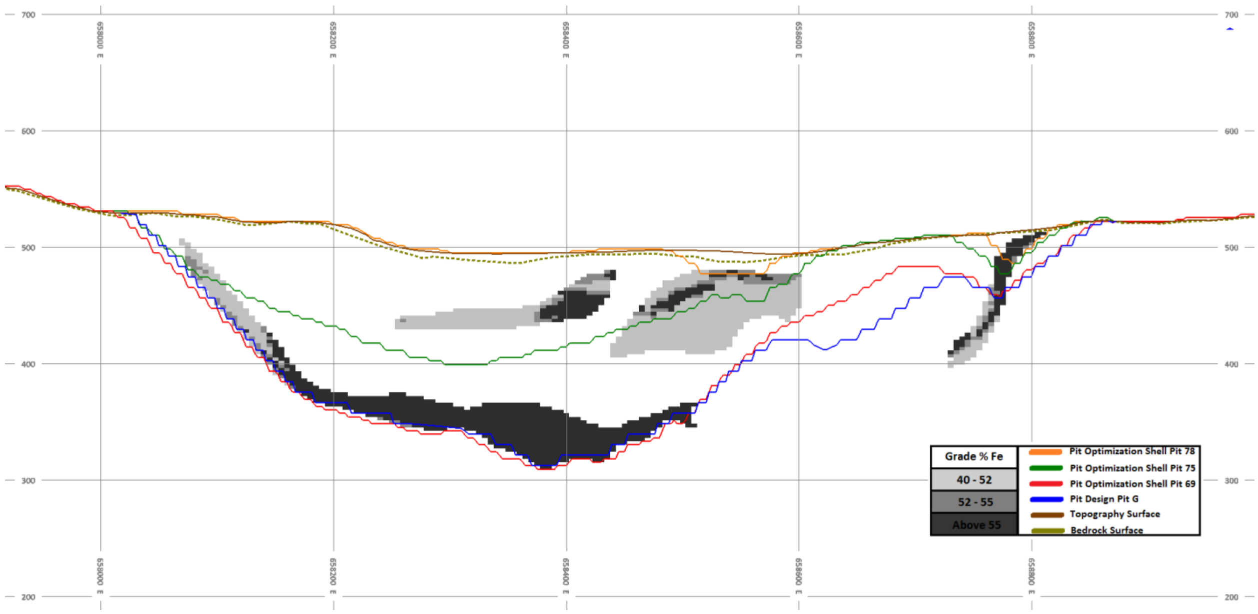


Figure 15-12: Pit Optimizations and Design at Long Section View 6086300 North

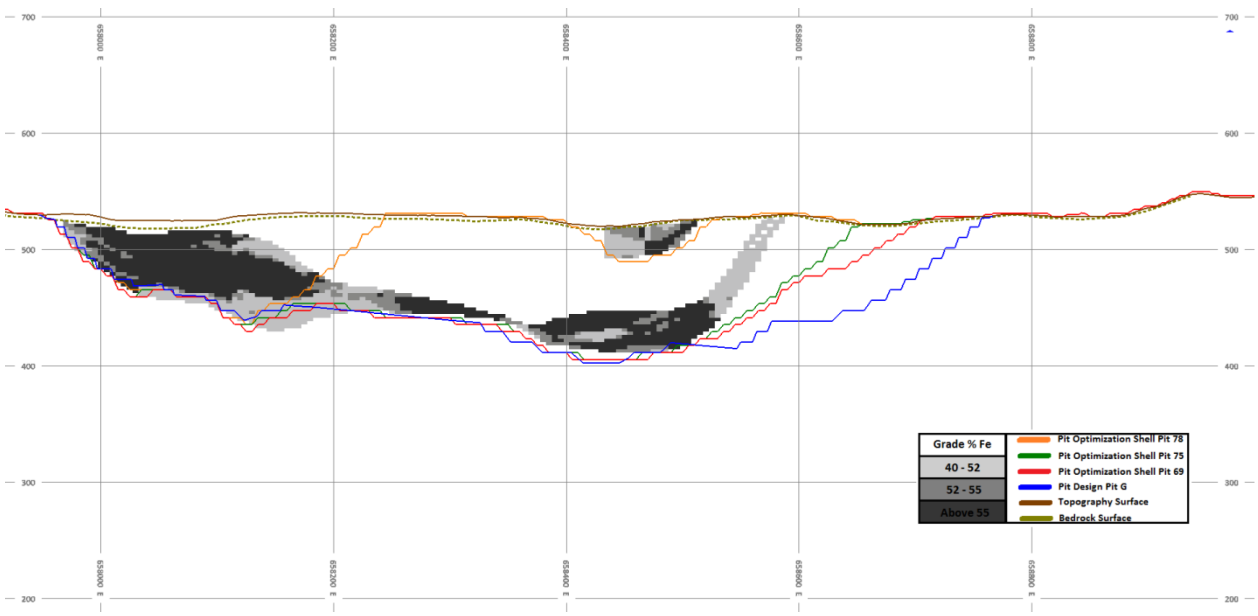


Figure 15-13: Pit Optimizations and Design at Long Section View 6086500 North

16 MINING METHODS

16.1 Introduction

Mining of the Joyce Lake deposit will generally follow the standard practice of a conventional open pit operation, with drill and blast, load and haul cycle using a drill/shovel/truck mining fleet. The overburden and waste rock material will be delivered to the overburden and waste disposal areas near the pit. The run-of-mine ore will be delivered to the ore stockpile or low grade stockpile.

Utilization of LCIO's mining equipment and personnel is envisaged for the development of the open pit, as well as for the removal of overburden. A contractor operated mine versus owner operated mine scenario has also been developed and the results are presented in Chapter 21.

16.2 Mine Plan

16.2.1 Mine Production Schedule and Methodology

The overall objective of the mine scheduling and planning process is to maximize Project NPV while achieving the processing plant objectives and targets. Generally, this is done by delaying the overburden and waste rock removal activities, e.g. costs for as long as possible. This objective is taken into consideration during all phases of the mine design and mine planning.

The mine planning process involves the creation of a series of nested pit optimization shells within the selected final optimized pit to be used to create pit phases. From these pit shells, a starter pit phase and one transition pit phase are designed and used as guides during the detailed planning process to indicate the direction of mining. Detailed mine planning was undertaken using MineSight's Interactive Planner Module. Figure 16-1 shows a 3D view of the various pit phase designs that were used to undertake the detailed mine planning process.

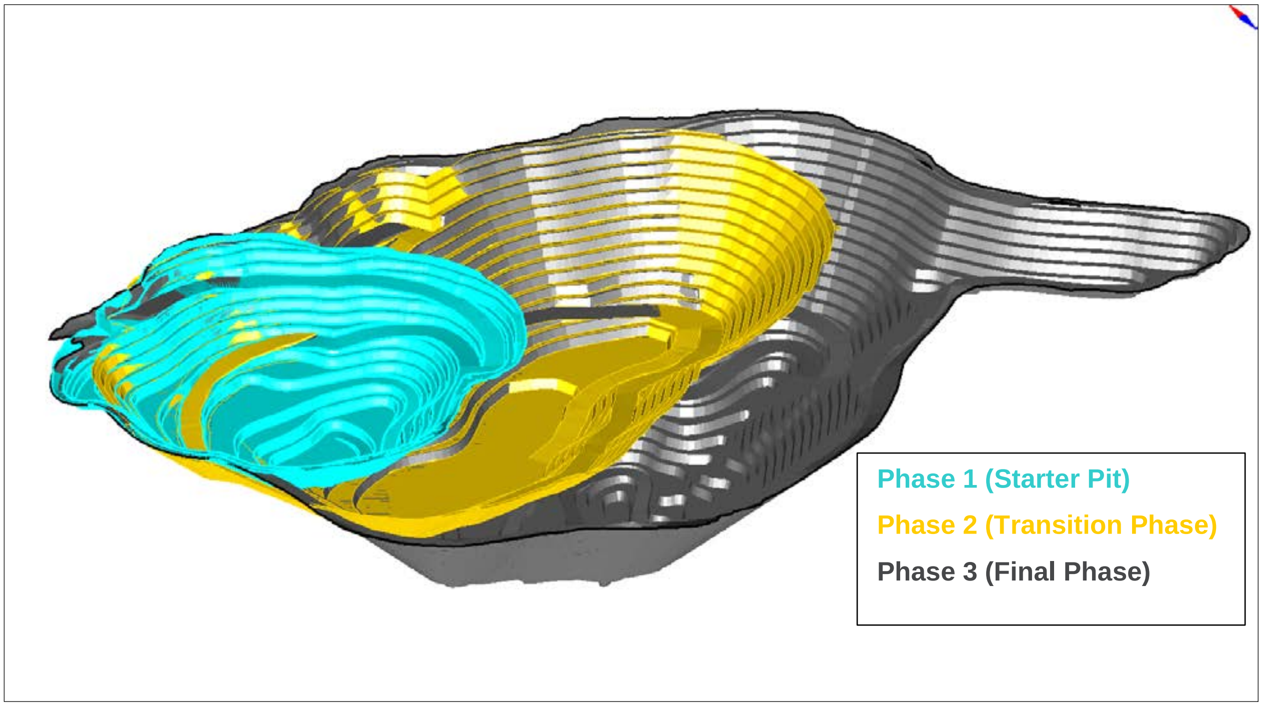


Figure 16-1: Mining Phase Design

The starter pit was designed to avoid excavation close to Joyce Lake during the pre-production and construction phases.

16.2.2 Scheduling Objectives and Blending

A mine production schedule was developed based on a fixed production target of 2.5 M dry tonnes per year of iron ore lump and fines products at an average grade of 60 to 62% Fe. The engineered pit phases were initially scheduled using MineSight Strategic Planner to provide a first pass mine plan and further refined using MineSight Interactive Planner. The mine plan has been developed in order to meet plant feed requirements according to general best open pit mine practices such as equipment fleet smoothing and maximizing NPV.

16.2.3 Pre-production and Construction

Using the primary fleet, the pre-stripping of the Joyce Lake pit will occur between July in Year 0 and March in Year 1 for a period of 9 months as follows:

- From July to November in Year 0 (5 months), a total of 4.5 Mt of overburden and waste rock is excavated and used for site construction purposes.

- From December in Year 0 to March in Year 1 (4 months), an additional pre-stripping of 4.5 Mt of waste rock is removed in order to provide access to sufficient ore material for the beginning of the production stage.

Due to Joyce Lake dewatering constraints, the pre-production phase is mainly carried out in the starter pit area. A buffer zone of 20 m has been left between the limits of the starter pit and Joyce Lake. In addition to the buffer zone, the excavation does not reach the Joyce Lake initial water elevation before the end of the pre-production phase. At this time, Joyce Lake is partialy dewatered and the water elevation is below the deepest pit bench. Figure 16-2 shows a plan view of the starter pit and final pit limits along with the Joyce Lake solid.

The pit perimeter dewatering wells, located on the boundary of the pit are to be developed during the pre-production phase, as explained in Chapter 18.

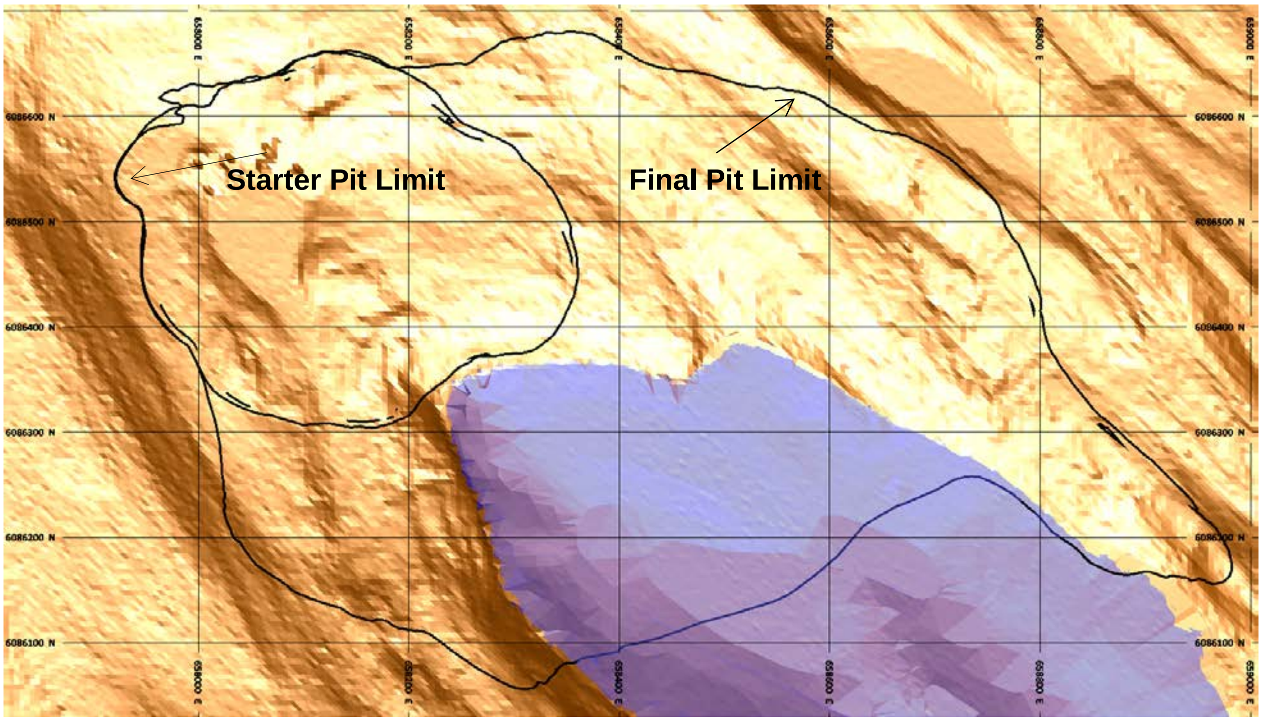


Figure 16-2: Joyce Lake vs. Pit Location

With the exception of a relatively small zone located under the deepest part of Joyce lake, the overburden thickness within the final pit limit varies from 0 m to 6 m, with an average of 2 m. Figure 16-3 presents the overburden thickness within the starter and final pit boundaries.

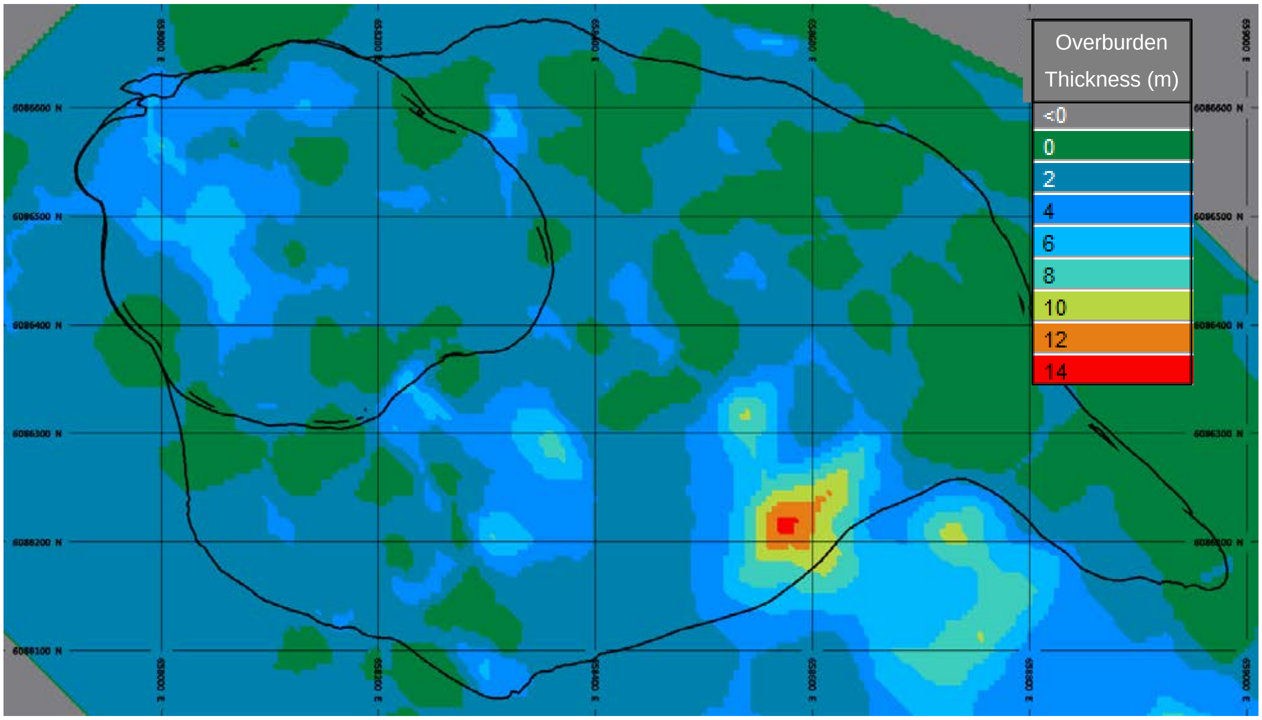


Figure 16-3: Mapping of Overburden Thickness

16.2.4 Production

Ore production will begin in April of Year 1 following the completion of the pre-stripping period. Ore will be supplied to the crushing plant at a rate of 2.5 Mt (dry basis) per annum. Mining will first occur in a small starter pit located at the North-West end of the deposit. After the end of Year 1 (December), mining will begin to infringe on Joyce Lake.

During production, the ore material above 55% Fe will be delivered to the high grade (HG) ore stockpiles near the crushing plant. The ore material between 52% Fe and 55% Fe will be delivered to the low grade (LG) ore stockpile and re-handled and processed at the end of the mine life.

As explained in Chapter 17, the current mine plan assumes that all ore material (HG and LG) will be re-handled from blending stockpiles, located adjacent to the crusher, by two 6.4 m^3 front-end loaders to maintain a consistent feed grade.

Open pit production is expected to occur over a total of six years with an additional 1.2 years of processing at the end of the mine life obtained from stockpiled low grade material.

The total combined ROM ore and waste quantity is approximately 15 Mt in Year 1, and ramps up to a maximum annual production rate of approximately 19.5 Mt in Year 3. Mine production slowly decreases until the pit is depleted at the beginning of Year 6.

The open pit production schedule has been developed on a 4-month basis for the life-of-mine. A summary of open pit material movement over the life of the mine is presented in Table 16-1, Figure 16-4 and Figure 16-5. The end-of-period maps for the open pit over the LOM are shown from Figure 16-6 to Figure 16-11.

16.2.5 Post-Mine Operation (Ore Stockpile Reclaim)

The mine will be depleted in March of Year 6. After the mine ceases operation, the high grade ore material mined and stockpiled during the previous winter will be processed, for a total amount of 1.9 Mt. A portion of this material will have to be temporarily stockpiled onto the low grade ore stockpile if the high grade ore stockpile capacity is exceeded.

During the mine operation, a total of 3.6 Mt of low grade ore (ore material between 52% Fe and 55% Fe) will be stockpiled onto the low grade ore stockpile area, located South-West of the pit. This material will be re-handled and processed after the high grade ore stockpile is depleted.

Table 16-1: Joyce Lake Mine Plan Summary

Year	4-months Period	HG Ore Stockpile to Plant				LG Ore Stockpile to Plant				Mine to HG Ore Stockpile				Mine to LG Ore Stockpile (52%-55%)				Waste Rock	Ovb	Total Moved		Strip Ratio	
		(kt)	(%Fe)	(%SiO_2)	(%Mn)	(kt)	(%Fe)	(%SiO_2)	(%Mn)	(kt)	(%Fe)	(%SiO_2)	(%Mn)	(kt)	(%Fe)	(%SiO_2)	(%Mn)	(kt)	(kt)	(kt)	(kt/d)	(t/t)	(t/t)
0	July-Nov. (5 mths)	-	-	-	-	-	-	-	-	92	59.7	9.4	1.3	62	52.9	19.5	1.4	3,496	801	4,451	29	-	-
1	Dec.-Mar	0	-	-	-	-	-	-	-	50	57.6	14.0	0.7	75	53.3	20.8	0.4	4,474	0	4,599	38	-	
	Apr-July	1,121	60.9	8.4	1.2	-	-	-	-	1,050	61.0	8.2	1.2	250	53.4	19.5	1.0	2,044	701	4,045	33	2.7	5.3
	Aug-Nov	1,118	60.2	9.1	1.3	-	-	-	-	1,047	60.3	9.0	1.4	470	53.3	20.2	0.7	3,487	301	5,304	44	3.8	
2	Dec.-Mar	0	-	-	-	-	-	-	-	133	57.4	15.4	0.5	240	53.3	21.6	0.3	4,868	0	5,241	43	-	
	Apr-July	1,230	59.3	11.5	0.9	-	-	-	-	1,164	59.4	11.3	1.0	682	53.2	21.1	0.4	4,524	301	6,671	55	4.5	6.5
	Aug-Nov	1,262	60.8	10.2	0.7	-	-	-	-	1,195	61.0	9.9	0.7	455	53.2	21.2	0.6	4,834	230	6,714	55	4.4	
3	Dec.-Mar	0	-	-	-	-	-	-	-	116	59.2	14.1	0.3	91	53.4	21.6	0.2	5,956	0	6,163	51	-	
	Apr-July	1,239	60.1	11.6	0.7	-	-	-	-	1,181	60.2	11.5	0.7	267	53.3	21.7	0.5	5,278	0	6,726	55	4.5	6.8
	Aug-Nov	1,248	61.2	9.9	0.7	-	-	-	-	1,190	61.3	9.7	0.7	212	53.4	20.7	0.9	5,191	0	6,593	54	4.3	
4	Dec.-Mar	0	-	-	-	-	-	-	-	205	59.2	14.1	0.2	195	53.2	22.2	0.2	5,734	0	6,134	50	-	
	Apr-July	1,244	61.0	9.9	0.8	-	-	-	-	1,142	61.2	9.6	0.9	244	53.2	20.7	1.0	5,094	0	6,480	53	4.3	6.4
	Aug-Nov	1,241	61.9	8.6	0.9	-	-	-	-	1,138	62.2	8.1	0.9	181	53.0	21.7	0.7	4,494	0	5,813	48	3.8	
5	Dec.-Mar	0	-	-	-	-	-	-	-	58	57.9	14.7	0.7	51	53.1	21.5	0.6	5,591	0	5,701	47	-	
	Apr-July	1,248	61.6	9.2	0.9	-	-	-	-	1,189	61.7	8.9	0.9	88	53.4	20.1	1.1	3,155	0	4,432	36	2.6	4.2
	Aug-Nov	1,238	63.1	7.8	0.4	-	-	-	-	1,238	63.1	7.8	0.4	54	53.3	20.9	0.7	1,464	0	2,755	23	1.2	
6	Dec.-Mar	0	-	-	-	-	-	-	-	1,894 (1)	63.7	6.5	0.5	26	53.6	20.6	0.6	399	0	2,319	19	-	
	Apr-July	1,250	63.7	6.5	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2
	Aug-Nov	644	63.7	6.5	0.5	606	53.3	20.9	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	
7	Dec.-Mar	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Apr-July	-	-	-	-	1,250	53.3	20.9	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	0
	Aug-Nov	-	-	-	-	1,250	53.3	20.9	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	
8	Dec.-Mar	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Apr-July	-	-	-	-	537	53.3	20.9	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	0
	Aug-Nov	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total		**14,082**	**61.4**	**9.2**	**0.8**	**3,643**	**53.3**	**20.9**	**0.6**	**14,082**	**61.4**	**9.2**	**0.8**	**3,643**	**53.3**	**20.9**	**0.6**	**70,083**	**2,334**	**90,143**	**-**	**4.1**	**4.1**

1. The high grade ore material mined in Y6 Dec.-Mar. will be temporarily stockpile in the low grade ore stockpile disposal area if required.
2. Mine plan based on a dilution of 1% at 35% Fe and 46.96% SiO_2 and an ore loss of 4%

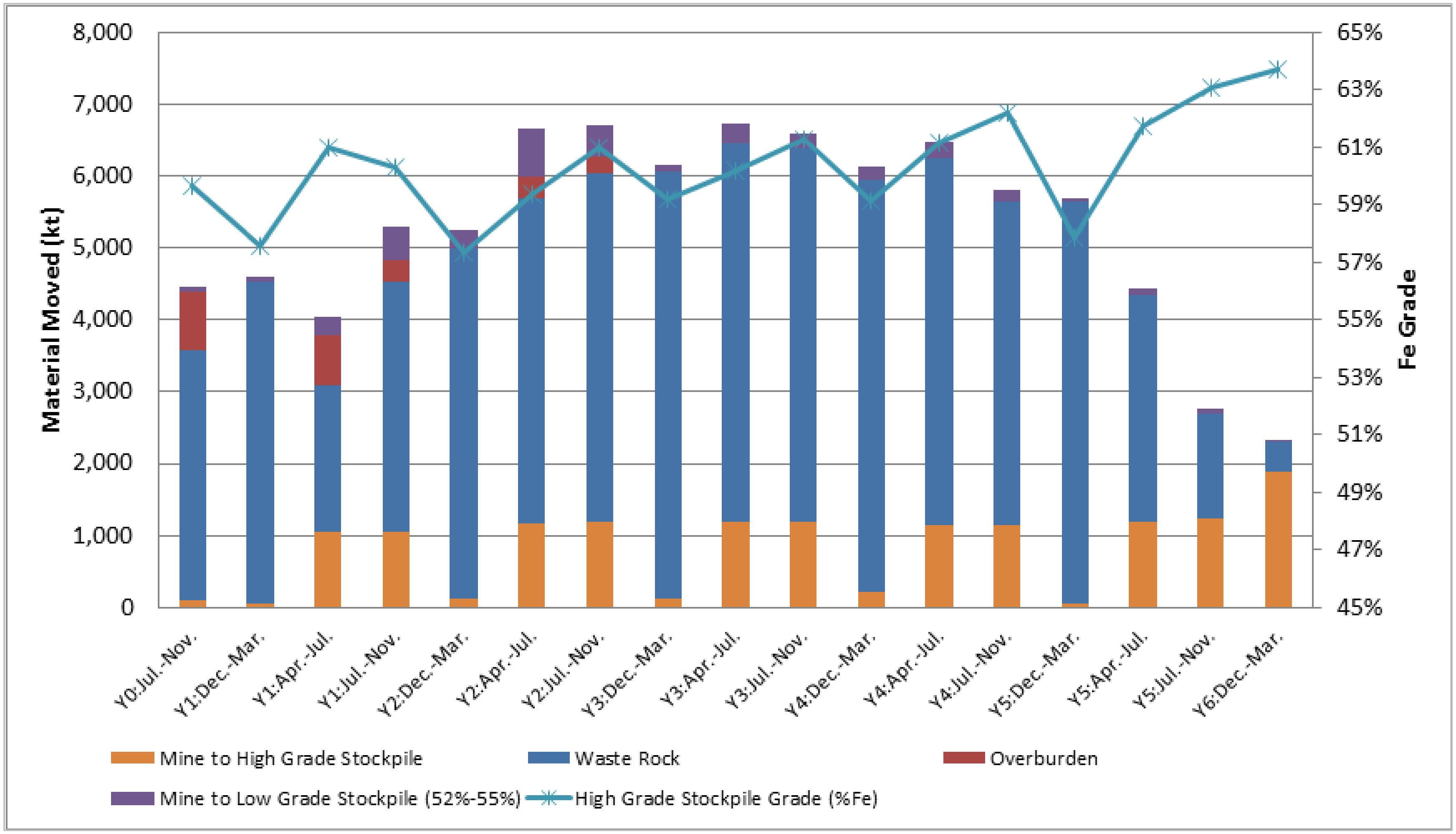


Figure 16-4: Material Movement Summary and High Grade Stockpile Grade

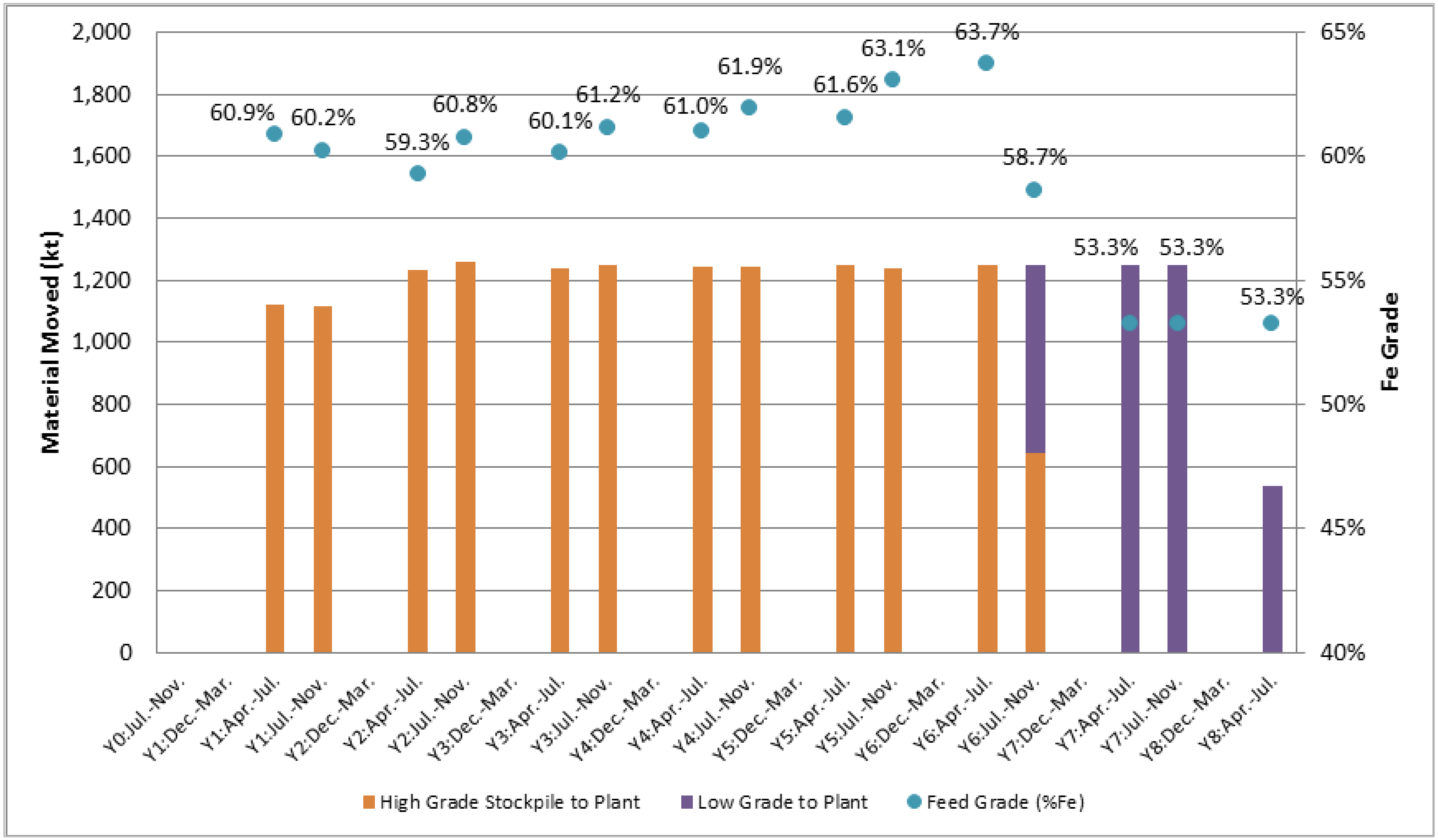


Figure 16-5: Crusher Feed Summary

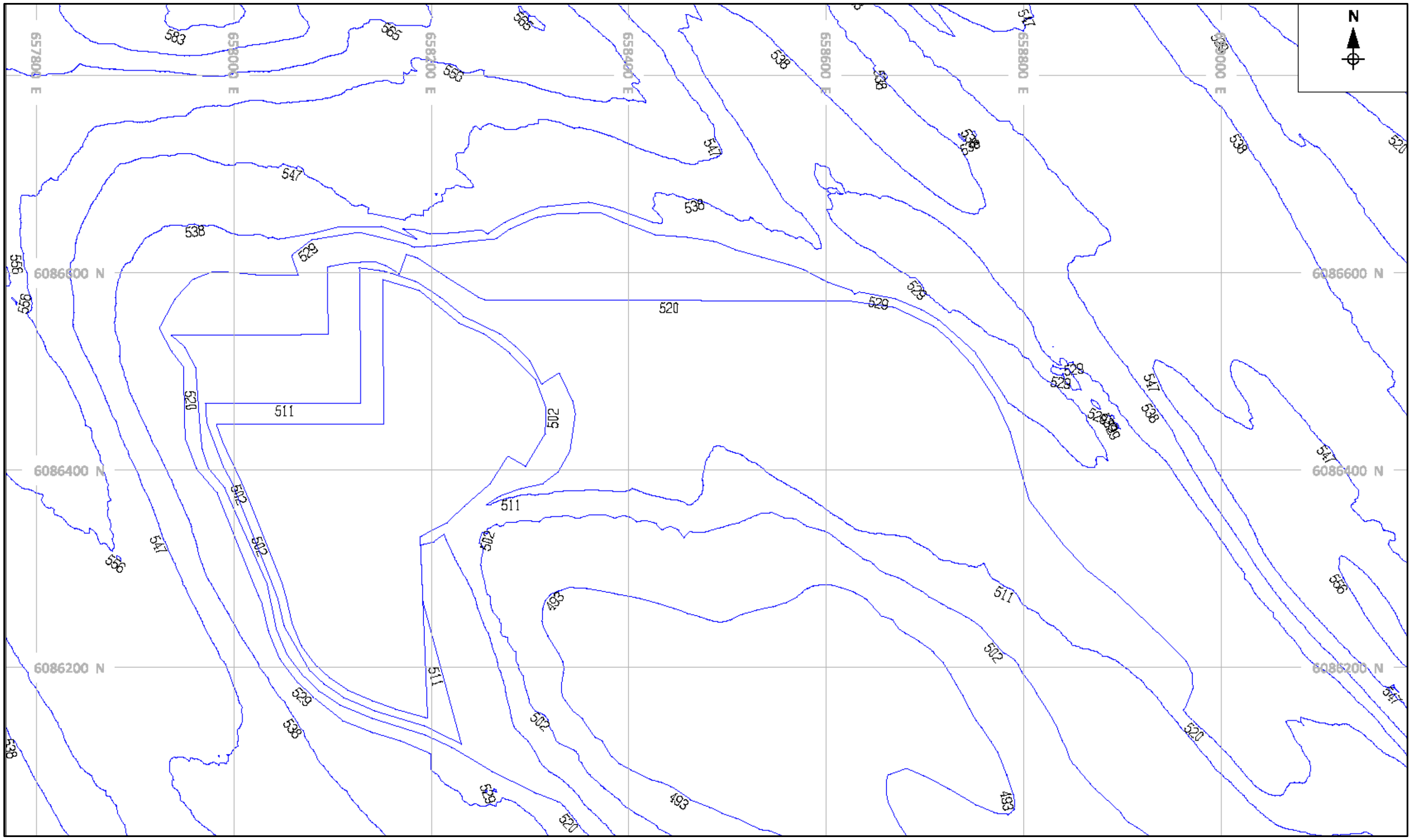


Figure 16-6: Aerial Topography at End-of-March Y1 (Pre-Production Phase)

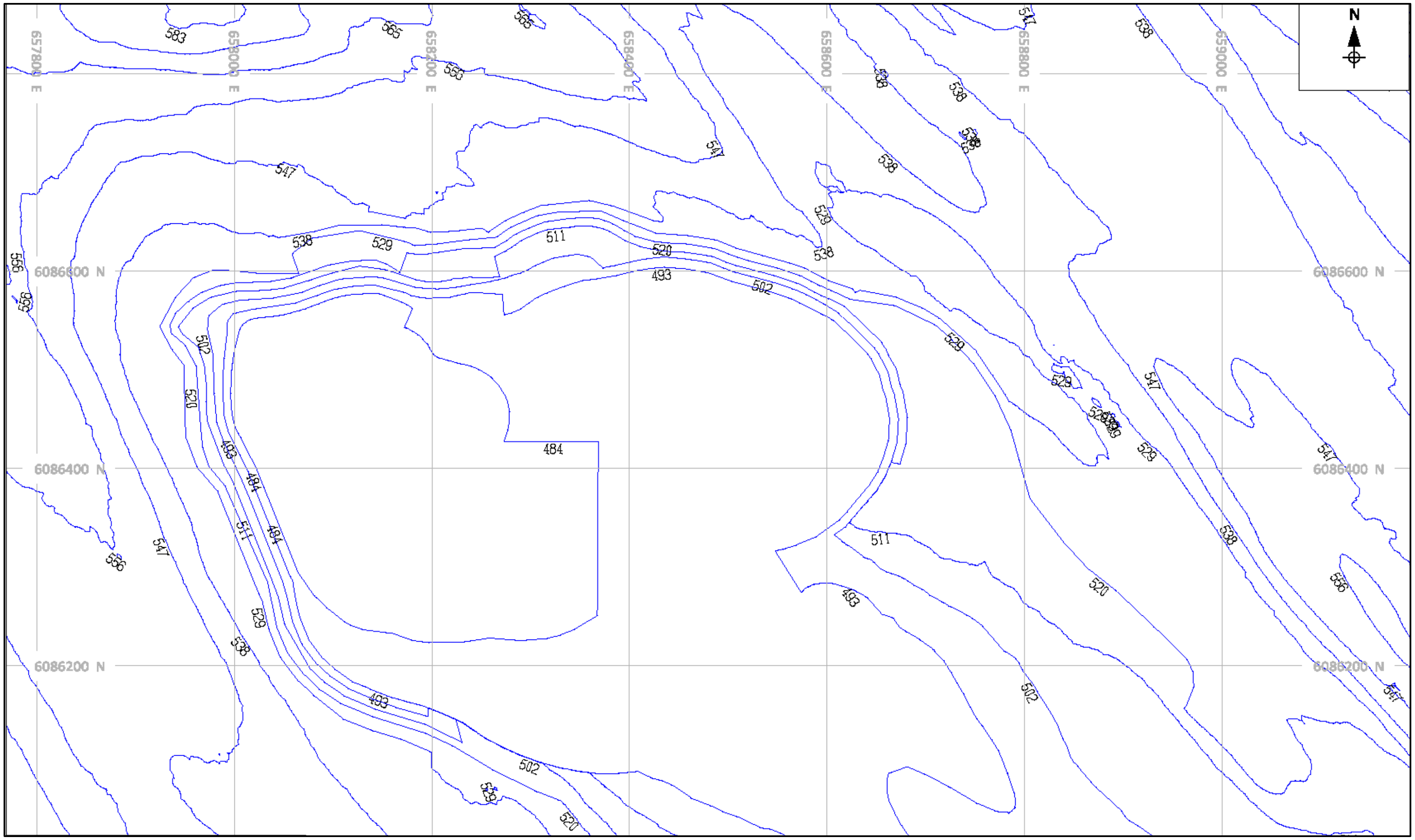


Figure 16-7: Aerial Topography at End-of-March Y2

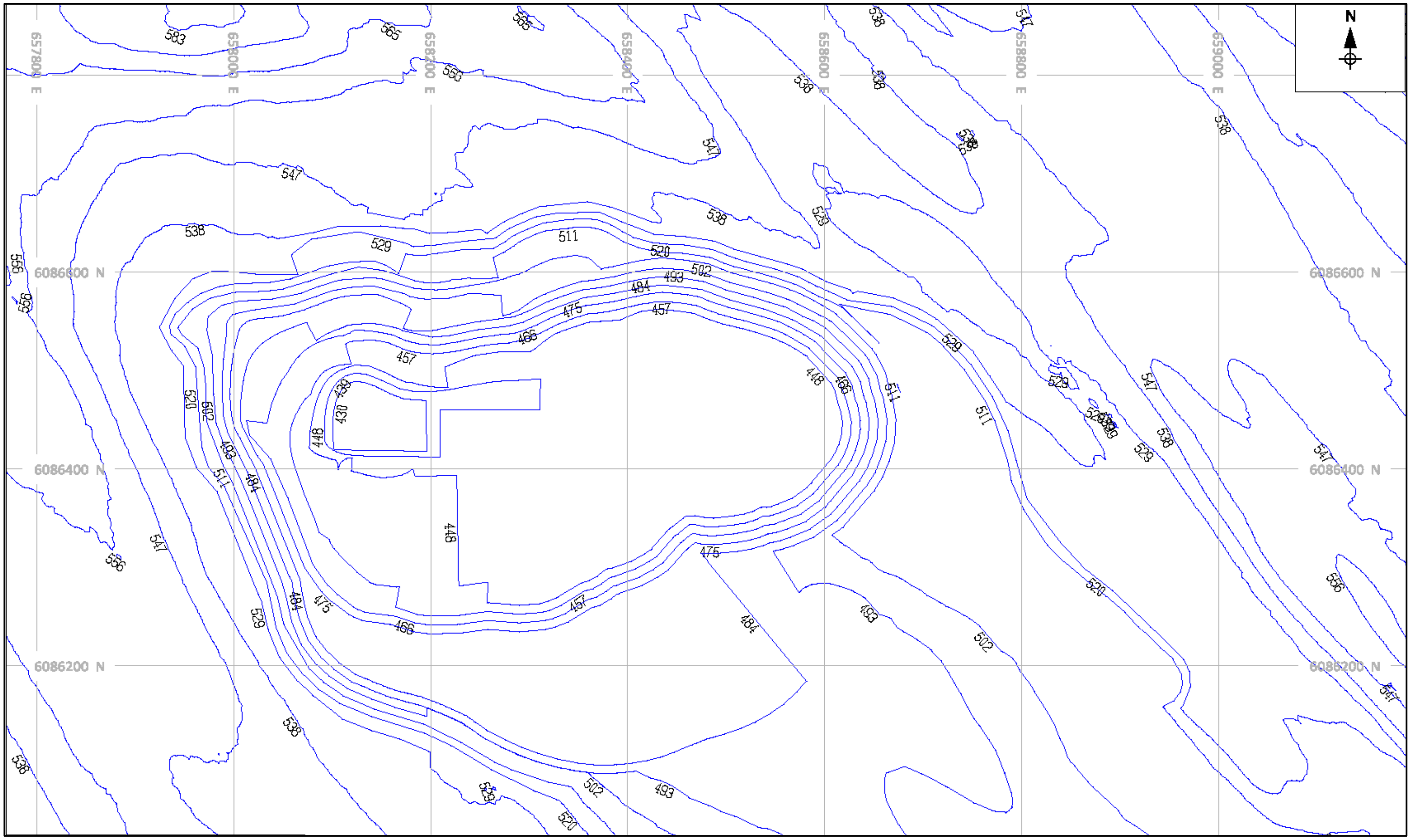


Figure 16-8: Aerial Topography at End-of-March Y3

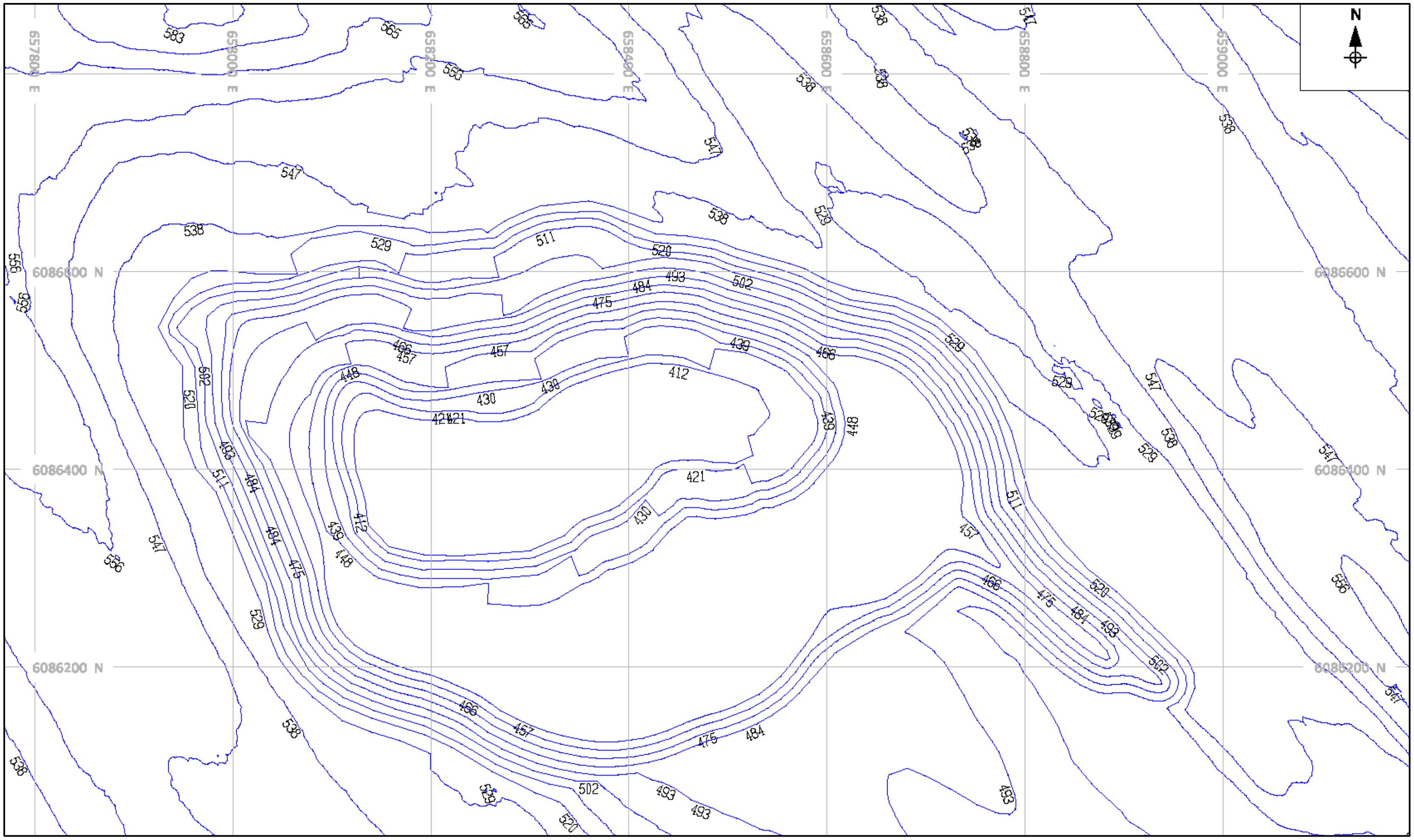


Figure 16-9: Aerial Topography at End-of-March Y4

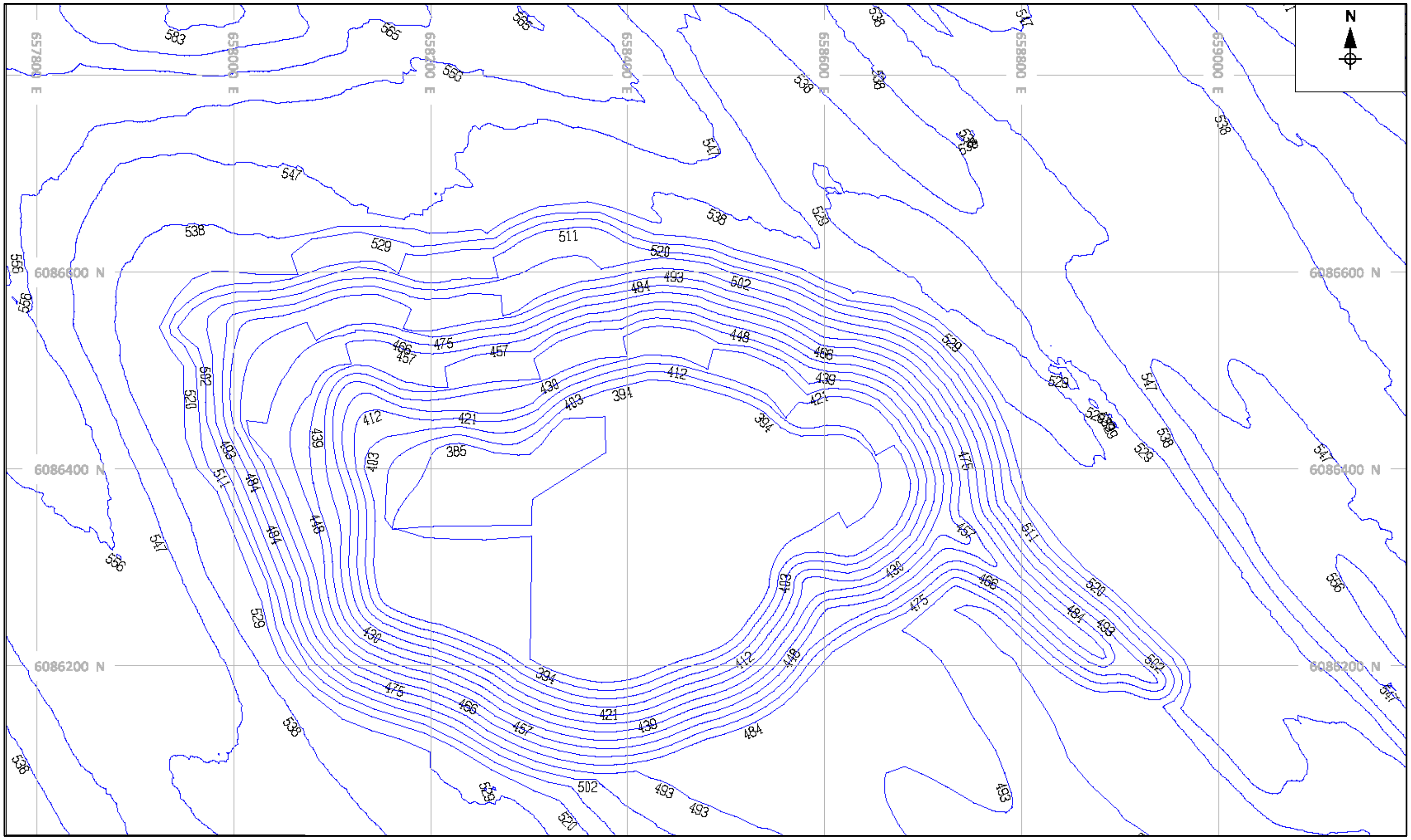


Figure 16-10: Aerial Topography at End-of-March Y5

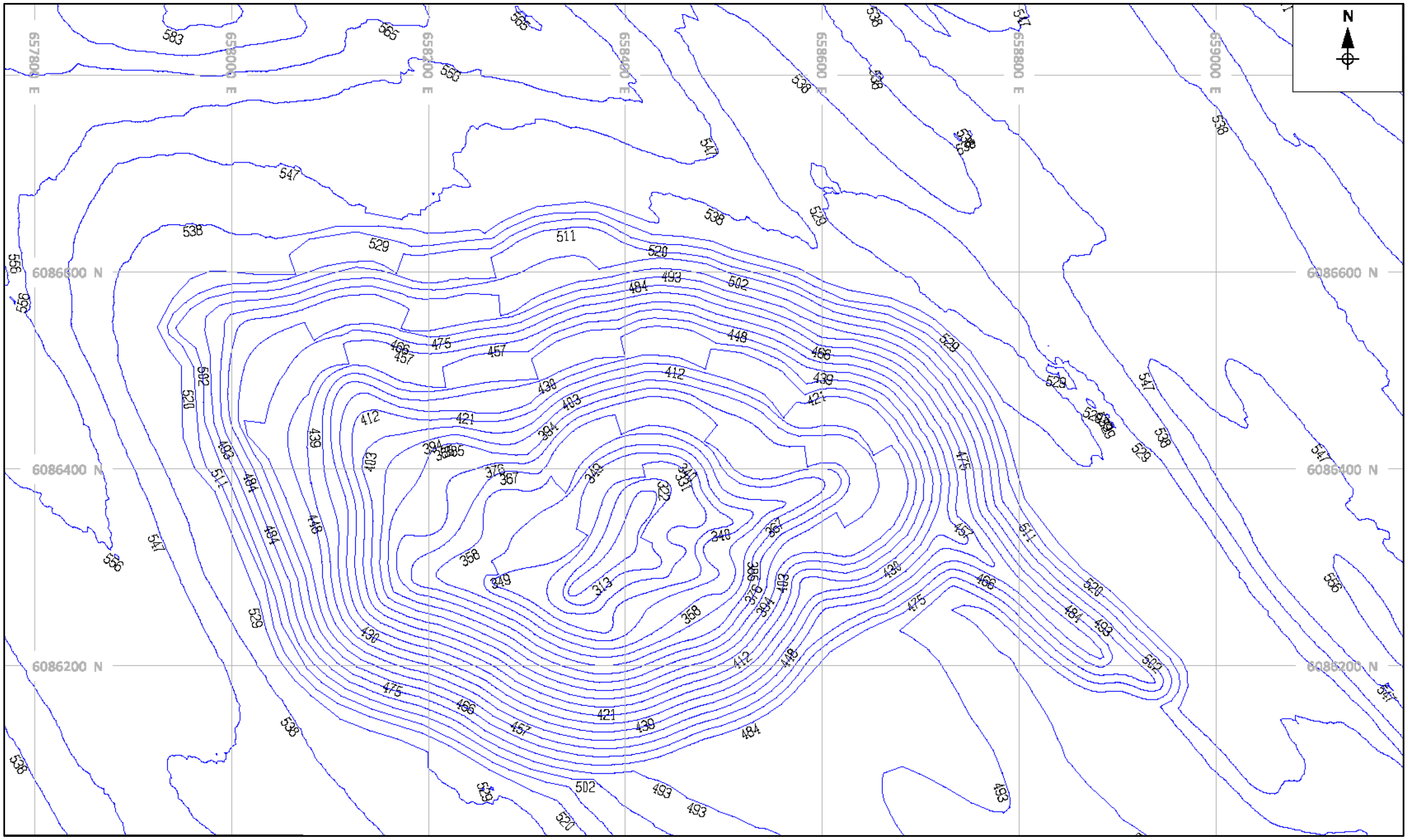


Figure 16-11: Aerial Topography at End-of-March Y6

16.3 Overburden, Waste Rock and Low Grade Ore Stockpile Design

Overburden and waste rock material from the Joyce Lake pit will be stored in the designated waste rock and overburden piles. The waste rock and overburden piles satisfy the required tonnages originating from the open pit, including the swell factors for each material type.

Geotechnical slope stability recommendations were provided by LVM in their report entitled "Joyce Lake and Area DSO Project Geotechnical Engineering Feasibility Study – Open Pit Design" dated December 19, 2014. The overall slopes recommended by LVM for the different piles are summarized in Table 16-2.

Table 16-2: LVM's Recommendations on Overall Slope Angles

Disposal Area	Overall Slope Angle
Waste Rock Pile	2.5H:1V
Overburden Pile	3.0H:1V
Low Grade Ore Stockpile	2.5H:1V

LVM also recommended the placement of sub-horizontal drains made of coarser material for drainage to reduce the pore water pressure and ensure stability of the structures.

Based on the overall slope angles for each material, BBA proposed the pile design parameters presented in Table 16-3. A 3D view of the piles with respect to the open pit is shown in Figure 16-12. The final elevations of the piles, as well as the total capacity can be found in Figure 16-13.

Table 16-3: Waste Rock, Overburden and Low Grade Ore Piles Design Criteria

Overburden Disposal Area	Value	Unit
Overall Angle (from horizontal)	3.0H:1V	-
Ramp Width	26	m
Ramp Grade	10	%
Swell Factor	20	%
Waste Rock Disposal Area	**Value**	**Unit**
Bench Face Angle	34	degrees
Overall Angle (from horizontal)	2.5H:1V	
Bench Height	10	m
Ramp Width	26	m
Ramp Grade	10	%
Swell Factor	30	%
Low Grade Ore Stockpile Disposal Area Design Criteria	**Value**	**Unit**
Bench Face Angle	34	degrees
Overall Angle (from horizontal)	2.5H:1V	-
Bench Height	10	m
Ramp Width	26	m
Ramp Grade	10	%
Swell Factor	30	%

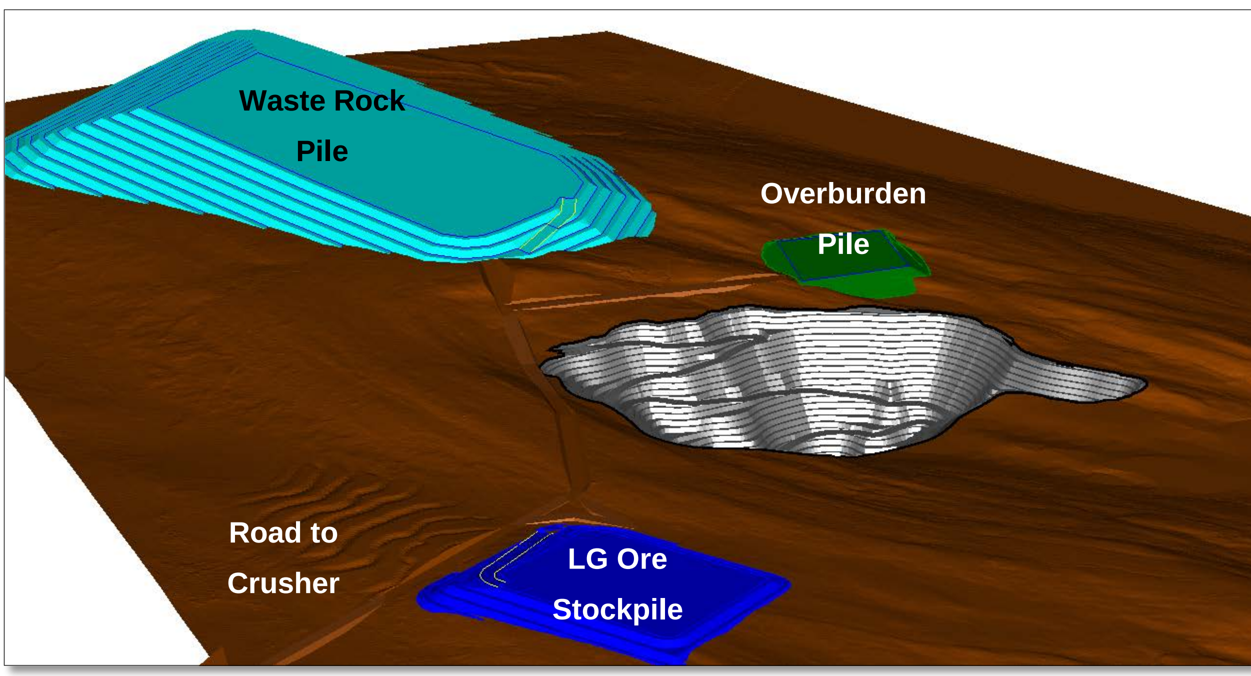


Figure 16-12: Isometric View of the Waste Rock, Overburden and Low Grade Piles

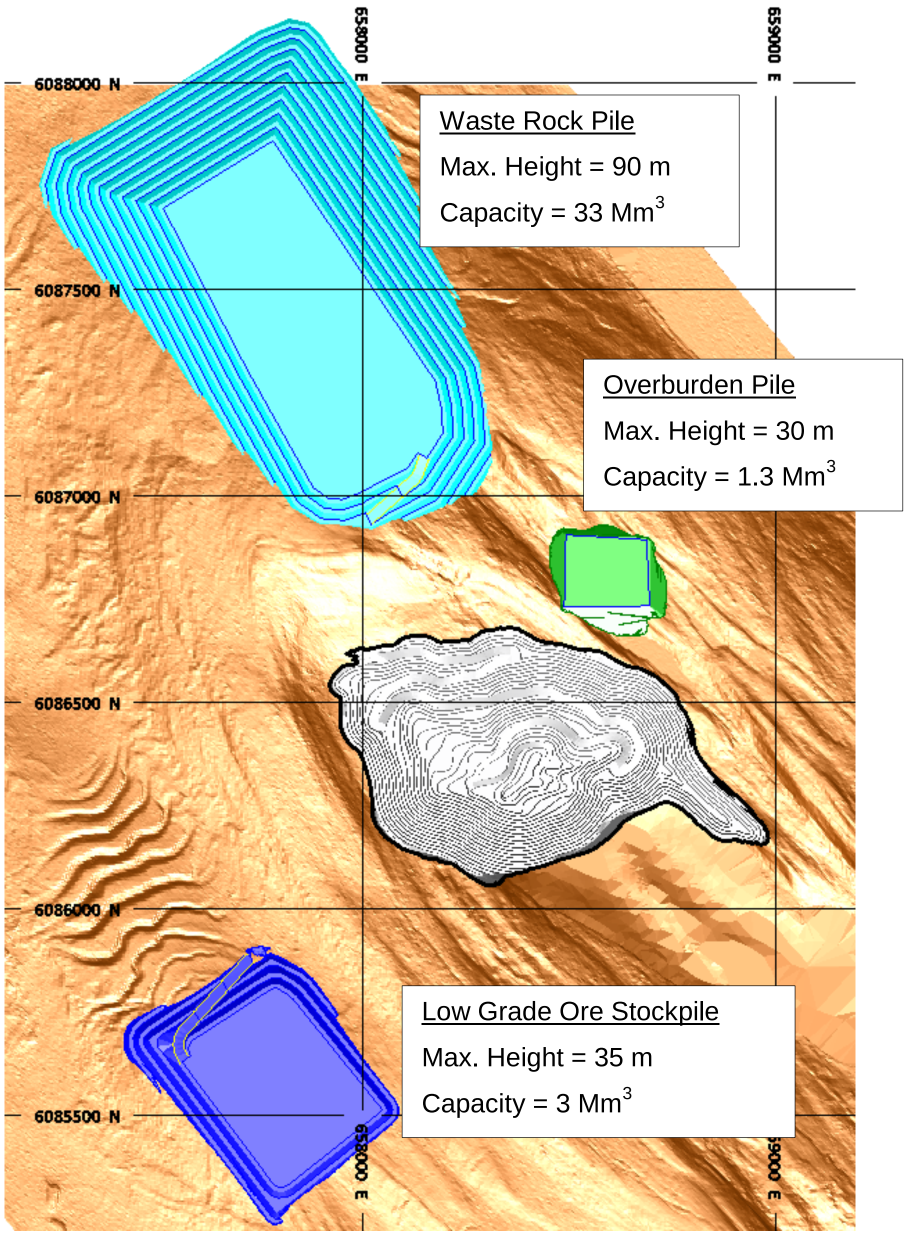


Figure 16-13: Elevation View of the Waste Rock, Overburden and Low Grade Piles

16.4 Open Pit Mine Equipment and Operations

The Joyce Lake deposit will be mined using conventional open pit mining methods based on a truck/shovel operation. All mining equipment will be diesel-powered. Using the production schedule presented in Table 16-1, the mining fleet requirement was calculated. All equipment is assumed to be owned, operated and maintained by LCIO.

Open pit mine operations are based on 720 shifts per year, and correspond to operations running 2 x 12 hour shifts per day, 7 days per week and 360 days per year, with the assumption that five operating days will be lost on average due to bad weather. The mining operations division will consist of the pit operations, maintenance, engineering and geology departments.

The selection of the primary fleet is based on the following parameters:

- operating hours
- mechanical availability;
- use of availability
- haulage distances;
- cycle time;
- truck speed; and
- equipment productivity.

The primary mining fleet consists of the following:

- The primary loading equipment for overburden, waste rock and ore consist of two diesel hydraulic shovels with a rated bucket capacity of 10 m^3. One 10 m^3 front-end loader will be used on an as needed basis to complement the primary loading equipment fleet. The flexibility of the loader, with its fast response time, justifies its use in replacing a shovel in loading support activities;
- The haul truck fleet is based on trucks with a 96-tonne payload, which is a good match with the 10 m^3 hydraulic shovels. The initial haul truck fleet consists of five trucks in the pre-production phase and will increase to 12 trucks in Year 3;
- Production drilling will be accomplished using a fleet of two diesel powered DTH blast hole rigs drilling 8½" diameter holes.

16.4.1 Mining Truck Trade-Off Study

Based on the mine production schedule and haulage distances, a mining truck capacity trade-off was performed for the following combinations:

- 65 tonnes trucks / 6m^3 hydraulic shovel / 6.4m^3 front-end loader; and
- 96 tonnes trucks / 10m^3 hydraulic shovel / 10m^3 front-end loader.

For each truck size, the speeds, fuel consumption, payload, personnel requirement and associated loading equipment were calculated along with the LOM equipment capital costs, operating costs, transportation costs and room-and-board costs. Table 16-4 shows the mining fleet requirement for the analysed combinations of equipment.

Table 16-4: Mining Fleet Comparison

Description	65-tonne truck	96-tonne truck
Truck Fleet (Peak)	17	12
Hydraulic Shovel Fleet	3	2
Wheel Loader Fleet	1	1
Other Equipment	Identical	

An undiscounted cashflow analysis was performed on the two mining fleet combinations and the results for the 96 tonne trucks indicate a slight improvement when compared to the 65 tonne trucks. Taking into account other parameters such as the trafficability, the parts and equipment availability and the manpower availability, the 96 tonnes truck was selected for the Project.

Since the 65 tonne truck was initially selected, the ramp width will have to be increased by 3-4 meters to accommodate the 96 tonne truck during the next phase of the project.

16.4.2 Operating Time Assumptions

The productive operating time available per shift has been calculated for primary mining equipment and separately for the drills to take into account the additional scheduled delays typically associated with the drills, such as additional time required for moving between drill patterns and spotting time between blast holes.

Scheduled delays for the primary equipment and drills take into account operator lunch breaks, inspection and fueling, shift changes, and coffee breaks. Table 16-5 provides details about the scheduled delays considered.

Table 16-6 shows how net operating hours are derived from scheduled delays and unscheduled delays (based on the job efficiency factor (JEF)). Unscheduled delays are delays that cannot be predicted or planned, such as traffic delays, blasting, cleaning, etc. These factors were estimated based on similar operations.

Table 16-5: Operating Shift Parameters

Shift Parameters	Value	Unit
Shift/Day	2	shifts
Minutes/shift	720	min
Worker and Equipment Shift Operating Time		
Shift Change / Safety Talk	15	min
Inspection / Fueling	15	min
Coffee Break	20	min
Lunch Break	30	min
Job Efficiency Factor (JEF)	83%	%
Drills Operating Time		
Shift Change	15	min
Inspection	15	min
Coffee Break	20	min
Lunch Break	30	min
Job Efficiency Factor (JEF)	75%	%

Table 16-6: Equipment and Worker Operating Time

Operating Time Calculations	Value	Unit
Worker and Equipment Operating Time per 12 hour shift		
Scheduled Time	720	min
Scheduled Delays	80	min
Scheduled Operating Time	640	min
Unscheduled Delays	107	min
Total Delays	187	min
Net Operating Time	533	min
Net Operating Hours	8.89	hr
Drills Operating Time per 12 hour shift		
Scheduled Time	720	min
Scheduled Delays	80	min
Scheduled Operating Time	640	min
Unscheduled Delays	160	min
Total Delays	240	min
Net Operating Time	480	min
Net Operating Hours	8.00	hr

16.4.3 Equipment Availability and Use of Availability

For each piece of major equipment, mechanical availability and use of availability factors were designated. The mechanical availability is a percentage that represents the hours when the equipment cannot be operated due to planned maintenance or breakdowns (unplanned). These factors were derived from supplier recommendations and/or experience. Equipment "use of availability" refers to the time that a piece of equipment is available and operated productively. The availability factors used over the LOM are presented in Table 16-7.

Table 16-7: Major Equipment Availability and Use of Availability

Equipment	Equipment Life				
Haul Trucks and Shovels	**Y1**	**Y2**	**Y3**	**Y4**	**Y5+**
Availability	91%	90%	89%	88%	87%
Use of Availability	95%	95%	95%	95%	95%
Drills	**Y1**	**Y2**	**Y3**	**Y4**	**Y5+**
Availability	88%	88%	88%	85%	85%
Use of Availability	95%	95%	95%	95%	95%

In addition to the mechanical availability and use of availability factors, an operator skill factor was also used in the fleet calculations for the haul trucks, the hydraulic shovels and the drills. This factor was applied to take into account the training period and the learning curve of the equipment operators. Table 16-8 presents the operator skill factor per period.

Table 16-8: Major Equipment Availability and Use of Availability

Year	4-month Period	Operator Skill Factor
0	July-Nov. (5 mths)	85%
1	Dec.-Mar	85%
	Apr-July	85%
	Aug-Nov	90%
2 and +	All	100%

16.4.4 Drilling and Blasting

The drill and blast design for the Study was determined by BBA, in collaboration with explosives suppliers familiar with this type of operation.

A combination of three different blast hole diameters and drilling patterns, as well as two powder factors, were analysed for both ore and waste. The resulting fragmentation curves were compared and one scenario was selected based on two main criteria:

1. A top size of 600 mm; and

2. The reduction of fines (<32 mm).

The ore zones will be drilled using 8-½ inch diameter holes on a drilling pattern of 6.0 m spacing x 6.0 m burden. Waste rock areas will use the same hole diameter, but a slightly larger drilling pattern of 6.5 m x 6.5 m. The spacing and burden for the ore zone is tighter to produce better fragmentation and selectivity.

Blast holes will be drilled to a total depth of 10 m, including 1.0 m of sub-drilling for a 9 m bench height. A stemming height of 3.5 m, to 3.8 m will be used to maximize the effectiveness of the explosives column. Based on the production schedule, up to two drills will be required.

Blasting will be executed under contract with an explosives supplier that will supply the blasting materials and technology, as well as the equipment to store and deliver the explosives products. The explosives ingredients will be delivered to the mine site by the explosives supplier and mixed in a satellite site building, made of portable containers and heated garage. In order to obtain optimum fragmentation, which will improve the materials handling operations, high-precision electronic detonators will be used.

Blasting will be conducted using a gaseable emulsion blend type explosive (30% prill) with an average density of 1.2 kg/m^3. An emulsion blend was selected for its water resistance and to optimize the fragmentation of ore material.

Based on the drilling pattern described above, the powder factor has been estimated at 0.26 kg/tonne in ore and 0.25 kg/tonne in waste.

It is also assumed that pre-split will be required for final walls. Pre-split holes will be drilled with a 3 inch diameter to a total depth of 9 m, using a spacing of 1 m. The pre-split holes will be loaded with a packaged detonator sensitive emulsion explosive.

A summary of the drill and blast specifications can be found in Table 16-9.

Table 16-9: Drill and Blast Specifications

Parameter	Unit	Ore	Waste
Drill Specifications			
Hole diameter	mm	215.9	215.9
Hole area	m^2	0.0366	0.0366
Bench height	m	9	9
Sub-drill	m	1	1
Stemming	m	3.5	3.8
Loaded length	m	6.5	6.2
Hole spacing	m	6.0	6.5
Burden	m	6.0	6.5
Penetration rate	m/hr	27	27
Re-drill	%	10%	10%
Rock mass/hole	t	1105	1084
Bulk Emulsion			
Density	kg/m^3	1200	1200
kg/hole	kg/hole	286	272
Powder factor	kg/tonne	0.26	0.25

16.4.5 Loading and Hauling

Production will be carried out using a fleet of 96-tonne capacity dump trucks and hydraulic shovels with a bucket capacity of 10 m^3 in ore and waste rock. The number of trucks operating at any given time is dependent on the annual mining rate (total material moved), and varies over the mine life. This fleet combination should allow for 4 pass-loading of trucks hauling ore and 5 pass-loading of trucks hauling waste and 5 to 6 pass-loading of trucks hauling overburden. A maximum of 12 haul trucks will be required during the peak periods.

The maximum shovel productivity per shift has been estimated at 16,600 tonnes of ore, 14,600 tonnes of waste and 11,700 tonnes of overburden. These productivities are based on a bucket fill factor varying from 86% to 95%, depending on the loaded material. Loading operations will also be assisted by one large front-end loader to maximize the flexibility of the operation. The loader will be used as production equipment but also as a replacement for the shovel in down-time situations, as well as for other tasks involving material handling.

Average annual haul profiles were created for HG ore, LG ore, waste rock and overburden. The haulage distances were further divided for in-pit flat hauls, in-pit up ramp hauls, flat on topography hauls and for crusher and piles. In the MineSight software, haul routes were traced according to mining centroids for every bench (and material) for each 4-month period. Subsequently, with these centroid distances and the respective tonnage per bench (per material) mined, the weighted and averaged distances were calculated on a 4-month basis. The in-pit ramp distances were also averaged using the same methodology.

In order to optimize the waste haul cycle times, dumping has been carried out in phases to allocate shorter hauls during earlier periods of the LOM. Centroid and up-ramp distances were traced for both the waste pile locations and crusher location.

Haulage travel speeds for the trucks were based on supplier data and were further adjusted using factors from BBA's internal equipment database. The travel speeds by road gradients for both loaded and empty trucks are shown in Table 16-10.

Table 16-10: Trucks Speeds (Loaded and Empty)

Haul Truck Load	Speed (km/h)					
	Acceleration 100 m	Flat (0%) Topo	Flat (0%) In-Pit/Crusher/ Dump	Slope Up (10%)	Slope Down (-10%)	Deceleration 100 m
Loaded	20	45	35	14	30	20
Empty	25	45	35	22	20	25

For each material type, the calculated cycle times were calculated based upon round-trip haulage profiles, the haul truck speeds, and on load/spot/dump times determined for each material. A graph showing the trend of cycle time over the LOM for each material type is shown in Figure 16-14.

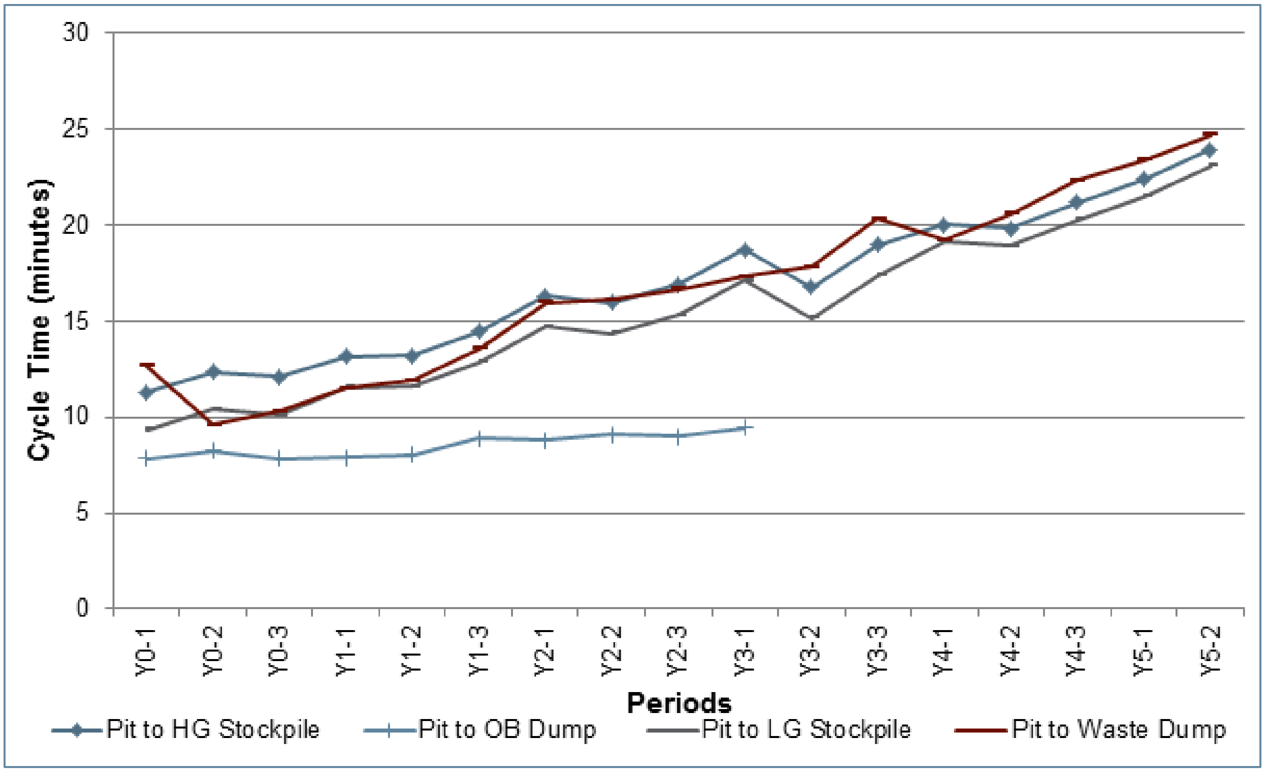


Figure 16-14: Cycle Time Trends on a 4-month Period Basis

16.4.6 Equipment Annual Fleet Requirements

The primary mining fleet was selected based on the scale of this mining operation, optimization fleet size utilization and matching of equipment, efficiency and reliability. At the peak point in the mine life, primary equipment requirements will consist of:

- 12 x 96-tonne diesel haul trucks;
- 2 x 10 m^3 diesel-hydraulic shovel;
- 1 x 10 m^3 front end loader; and
- 2 x 8.5" DTH blast hole drills.

To complement the primary mining equipment fleet, a list of auxiliary and support equipment was developed by BBA based on experience in similar open pit mining operations. The requirements for auxiliary support equipment were determined primarily based on the scale of the operation, the size and number of active waste rock piles and length of haul roads to be maintained.

Table 16-11 shows the mine equipment fleet requirements to support the mining operation in the peak years.

Table 16-11: Mine Equipment List (Peak Years)

Equipment	Peak
Production Fleet	
Trucks (96 tonnes)	12
Shovel (10 m^3)	2
DTH drill (8.5 inches)	2
Support Fleet	
Wheel Loader (10.7 m^3)	1
Grader (14')	1
Track Dozer (equiv. CAT D8T)	3
Pre-Split Drill (3 inches)	1
Auxiliary Fleet	
Water Truck / CAT740 (30k l.) / USED	1
Water Tank Body	1
Sand Spreader Body	1
Fuel/Lube Truck- 10kl fuel (GF40EFLT)	1
Service Truck 22,000 GWV, 250 hp	1
Skid Steer	1
Pick-up Truck (Crew Cab)	2
Lighting tower 4 post of 1000 w. / diesel generator	4
Dewatering Pump +Booster 75HP 500pi head (on skid)	3
Tire Changer (Lift Truck with TM10 Attachment)	1
Total Mining Equipment	**38**

Low Grade Ore Stockpile Re-Handling

The low grade ore stockpile will be re-handled and processed at the end of the mine life. The low grade ore will be loaded with the front-end loader, and transported by mining truck to the crusher area. Since the crusher is not equipped with a direct dump system from truck to crusher, the mining trucks will dump the material on the blending pad and another front-end loader will feed the crusher.

The low grade ore re-handling activity will be performed with the following equipment:

- One front-end loader with a capacity of 10 m^3; and
- Two mining trucks with a capacity of 96 tonnes.

16.4.7 In-Pit Mine Dewatering

The in-pit mine dewatering pumps have been selected based on the in-pit water flow estimate in the hydrogeological report. The in-pit mine dewatering will be performed using three 75 HP dewatering pumps, including one back up unit. As the mining operation goes deeper into the pit, booster pumps will also be added to reach the required 200 m head.

Given that the pit is located within the limits of a natural lake, the mine dewatering aspect must be carefully assessed. BBA considered that two people will be assigned to mine dewatering activities and a provision for outsourced consulting was put on the estimate.

16.4.8 Mine Services

The mine services include all ancillary activities related to the operation of the pit, including outsourced consulting (geotechnical and dewatering), specialized mining software and aggregate requirements.

Due to the relatively short mine life and the limited mine equipment, no mine fleet monitoring system was envisaged.

16.4.9 Open Pit Mine Personnel Requirements

The personnel requirement for the open pit mine includes all of the hourly staff working in open pit operations that are required for the operation and maintenance of the equipment involved with or supporting mining activities, as well as the salaried engineering, geology and supervisory staff.

The maximum number of salaried employees is 27. The mine salaried staff requirements over the life of the mine are presented in Table 16-12.

The number of hourly personnel reaches a peak of 126 in Year 4. A complete list of the hourly personnel requirements is listed in Table 16-13.

The number of operators required for the major mining equipment (haul trucks, shovels, and drills) was determined according to the number of operating units and number of rotations during which the equipment is in operation. Most of the operators for the major mine equipment are based on a four crew rotation. Hourly maintenance employee requirements were determined based on the number of equipment to maintain.

Table 16-12: Mine Salaried Personnel Requirement

Job Title	Employees
Mine Superintendent	1
Mine Shift Foreman	4
Blaster	2
Blaster Helper	2
Production / Maintenance / Mine Clerk	2
Maintenance	
Maintenance Superintendent	1
Mechanical/Industrial Engineer	1
Mine Maintenance Foreman	4
Mine Maintenance Trainer	2
Engineering	
Chief Engineer	1
Mine Planning Engineer	2
Mine Surveyor	2
Geology	
Chief Geologist	1
Geologist	1
Geologist Technician	1
Total Salaried Staff	**27**

Table 16-13: Mine Hourly Personnel Requirement

Job Title	Y0-3	Y1-1	Y1-2	Y1-3	Y2-1	Y2-2	Y2-3	Y3-1	Y3-2	Y3-3	Y4-1	Y4-2	Y4-3	Y5-1	Y5-2	Y5-3	Y6-1
Operations																	
Shovel Operators	4	4	4	6	7	8	8	8	8	8	8	8	7	7	6	4	3
Loader Operators	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Haul Truck Operators	18	19	19	25	23	33	39	36	41	42	40	47	41	43	36	24	21
Drill Operators	4	5	4	6	6	7	7	6	8	9	8	8	7	7	6	4	4
Dozer Operators	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Grader Operators	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Other Auxiliary Equipment	6	6	8	8	8	8	8	8	8	8	8	8	8	8	6	4	4
General Labour	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Dewatering	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Hourly Operations Total	56	58	60	69	68	80	86	82	89	91	88	95	87	89	78	60	56
Field Gen Mechanics	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Field Welder	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Field Electrician	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Shovel Mechanics	2	2	2	2	2	3	3	3	3	3	3	3	3	2	2	2	2
Shop Electrician	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Shop Mechanic	6	6	6	6	6	8	8	8	8	8	8	8	8	8	6	6	6
Mechanic Helper	2	2	2	4	4	4	4	4	4	4	4	4	4	4	2	2	2
Welder-machinist	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Lube/Fuel Truck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tool Crib Attendant	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Janitor	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Hourly Maintenance Total	**26**	**26**	**26**	**28**	**28**	**31**	**31**	**31**	**31**	**31**	**31**	**31**	**31**	**30**	**26**	**26**	**26**
Hourly Personnel Total	**82**	**84**	**86**	**97**	**96**	**111**	**117**	**113**	**120**	**122**	**119**	**126**	**118**	**119**	**104**	**86**	**82**

17 RECOVERY METHODS

The Joyce Lake DSO project is based on dry processing of high grade ore using a simple dry crushing and screening process, as confirmed following a trade-off study performed early in this feasibility study that will be described later in this section. The design basis for the dry processing plant was developed for a maximum plant throughput capacity of 3.0 Mtpa and was used to develop the process design criteria and the process flowsheet as well as for the preliminary selection and sizing of major mechanical equipment. The mining operation delivers Run of Mine (ROM) ore, at a nominal 6% moisture level, to the stockpile area ahead of the dry processing plant. Dry processing begins with the front end loader reclaim of ROM ore that feeds the process plant. Following processing, a lump product and a fine product are generated and directed into their respective stockpiles. Processing is considered to end with a front end loader that loads the products into haul trucks.

The crushing and screening circuit design criteria for this feasibility study were first developed by BBA using simulation software with input from the testwork results, as described previously in Section 13 of this Report. As part of the request for budgetary proposals, vendors were asked to perform their own analysis and propose equipment and arrangement in order to meet targeted throughput with the provided ore characteristics from testwork.

BBA has recommended that further targeted testwork be performed during detailed engineering, prior to final design, to confirm the crushing circuit design selected, as well as the iron grade of lump and fines final products from a range of feed grades.

17.1 Process Flowsheet Development

The flowsheet selected for the Project consists of a dry crushing and screening process to treat ROM high grade ore having an average grade of about 62% Fe at a 55% Fe deposit cut-off grade. Low-grade material included within the mineral reserves, grading between 52% and 55% Fe, will be mined and stockpiled for processing at the end of the mine life. ROM ore is assumed to contain a nominal moisture level of 6%. The dry processing plant produces two products classified by particle size: a lump and a fines product. All the mined ore is converted into saleable product with no generation of process rejects. The nominal COG for the Joyce Lake deposit high grade material, as derived from the mineral reserve calculation that includes mining dilution and recovery presented in Section 15 of this Report, was set at 55% Fe in order to provide a feed to the dry processing plant averaging about 62% Fe (excluding low grade stockpiles processed at end of mine life). The 62% Fe iron grade corresponds to the benchmark grade where no Fe premium or penalty applies. Consideration is also given to the fact that during dry processing the lump product is expected to become slightly upgraded in iron content as finer silica should report to the fines product. The low grade material portion of the mineral reserve grading between 52% and 55% Fe will attract appropriate penalties for Fe and silica grade. These penalties will be discussed in more detail in Section 16 and Section 22 of this Report. Annual product production and sales were determined according to the annual mine plan developed.

During the early part of this Feasibility Study, a trade-off study was performed to determine if incorporation of a wet processing plant, to upgrade material having Fe grade between 50% and 55% Fe, would enhance the financial performance of the project when compared to the base case of using only dry processing of the higher grade material. This TOS is discussed in detail in a report titled “Dry versus Wet Processing”, dated September 19, 2014.

In the wet processing plant scenario studied, the aforementioned dry plant continues to process the higher grade ore (grade at and above 55% Fe) but is complemented by a wet plant that would process lower grade ore between 50-55% Fe. Testwork suggests that material lower than 50% Fe is difficult to concentrate and was therefore not considered for potential upgrading. The lump and fines produced by the wet plant are proportionally blended with the lump and fines produced by the dry plant in order to minimize product variability, as well as to minimize selling price penalties. For this TOS, it was assumed that the open pit mining operation would be able to release 62% Fe material for dry processing and the lower grade material for wet processing at the average proportions of the deposit. Furthermore, annual production of saleable product for both dry processing only and for dry/wet processing cases was kept at 2.0 Mtpa (note the TOS was performed at 2.0 Mtpa, while the Feasibility Study is based on 2.5 Mtpa).

The design of the wet plant was based on the following assumptions. Some of these assumptions were not supported by sufficient testwork and would thus require significantly more testwork for confirmation.

- The mine life was extended by the additional low grade material processed in the wet plant;
- An overall iron recovery of 75% is achieved in wet processing;
- Wet scrubbing and screening is sufficient to produce a lump product (-31.5/+6mm) grading 57% Fe from low grade material;
- The fines from the wet process, grading 60% Fe, consist of two distinct products: a primary fines product (-6.3/+1mm) obtained following wet scrubbing and screening, and a concentrate product resulting from wet high intensity magnetic separation (WHIMS), and de-sliming using screens and cyclones;
- Final product combined (i.e. wet and dry) lump and fines grades of 61.7% Fe and 60.4% Fe respectively.

The TOS concluded that despite the longer mine life and increase in saleable product resulting from the addition of a wet processing plant to the base case, this scenario would not improve the financial performance of the project and should not be pursued further. The combination of higher operating costs, lower annual revenues resulting from a lower average product selling price due to increased penalties, and substantially higher capital costs required to build the wet plan, were all found to be contributing factors in the decision. In effect, the Joyce Lake deposit does not contain enough material in the 50-55% Fe range to justify the addition of a wet processing plant.

Based on these findings, it was concluded that this Feasibility Study be pursued based on a simple dry processing flowsheet. Furthermore, material between 52% Fe and 55% Fe will be stockpiled in low-grade stockpiles for processing through the dry plant at the end of the mine life. Additionally, waste material grading between 50% and 52% Fe can be segregated from other waste and stockpiled separately for the possibility of future processing, should market conditions favor such an initiative. However, for the purpose of this Study, this material is considered as waste going to the waste dump.

17.2 Process Description

The Joyce Lake DSO flowsheet consists of a two-stage dry crushing and screening process to produce "lump" and "fines" products. The process flowsheet is illustrated in Figure 17-1. A two-stage crushing circuit is required to produce material at the target size of 100% passing 31.5 mm.

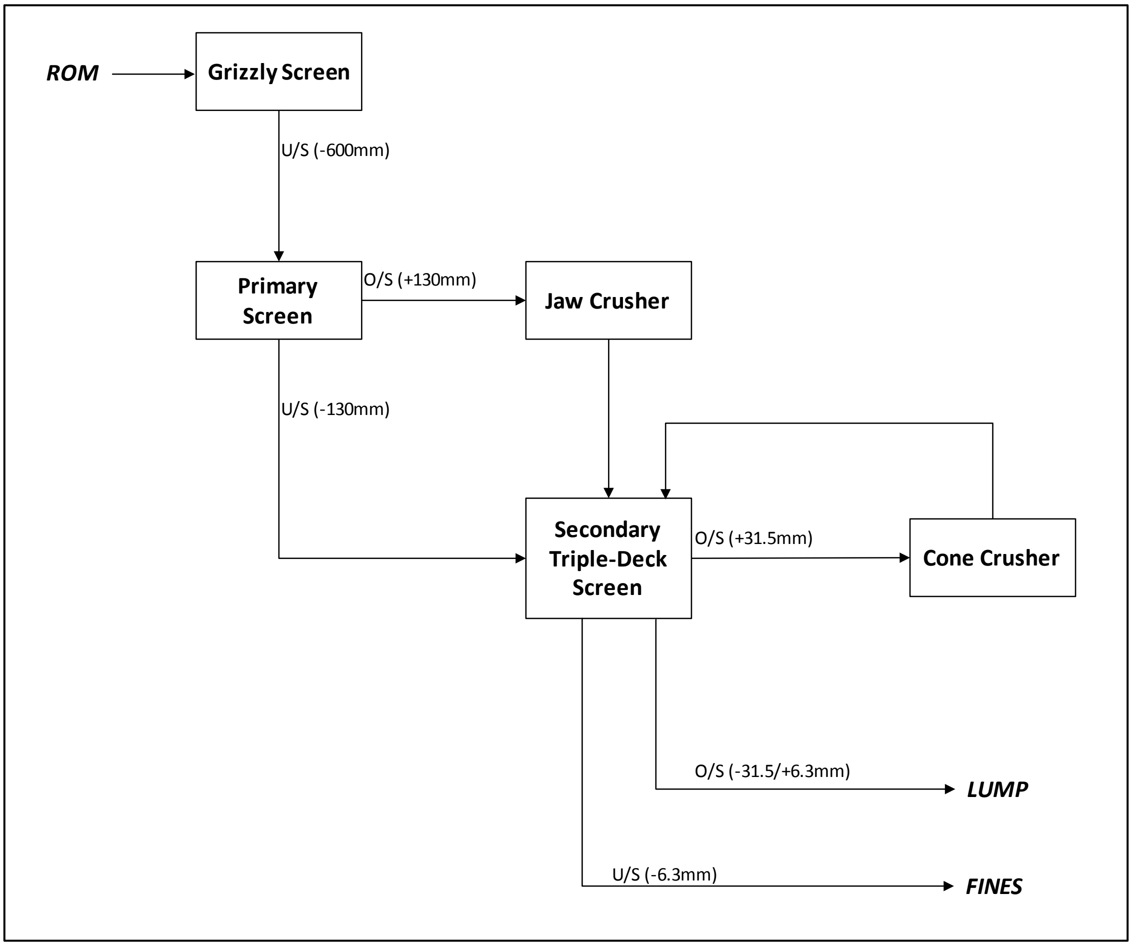


Figure 17-1: Simplified PFD for Joyce Lake Dry Processing

Following a request for budgetary proposals from various equipment vendors, several options were considered including mobile and semi mobile plants, as well as both one-line and two-line configurations. The configuration selected for this Feasibility Study is based on a two-line mobile plant with each line designed to process 50% of the total process throughput, equivalent to 350 tph. The two half-line mobile plant design was retained for reasons of cost and flexibility; including the possibility of using the two lines at separate locations during project construction should the project construction plan require such a scenario.

Process design is based on mining haul trucks delivering material from the open pit mine to the ROM ore stockpile area ahead of the process plant. Sufficient stockpiling space is provided to allow for segregating ore to allow for blending feed materials ahead of the process plant to minimize product grade variability. A dedicated front end loader of 16 t capacity is used for maintaining the ROM stockpile and for feeding the process plant.

The front-end loader transfers material from the ROM stockpile to a feed hopper fitted with a static grizzly screen to scalp off any oversized material (+600 mm). No rock breaker is provided as the +600 mm material will be rejected to a stockpile to be processed later. Once a sufficient quantity of material has accumulated, a contractor will be used to break the oversize rocks for processing. The material passing the static grizzly is directed onto a vibrating grizzly feeder that serves to separate material at 130 mm prior to the primary crushing stage. The oversize material (+130 mm) is fed to a jaw crusher where it will be crushed to a top size of 225 mm. The undersize material from the static grizzly joins the jaw crusher product and the materials are combined on a common collecting conveyor. This blended material is conveyed to a triple deck horizontal screen that separates the material into three products:

- The oversize +31.5 mm material is conveyed from the top screen deck to a cone crusher for further size reduction to a targeted top size of 32 mm;
- Lump product (-31.5/+6.3 mm);
- Fines product (-6.3 mm).

The material discharged from the cone crusher is returned to the triple deck screen. The cone crusher is therefore in closed loop with this screen thus ensuring that no material coarser than 31.5 mm is sent with the final lump product. While a double deck screen would normally suffice to separate the material into oversize, lump and fines products, a third deck was added to relieve the load on the 6 mm screen. This was done in order to alleviate excessive bed depth issues and inefficient screening that might be encountered in separating the fines and lump products. Each of the two final lump and fines products is discharged via a chute onto its respective collecting conveyor and subsequently to its respective stockpile using an appropriately designed conveyor stacking system. Each product stockpile has a design capacity to hold 16 hours of material to allow for scheduled plant maintenance shut-downs. A dedicated front-end loader of 16 t capacity is used to load product from the product stockpiles into product haul trucks that deliver product to the load-out and rail loop area.

The design also provides adequate room on the process plant pad for emergency stockpiles for both the lump and fines products should the need arise. The front end loader used for product haul truck loading would also be used for emergency product stockpile management.

Although annual product production and sales have been determined based on the annual mine plan of 2.5 Mtpa ore tonnes, the process plant design has been based on an annual maximum production of 3.0 Mtpa of product. For the purpose of this Feasibility Study, it is considered that processing starts at the ROM ore stockpile and ends with the product loaded into the product haul trucks.

17.3 Plant Feed Assumptions

The sizing of the dry crushing and screening plant for the 3.0 Mtpa capacity is highly dependent on the run of mine (ROM) particle size distribution being delivered to the plant from the mine. The proportion of lump and fines products can vary significantly with ore blasting practice in the harder ore areas of the mine, as well as the less competent ore areas of the mine.

In carrying out its crushing and grinding simulations, BBA assumed a relatively coarse ROM feed size to the plant in order to ensure sufficient processing capacity during extended periods of harder ore processing. The proposed ROM PSD (particle size distribution) to be used for design is given and illustrated in Figure 17-2.

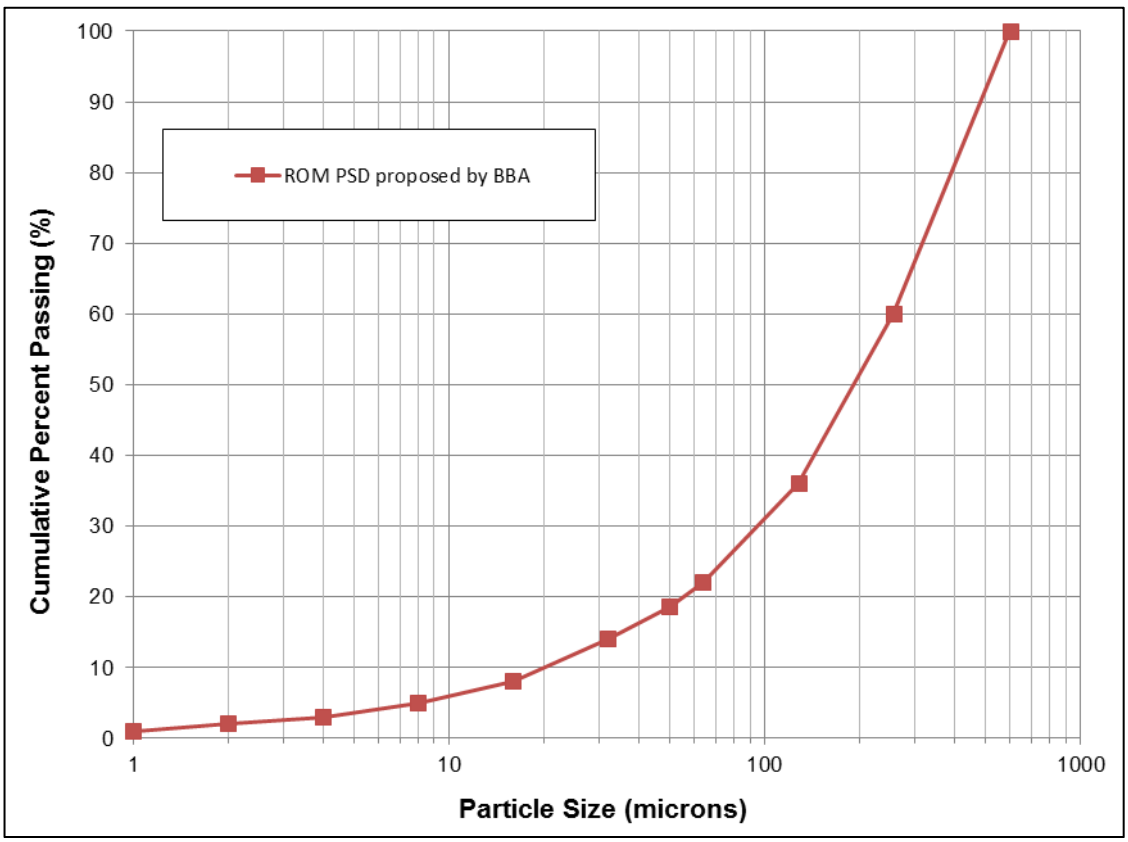


Figure 17-2: Proposed ROM PSD

Table 17-1: Proposed ROM Particle Size Distribution

Screen size (mm)	Cumulative Passing (%)
600	100
256	60
128	36
64	22
50	18.5
32	14
16	8
8	5
4	3
2	2
1	1

The crushing circuit was sized based on 100% processing of harder ores using ore hardness data from the testwork. It is understood that, during periods of mining in areas of the deposit where the ore is highly fractured, a significant amount of ore will likely bypass the jaw crusher.

17.4 Product Size Specifications

Two products are generated from the dry processing flowsheet: lump (-31.5/+6.3 mm) and fines (-6.3 mm). Lump product commands a higher selling price than the fines, therefore the crushing circuit will be designed such that production of lump is maximized. There is also a price penalty if the fines product contains fines (-100 µm) in excess of 15%. As such, the crushing circuit design seeks to minimize fines generation in the fines product and produce lump in preference to fines.

17.5 Process Design Criteria

The process plant design criteria for the Project is a combined 3.0 Mt of lump and fines product per annum on a dry basis. The ROM moisture content is assumed to average 6%. It is anticipated that the processing facility will operate for 240 days per year. It is not intended to operate the dry processing plant during the colder winter months, typically between mid-November to mid-March.

The design criteria for the Joyce Lake DSO plant is presented in Table 17-2.

Table 17-2: Process Design Criteria for the Joyce Lake DSO Processing Facility

Criteria	Unit	Value
General		
Annual plant feed (dry basis) - design	tpa	3,000,000
Annual plant feed (dry basis) - nominal	tpa	2,500,000
Operating time (days per year)	d	240
Operating time (hours per day)	h	24
Equipment utilization	%	75
Lump size	mm	6.3 - 31.5
Fines size	mm	< 6.3
Lump undersize tolerance (<8 mm)	%	10
Fines undersize tolerance (<100 µm)	%	15
Grizzly		
Separation size	mm	600
Primary Sizing Screen		
Screen aperture size	mm	130
Feed top size (F_{100})	mm	600
Jaw Crusher		
Feed top size (F_{100})	mm	600
Crusher work index	kWh/t	10.6
Abrasion work index	g	0.56
Secondary Sizing Screen		
Top deck screen aperture size	mm	31.5
Bottom deck aperture size	mm	6.3
Cone Crusher		
Crusher work index	kWh/t	10.6
Abrasion work index	g	0.56
Lump Product Stockpile		
Lump bulk density	t/m^3	2.1
Lump angle of repose	°	33.1
Stockpile capacity (~16h)	t	9,000
Emergency stockpile capacity	t	24,000
Fines Product Stockpile		
Fines bulk density	t/m^3	2.3
Fines angle of repose	°	32.4
Stockpile capacity (~16h)	t	4,000
Emergency stockpile capacity	t	24,000

17.6 Major Mechanical Equipment List

The Joyce Lake DSO flowsheet includes a static grizzly, feed hopper, vibrating grizzly feeder, jaw crusher, secondary triple-deck sizing screen and cone crusher. The design capacities and main specifications for each piece of equipment are presented in Table 17-3.

Table 17-3: Major Mechanical Equipment Specifications

Equipment	Description	No. of Units	Size	Installed Power (kW)
Grizzly	Bar spacing: 600 mm x 600 mm	2	TBD	N/A
Feed hopper	Capacity: 35 t	2	TBD	N/A
Vibrating grizzly feeder	Bar spacing at discharge: 130 mm	2	1.3m x 6.0m	30
Jaw crusher	Capacity: 240-780 tph Closed side setting: 50-175 mm	2	0.8m x 1.4m	132
Secondary screen	Triple-deck horizontal screen	2	2.1m x 6.1m	37
Cone crusher	Capacity: 150 – 470 tph Closed side setting: 13-51 mm	2	3.2m x 2.4m x 2.7m	200

17.7 Process Plant Power Requirements

The estimated power draw for the process plant will be approximately 865 kW. A breakdown of processing power demand by sector is shown in Table 17-4.

Table 17-4: Process Plant Power Demand by Area

Area	Power Demand (kW)
Portable jaw crusher plant	221
Portable screening plant	78
Portable cone crushing plant	393
Conveying	173
Total Power Demand	**865**

17.8 Process Plant Loader Operations

The ROM ore stockpile ahead of the process plant is fed by the mining haul trucks. Although the mine plan aims to provide ore blending for grade right from the pit, it may be that some additional grade blending will be required. The design provides that sufficient area is available at the ROM ore stockpile pad to segregate ROM ore according to grade to allow for blending to feed the process plant.

Processing requires the feeding of the process plant from the ROM ore stockpile. For this, one front end loader having a nominal capacity of 16 t is proposed. This loader would not only feed the process plant but would also manage the ROM ore stockpile and perform the required ore blending. A cycle time analysis indicated that this equipment would have a utilization rate of approximately 50% during the operating season.

The lump and fines products produced by the processing plant will be loaded into haul trucks for transportation to the product load out and rail loop area. A detailed analysis of product haul truck cycles was performed and will be described later in this Section of the Report. Based on the requirements of the haul truck fleet operation and cycles, a haul truck loading analysis was performed. It was determined that one front end loader, having a nominal capacity of 16 t is required to load the haul trucks and to manage the product stockpiles at the process plant, including emergency stockpiles. A cycle time analysis indicates that this equipment would have a utilization rate of about 60% during the operating season.

17.9 Product Haul Truck Operations

For this Feasibility Study, product truck haulage is considered as a separate activity and is not part of ore processing. An analysis was performed to evaluate technically robust and proven strategies and equipment for product hauling. Early in this Feasibility Study, a TOS was performed to compare hauling by truck versus extending a rail line from the main Schefferville railway to a location in proximity of the mine. This TOS is documented in a report titled “Haul Road vs Rail” dated October 6, 2014. From this TOS, it was determined that road haulage is more cost effective and was adopted for the Feasibility Study.

Following an analysis of various trucking equipment options and in consultation with vendors, it was decided that, for the Feasibility Study, product hauling would be by a bi-train trailer configuration using two side dump trailers, each with a 75 tonne capacity. The truck fleet requirements were estimated using the design parameters indicated in Table 17-5.

Table 17-5: Haul Truck Fleet Design Parameters

Criterion	Value	Unit
Hauling distance (Plant to Rail Loop)	43	km
Annual production	2,500,000	tpa (dry)
Annual tonnage for material handling	2,650,000	tpa (wet @ 6%)
Days per year	240	d
Daily hauling requirements (nominal)	11,042	t/d (wet)
Truck utilization	20	h/d
Truck hauling capacity	145	t/trip
# of hauls per day for fleet	76	Loads/d
Max speed loaded	50	km/h
Max speed unloaded	80	km/h
Loading time at plant	12	min
Nominal cycle distance	86	km
Nominal cycle time	138	min
Truck average speed	42	km/h
Truck operating Time	1,200	min / day
Trips per day/truck (rounded down)	8	-
Tonnes per truck	1,160	t
Plant tonnes per day	11,042	t
Trucks required in fleet	9.5	# required
Trucks (rounded)	10	# required

This analysis concludes that a fleet of ten product haul trucks will be required based on an annual nominal production of 2.5 Mt. Fleet requirements can be adjusted based on the annual mine production plan. It is recommended that one additional truck be provided as emergency back-up to the 10 truck fleet to assure sufficient hauling capacity during scheduled and emergency maintenance.

18 PROJECT INFRASTRUCTURE

This Chapter describes the major infrastructure required to support the Joyce Lake DSO Project. The Project is staged in two main areas. The open pit mine site area, located to the north of the Iron Arm water body, incorporates the mineral deposit as well as the processing facility and worker's permanent camp. The product load out and rail loop area, located to the east of the main Schefferville rail line, incorporates the main product stockpile, a 6.9 km rail loop and facilities and equipment for loading railcars. These two areas are connected by a new product haul road covering a distance of 43 km. This includes a new rock causeway crossing the Iron Arm water body, which is to be used for year-round access to the open pit mine area. Access to the site from the town of Schefferville, Quebec is by an existing road that will be overhauled and extended to connect with the aforementioned product haul road. LCIO will not build, own or operate any other facility outside of the aforementioned Project areas. Product rail transportation services, from the Project rail loop connecting to the main Schefferville railway, will be contracted from service providers, as will product unloading and ship loading at a third party port terminal facility.

Mining operations during the LOM are planned to take place year-round. Processing, product hauling, rail transportation and shipping are planned for eight months of the year, thus avoiding potential problems related to processing and transporting of humid product over the cold winter months.

18.1 Project General Arrangement and Site Plan

Figure 18-1, Figure 18-2, and Figure 18-3 present the general plan of the Project and surrounding areas, a close-up of the open pit mine area and a close-up of the product load-out and rail loop area. The following approach was taken in order to develop the site plan:

- As a rule, major site infrastructure, including waste and overburden stockpiles, was kept outside of mineralized areas. Although LCIO has not performed any condemnation drilling in the designated areas for the waste piles, local geology, and mineralization trends do not indicate the presence of any mineable mineralization enriched iron zones outside of the Joyce Lake estimated mineral resources.
- For this Feasibility Study, a geotechnical survey was performed by LMV, as documented in its report. Geomorphological analyses supported by limited geotechnical drilling data were used to optimize the location of roads pads, the rail loop and water crossings. The geotechnical survey also identified the location of possible borrow materials for construction. This was captured in the proposed site general arrangement.
- The haul road is kept within the Labrador provincial boundaries and avoids routing over claims held by others, as based on information provided to BBA by LCIO.

- The ultimate open-pit mine footprint has been determined from the mineral reserve calculations based on the mineral reserve estimate, as presented in Chapter 15 of this Report.
- The open pit infringes on the footprint of Joyce Lake and therefore the lake must be drained and surface water must be managed accordingly.
- In order to minimize impact on the environment and to facilitate permitting, the following measures and design features have been considered during the course of the site plan development:
  - Major stream crossings were identified by the Stantec water management team and appropriate culvert and bridge design has been adopted.
  - All new project infrastructures are located within Labrador. No new roads or other new infrastructure are being considered within Quebec.
  - The existing access road from Schefferville to the existing LCIO exploration camp is part of the project and this road will be upgraded to facilitate access to the project and also to benefit the community once operations at Joyce Lake are terminated.
  - Two existing roads running north/south, one to the east and one to the west of the main Schefferville rail line will be used, but only during the construction phase of the Project, in order to allow access to the planned product load out and rail loop area.
  - Project design incorporates components and features such as a mobile dry processing plant, a modular worker camp, a centralized diesel power generation plant and modular buildings for easy relocation to other projects and for easy site restoration.
  - The DSO project has a 100% recovery of processed material and generates no process rejects so no disposal of such rejects is required.
  - Crossing of the Iron Arm water body is done using a 1.2 km long rock causeway. Design provides for two bridges within the causeway allowing fish passage and passage for leisure boaters.
  - Roads and causeway are designed so as to remain in place and benefit the community once operations at Joyce Lake cease.

- The project is not connected to an electric power utility grid and generates its own power using diesel generator sets. Electric power is provided to the main mine area infrastructure by a centralized diesel power generation station through a local power distribution grid. More remote infrastructure will have local generators for their specific power requirements.

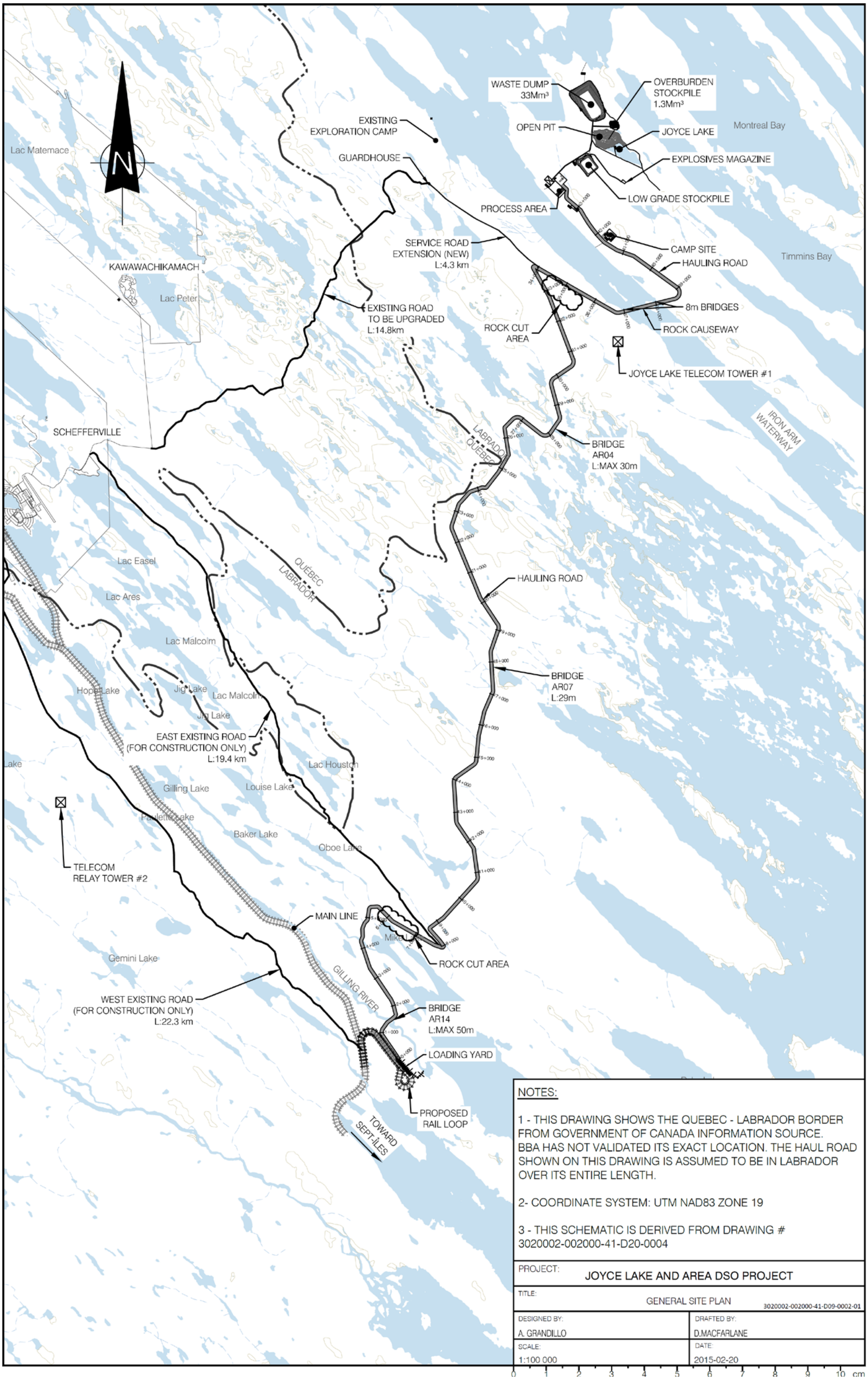


Figure 18-1: Project and Surrounding Area

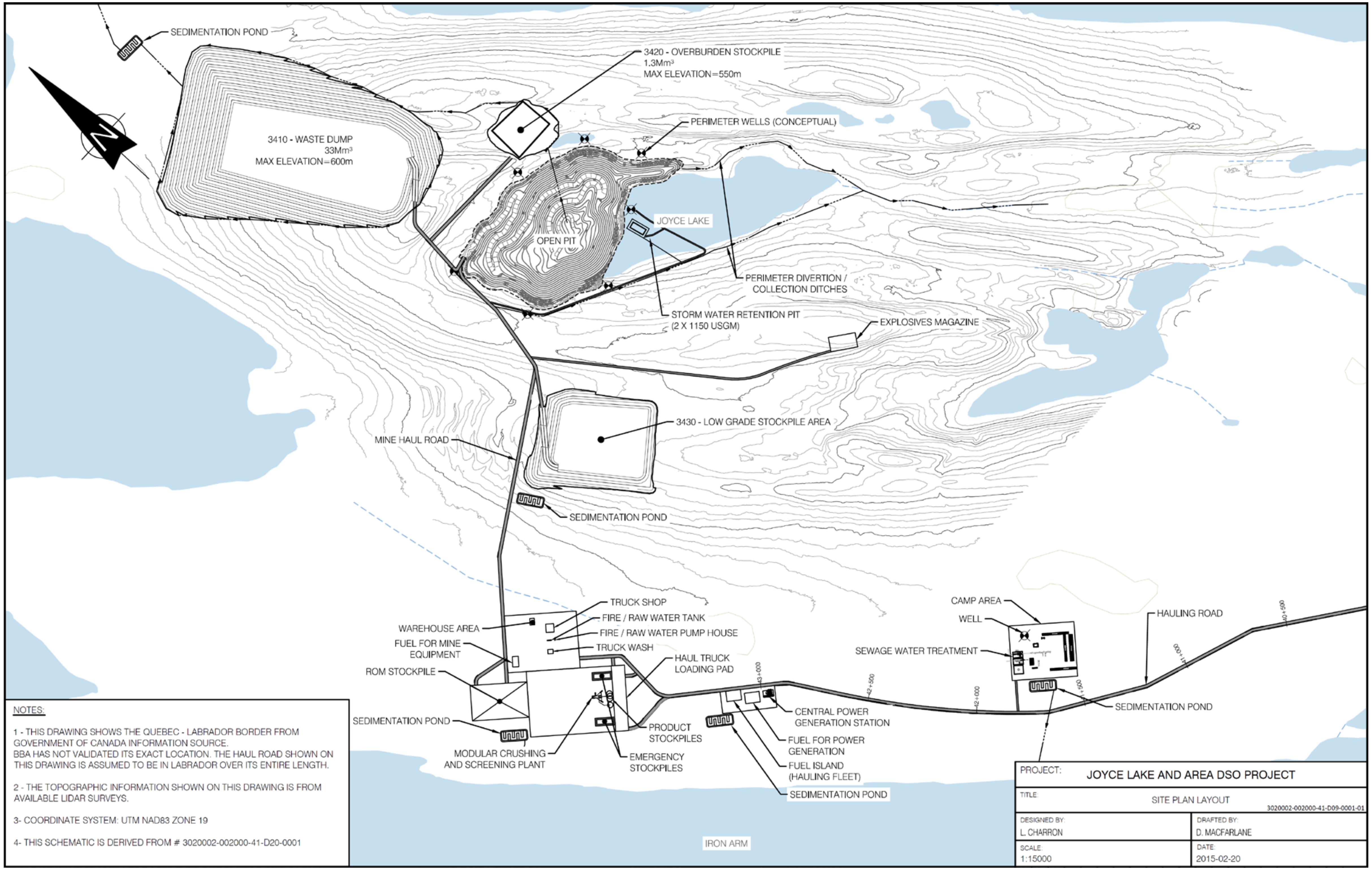
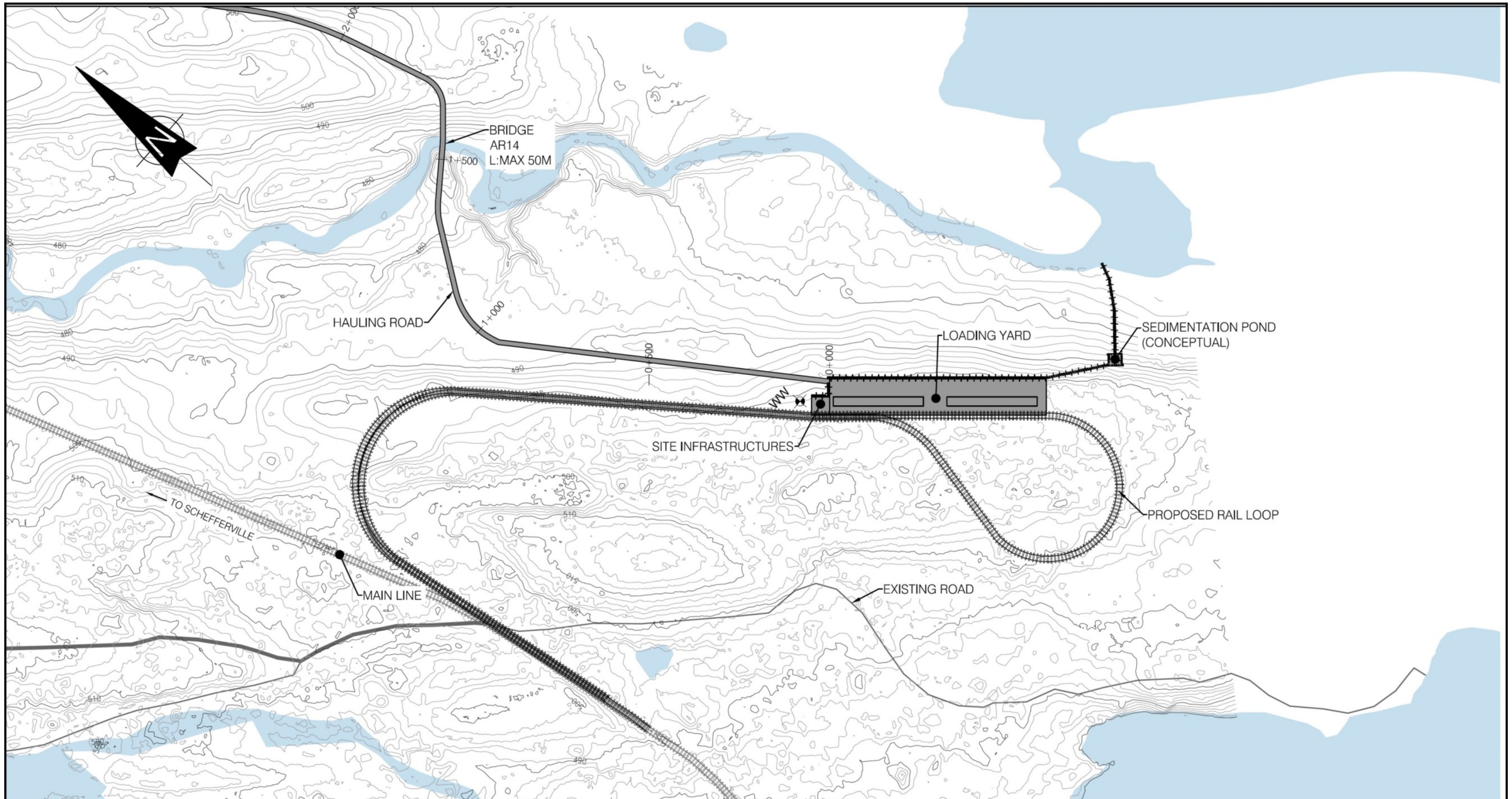


Figure 18-2: Sketch of Open Pit Mine Area



NOTES:

1 - THIS DRAWING SHOWS THE QUEBEC - LABRADOR BORDER FROM GOVERNMENT OF CANADA INFORMATION SOURCE. BBA HAS NOT VALIDATED ITS EXACT LOCATION. THE HAUL ROAD SHOWN ON THIS DRAWING IS ASSUMED TO BE IN LABRADOR OVER ITS ENTIRE LENGTH.

2 - THE TOPOGRAPHIC INFORMATION AREAS SHOWN ON THIS DRAWING IS FROM AVAILABLE LIDAR SURVEYS.

3- COORDINATE SYSTEM: UTM NAD83 ZONE 19

4 - THIS SCHEMATIC IS DERIVED FROM DRAWING # 3020002-002000-41-D20-0004

PROJECT: JOYCE LAKE AND AREA DSO PROJECT	
TITLE: RAIL LOOP LAYOUT	
DESIGNED BY: L. CHARRON	DRAFTED BY: D. MACFARLANE
SCALE: 1:10 000	DATE: 2015-01-22

Figure 18-3: Project Load Out and Rail Loop Area

18.2 Description of Major Project Infrastructure and Activities

Schefferville is located in Quebec about 20 km to the south west of the Joyce Lake deposit, which is located in Labrador. Existing project infrastructure is currently limited to a 20 bed camp, used by LCIO for staging its exploration activities in the area. This exploration camp is located to the west of the Joyce Lake deposit. The Iron Arm waterway separates the exploration camp from the project mine area. This camp site includes two helicopter pads. A modular barge having a capacity of about 20 t is stored at the camp site. Past activity on the project has been limited to exploration. An existing 21.4 km access road connects Schefferville to the exploration camp. This road is frequently used by LCIO personnel to access the camp, as well as by local residents to access their cottages.

18.2.1 Access to Project Areas During Construction

As mentioned earlier, the Project is staged in two areas; the open pit mine area where mining and processing take place, and the product load-out and rail loop area where product is loaded into railcars and transported to port. Mining takes place year round and processing takes place over eight months of the year, generally from mid-March to mid-November.

During construction of the Project, access to the open pit mine area from Schefferville will be from the existing road running to the existing LCIO exploration camp. This 14.8 km road is in relatively good condition but requires some upgrading for it to serve adequately for the construction phase of the project, as well as to support traffic for operations. A new road extension of about 4.3 km, located entirely within Labrador, needs to be constructed along the south side of Iron Arm in order to connect the existing Schefferville access road to the planned haul truck road, which in turn, will connect to the mine site by means of the new rock causeway that is part of the Project. Construction of the access road system, including the rock causeway, is planned to take place early in project development, once all permits are obtained. This will allow unhindered access from Schefferville to the open pit mine area and will allow pre-stripping mining operations to begin, as well as construction of all mine site infrastructure according to the construction schedule developed. This approach will allow for haul road construction to begin from east to west.

Project construction would benefit from having a well situated staging area for storage and assembly of equipment and materials. The existing old Schefferville airport clearing, located about 9.3 km from Schefferville, within the province of Quebec, is well situated to serve this purpose. This area is relatively flat and clear and would be ideal for use during the Project construction phase as a staging area to store materials and preassemble project equipment.

Project construction is planned to take place simultaneously at the open pit mine area and at the product load-out and rail loop area. To access the product load-out and rail loop area, there are two existing roads available. One of these roads, located to the east of the main line railroad and currently used by Labrador Iron Mines (LIM) to access the Houston deposit, is planned to be used as an access during construction of the Gilling River bridge crossing from the east. The other road, to the west of the main line railroad, is planned to be used to access the Project load out and rail loop area located to the west of the Gilling River. These two roads provide all the access required to allow for optimal construction planning of the load out and rail loop area infrastructure.

Topography at the planned rail loop and load out area indicates that significant blasting will be required and a cut and fill construction method will need to be used to achieve design slopes for the railway. Site geotechnical data has confirmed that materials generated from blasting in this area can be used as borrow materials for construction of the rail loop and load out area pad, as well as for the haul road. It is estimated that enough material will be generated to allow for construction of all the rail loop and load out area pads, as well as for construction of about 17 km of the haul road from west to east. Thus, construction of the haul road can take place simultaneously from both ends of the main Project infrastructure, greatly benefiting the overall project construction schedule. The major bridge crossing over Gilling River can therefore be built from both sides of the river and, once built and available, the bridge will provide unhindered access to the rail loop area from the east.

It should be noted that the two aforementioned existing access roads are only planned for use during construction and are not planned to be used as part of the Project operation.

18.2.2 Main Access Road to Project Areas During Operations

The previously mentioned road from Schefferville to the existing LCIO exploration camp will be used for regular access to the Project on a year-round basis during operations. Part of the existing road (about 5.1 km) from Schefferville to the Kawawachikamach First Nations reserve cut-off is in excellent shape and is maintained by the Quebec provincial government. The existing road from the Kawawachikamach cut-off to the LCIO exploration camp will be used during Project construction and operation to transport personnel, goods, equipment, fuel, etc. between the Project areas and the local communities. As previously mentioned, the road is overhauled prior to the start of construction.

A 4.3 km extension to the existing and upgraded access road will be required to connect to the planned product haul road in order to provide access to the two Project areas. This new road will be entirely within Labrador.

18.2.3 Product Haul Road

The product haul road connects the process plant product pad at the mine site to the product load out and rail loop area located at a distance of 43 km. Although this road is primarily designed and intended for product haulage using off-road 150 t capacity bi-train type haul trucks, it will also serve, for part of its length, for vehicles transporting personnel, fuel and other goods to both the mine site area and the product load-out area. This road is designed for heavy traffic and is engineered based on specific topographical and geotechnical features over its length. The width of the road is 10 m. Figure 18-4 provides a typical cut of the layers of materials used for its construction. The thickness of the lower structural layers can vary according to specific local geotechnical characteristics.

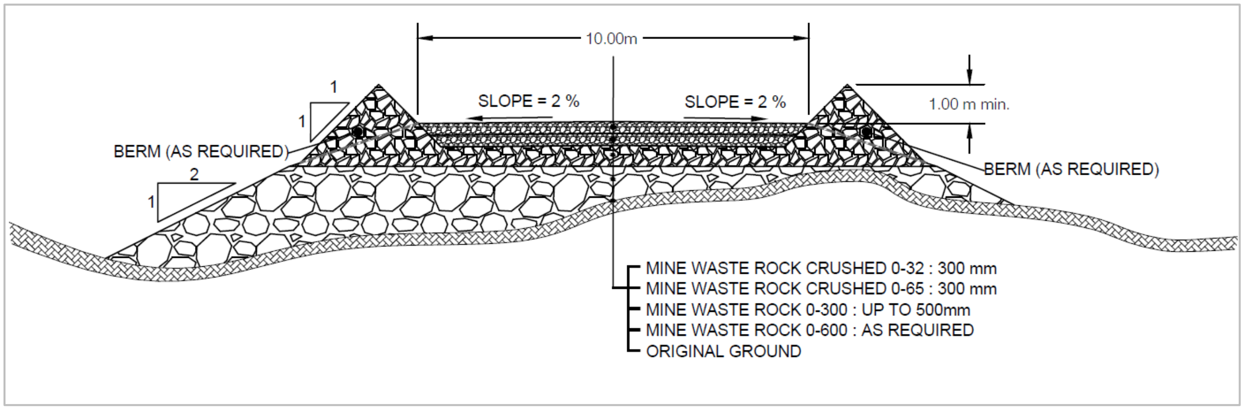


Figure 18-4: Typical Product Haul Road Profile (not to scale)

Water crossings along the haul road have been designed and engineered based on recommendations made by the Stantec water management team. Stantec's recommendations were based on historical and recently collected data.

Crossing of the Iron Arm water body to access the mine site area was the subject of a trade-off study performed by BBA early in the feasibility study. Results of this study are detailed in the report entitled "Iron Arm Crossing". This study compared various means of crossing the waterway for product, as well as for personnel, materials and equipment. The trade-off study concluded that the construction of a rock causeway would be the safest, most practical, flexible and cost effective method of crossing Iron Arm and this was retained for this feasibility study. The proposed rock causeway was located in an area of favourable bathymetry requiring minimal fill material for construction. The causeway length is 1.2 km from shore to shore. Design provides for two 8 m span bridges within the length of the causeway allowing for fish movement as well as for boating activities, as per Government guidelines. Design is such that the causeway can remain for the benefit of the community after mining activities are concluded.

A typical cross-section of the causeway and a schematic of a bridge span are presented in Figure 18-5 and Figure 18-6 respectively.

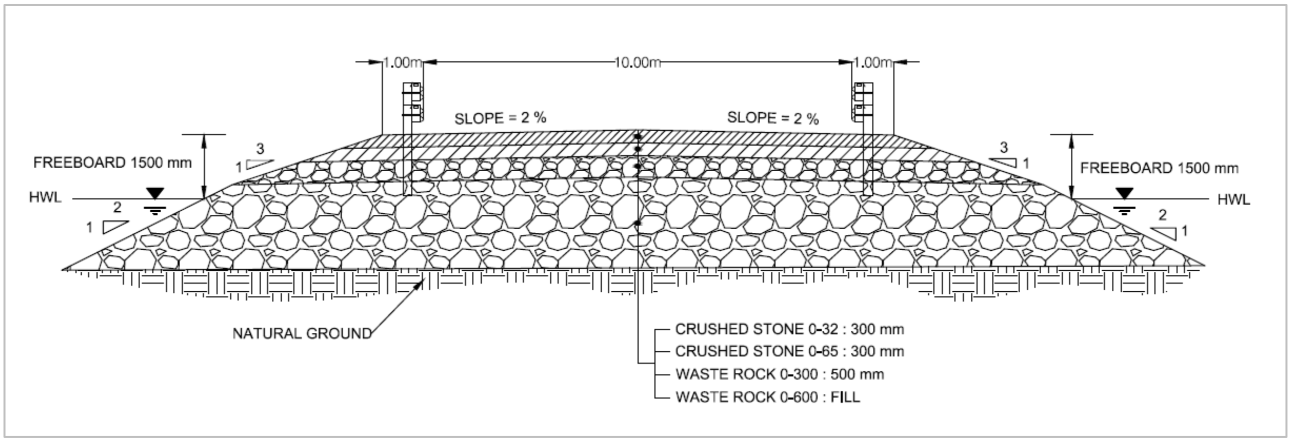


Figure 18-5: Typical Cross-section View of the Causeway (not to scale)

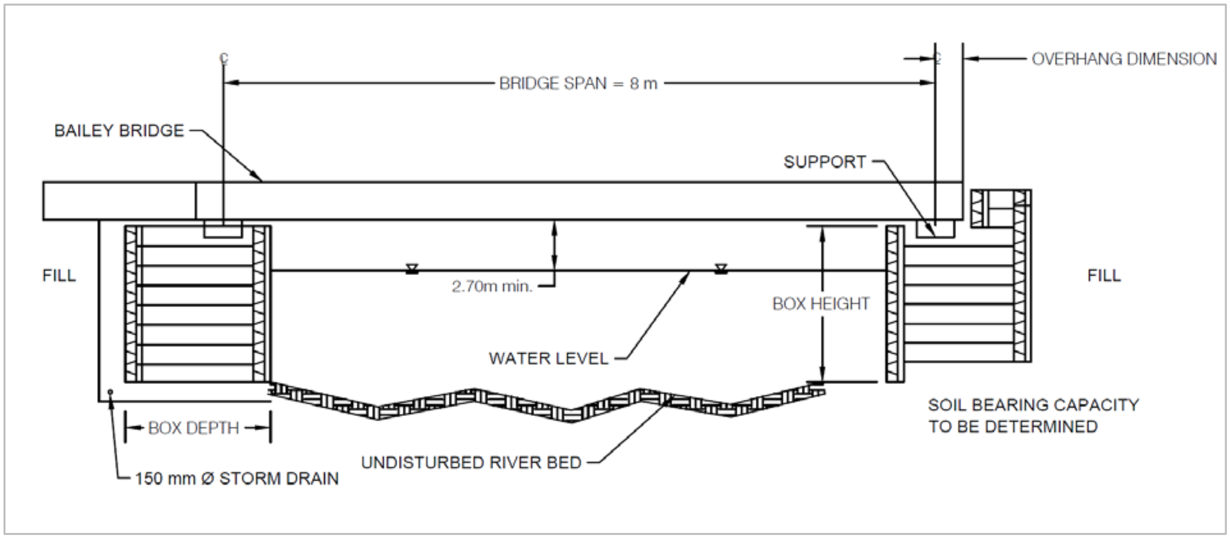


Figure 18-6: Schematic Causeway Bridge Span (not to scale)

18.2.4 Mine Site Roads

The mine haul roads were designed to accommodate the selected mining truck fleet, as described in Chapter 16. The roads connect the open pit to the waste rock and overburden piles, as well as to the process plant and mine garage. Secondary roads are provided in the area in order to access the explosives magazine and the pit perimeter dewatering stations.

18.2.5 Site Infrastructure Drainage

Storm water and surface run-off water are managed according to Stantec's recommendations. Pads underlying surface infrastructure are drained and water is collected in peripheral ditches and directed into sedimentation basins where solids are allowed to settle before water is released into the watershed.

18.2.6 Mine Operations and Maintenance

Truck Shop

The truck shop building consists of a structure supported on a series of functional containers. The steel truss roofing system is covered by a fabric membrane. Inside, the rig-mat type flooring system is assembled on site and eliminates the need for a poured concrete pad. The HVAC system included within the Truck Shop consists of a diesel fuel powered heating system. It also includes all the ducts and exhaust dampers required to meet air change requirements, as well as a diesel day tank.

The truck maintenance shop consists of six identically sized garage bays in a back-to-back configuration sized to accommodate CAT 777 or equivalent mine trucks, as well as other mobile mining equipment. The product haul trucks will also be serviced in this facility. Mine truck tire changing will require coordination with adjacent bays in the garage or can be performed outside, weather permitting. The mine truck dump boxes can only be removed outside using a mobile crane. A 15-tonne gantry crane is provided in the garage bays for heavy lifting duties. A sketch of the truck shop is presented in Figure 18-7.

Oils, coolant and windshield water solution used for truck oil changes and maintenance will be stored in interchangeable totes. Used oils, lubricants and coolants will be collected and stored in interchangeable totes (bins) and appropriately disposed of through a third party service provider.

Potable water will be supplied to the building in water bottles and raw water will be stored in a 5,700 L tank for use in the garage bays. The raw water will be sourced from a nearby well.

Sewage will be collected in a 5,700 L tank and transported to the sewage treatment system located near the permanent camp.

The aforementioned pre-assembled containers, acting as supports for the roof system, will incorporate four office spaces for maintenance mine management personnel, a 30-person lunch room, washrooms, a mechanical room, an electrical room, oil storage and small parts storage.

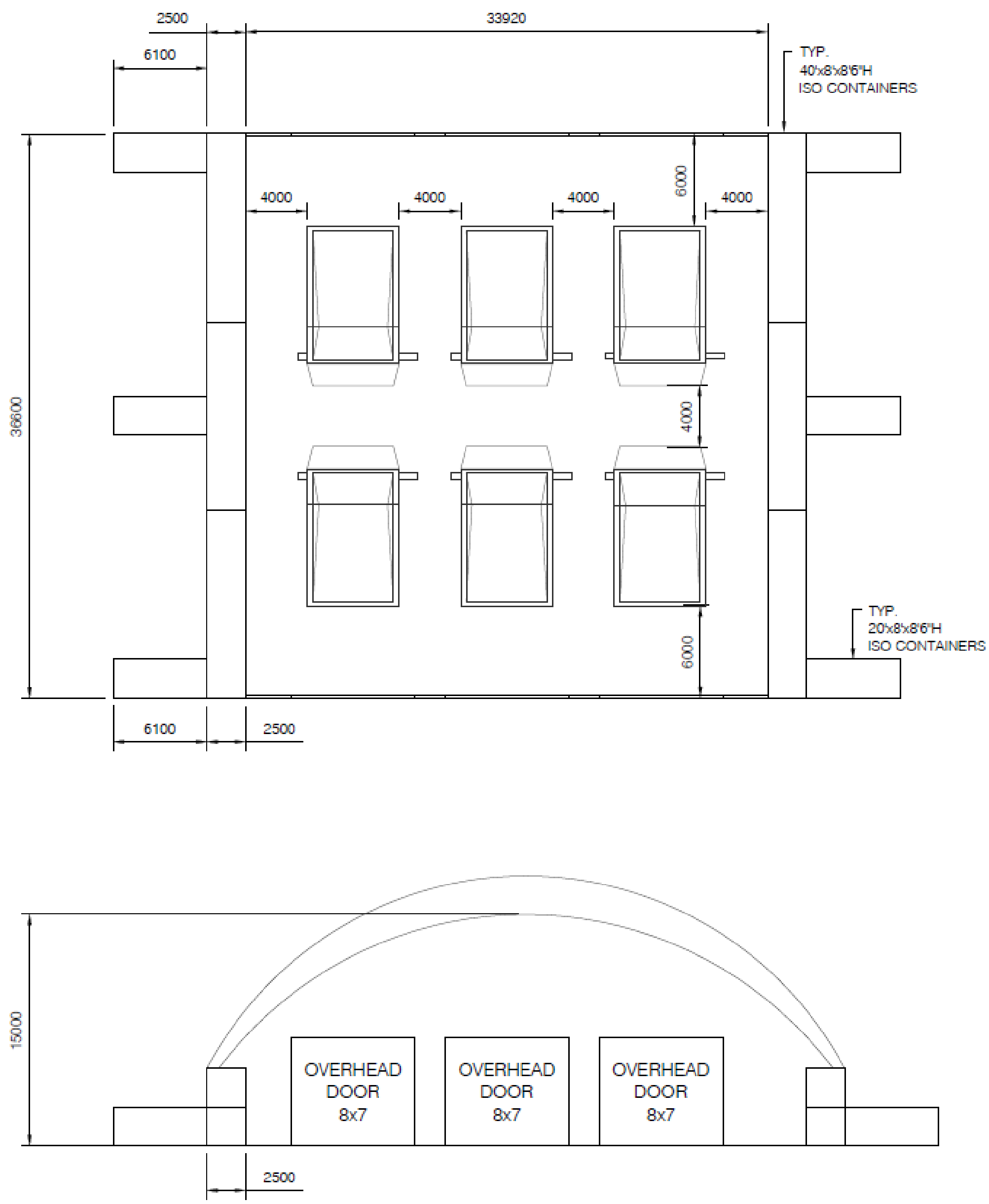


Figure 18-7: Truck Shop Overhead and Cross-section Views

Truck Wash

The Truck Wash building consists of a structure, built in the same configuration as the garage, using containers as part of the structure.

The truck washing package system includes two hoses for high flow/low pressure water and two hoses for low flow/high pressure water for finishing. Flooring in the truck wash bay consists of a steel hydropad that drains into a system designed to separate large solids and a filtering system that recycles the water. Raw water is used as make-up water, which is supplied from a nearby well.

Warehouse

The warehouse consists of a dome structure supported by prefabricated concrete blocks sitting on a gravel pad. The warehouse will include racking and open space for larger pieces of equipment. It is not planned to heat the warehouse. Should heating be required, space heaters can be used.

18.2.7 Dry Processing Plant

The dry processing dual-line plant, located approximately 2 km southwest of the open pit mine, consists of mobile jaw crushing, screening, cone crushing and conveyor systems. A more detailed description of the processing facilities is provided in Chapter 17.

18.2.8 Central Power Plant and Stand-Alone Generator Sets

All electric power for the project will be generated using diesel powered generators. Overall power requirements for the Project have been estimated on a monthly basis, giving due consideration to the fact that some areas are not operated during the winter months. Design provides that the aforementioned, diesel generators are in two configurations:

- A centralized power plant with generator sets (genset) will produce electric power that will be distributed through a local grid to the permanent workers camp, administration building, mine maintenance area, service areas and the process plant. A central power plant offers the advantage of load sharing between the generators, as well as shared redundancy, thus less installed power is required.
- Stand-alone local generators for more remote areas such as the rail loop, telecom towers, guardhouse, perimeter and open pit mine dewatering stations, etc.

The centralized power plant design consists of five 600 V, 818 kW prime-rated generator sets, each complemented by a step-up transformer (0.6-13.8 kV) delivering power to the processing plant, the mine infrastructure facilities (mine offices, truck shop, wash bay and warehouse), the permanent camp and the administrative buildings via 13.8 kV overhead lines. When the processing plant is in operation (8 months out of 12), the centralized power plant will operate with four generator sets running and one generator set in standby mode. During the winter months, when processing is curtailed and only mining operations are carried out, three generator sets will be running and two will be in standby mode.

Remote areas (rail-loop area, explosives magazine area, telecom towers, guard-house, pit perimeter dewatering pumps) will be fed by independent, stand-alone 600 V diesel generator sets.

The estimated power demand used for design of the central power plant is 2.4 MW. It should be noted that the process plant is operating only eight months of the year. As such, power requirements vary from month to month and from season to season. Average annual power consumption to be supplied by the central power plant is estimated at 14.1 GWh. A single-line diagram for the centralized power plant is presented in Figure 18-8. A general power demand profile, as well as average annual diesel consumption by area, is presented in Table 18-1. An estimate of the annual fuel consumption for the stand-alone diesel generator stations is presented in Table 18-2.

Table 18-1: Joyce Lake Site Power Demand – Centralized Power Plant

Area	Power Demand (kW)	Annual Diesel Consumption (L)
Permanent camp	470 - 750	1,287,000
Administration buildings	79 - 125	215,000
Mine infrastructures (mine office, truck shop, wash bay, warehouse, etc.)	450	950,000
Crushing/screening process plant	933 (8 mo)	1,313,000
Network losses (2%)	*44*	*Incl.*
Design margin (10%)	*223*	*Incl.*
TOTAL	**1,500 - 2,400**	**3,765,000**

Table 18-2: Joyce Lake Site Power Demand – Stand-alone Generators

Area		Annual Diesel Fuel Consumption (L)
Stand-Alone Generators	Explosives Magazine	27,000
	Rail-loop	48,200
	Guard-house	14,600
	Telecom Towers	11,400
	Mine Perimeter Wells	803,300
TOTAL		**904,500**

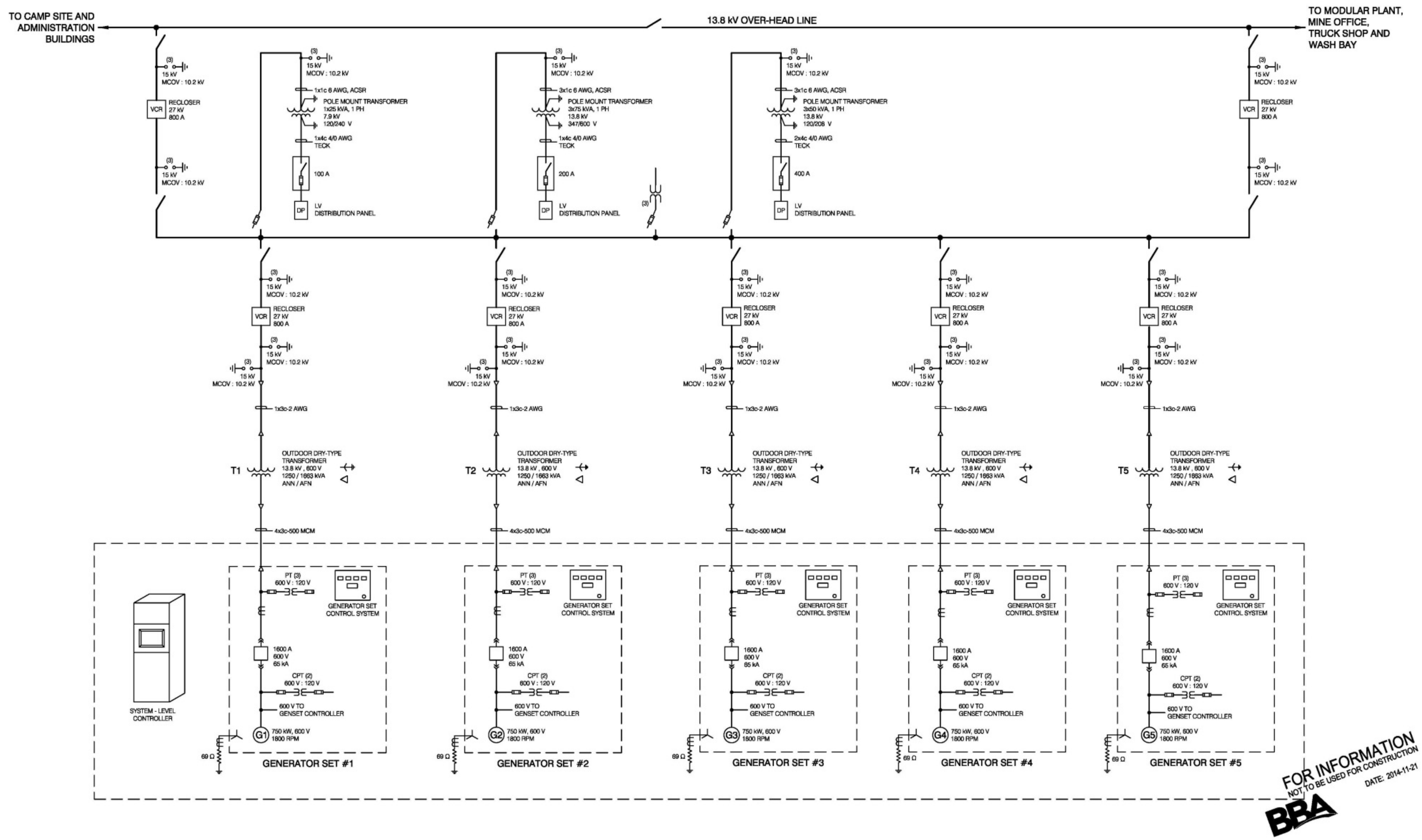


Figure 18-8: Single-Line Diagram

18.2.9 Fuel Storage and Management

Fuel for mining equipment, product haul trucks, wheel loaders, auxiliary equipment and for the diesel generators will be railed in to the Schefferville rail terminal from Sept-Îles. Total diesel fuel consumption at the peak years of operation has been estimated at 1.17 M litres per month in the winter months and 1.75 M litres per month during the months when processing and product hauling take place.

To handle this volume, six rail tanker cars, each having a capacity of 96,000 litres, will be required to deliver fuel from the Sept-Îles terminal to Schefferville rail terminal at a rate of once per week. Fuel is stored in the tanker railcars and a local service provider will transport fuel from the tanker cars to the site. These logistics require that two sets of three railcar tankers will be needed to deliver the fuel to meet the required cycle time. The local service provider will transport fuel to site using 20,000 litre capacity tanker trucks. At peak consumption during summer months, three tanker trucks per day would need to be delivered to site.

Fuel is stored on site in different areas in proximity of its end users, as shown in the general site plan. Fuel storage is done in skid type, double-walled horizontal tanks each having a 50,000 litre capacity, with integrated containment and overfill protection. Each of the fuel storage areas, with the exception of the central power plant, is equipped with a fueling station with metering. A dedicated small capacity fuel truck will be part of the site infrastructure mobile fleet and will distribute fuel to remote stations and users such as in pit mining equipment, dewatering pumping stations, telecom towers, etc. Gasoline for light vehicles will be purchased directly from a distributor in the nearby communities and delivered to site. Table 18-3 outlines the various fuel storage areas and holding capacities.

Table 18-3: Joyce Lake Fuel Storage Stations

Fueling Station	Fuel Type	Tank Capacity (L)	Equipment Serviced
Mine Equipment Station	Diesel	1 X 50,000	Mine trucks and auxiliary mining equipment.
Power Plant Station	Diesel	2 X 50,000	Central power plant and stand-alone generators.
Product Haul Truck Station	Diesel	1 X 50,000	Product haul trucks.
Pickup Truck Station	Gasoline	1 X 5,000	Site pick-up trucks.
Rail-Loop Station	Diesel	1 X 50,000	Loaders and local generator.

18.2.10 Site Services

Potable water

Potable water is supplied to the permanent camp from a water treatment system located near the camp that will treat fresh water supplied from a water well. The treatment facility will be sized for a 144 person camp.

Water lines connected to the camp will be contained inside a heated utility tunnel to prevent freezing during winter months. Potable water for the other buildings and areas on site will be supplied with water bottles.

Raw water

Raw water will be supplied by three water wells, one for the Truck Shop and Truck Wash bay, one for the Permanent Camp and one for the Load-Out and Rail-Loop area. Each well will be located in the vicinity of the buildings for nearby water supply. The raw water wells will also be used to fill the fire water tanks on site.

Fire water

Fire water will be stored and supplied to the permanent camp and to the truck shop according to NFPA requirements. Dedicated 200,000 litre tanks will supply fire water sourced from the raw water wells, as previously described.

Sewage treatment

A centralized sewage treatment facility for the entire site will be located at the workers camp. Sewage collected from the truck shop and rail-loop areas will be transported to the workers camp treatment system using a septic tanker truck or totes. The sewage treatment system will develop quantities of solid waste that will be disposed of through a contracted service in Schefferville.

18.2.11 Product Load-Out and Rail Loop Area

The product load-out and rail loop area is located south of the mine site at the end of the 43 km product haul road. A rail loop with 6.9 km of track will be constructed connecting to the existing Schefferville railway line. The product haul trucks arriving from the processing plant will dump the lump and fines products onto two stockpiles built on a 600 m x 100 m pad. The stockpiles each have a capacity of 24,000 t. Wheel loaders load product into railcars. Each railcar is weighed to make sure that weights are optimized without exceeding limits. As is the case with the process plant, product hauling only takes place over eight months of the year.

During the winter months when no product shipping takes place, the product railcars will be stored on the rail loop, which is of sufficient length to allow for storage of two train sets (480 railcars) and the locomotives. LCIO will provide the railcars for product transportation and for diesel supply to the project. It is assumed that the rail transportation service provider operating the main Schefferville rail system will operate the locomotives provided by the main line service provider, as well as an area and the required rail track where it can put aside non-conforming railcars, store diesel fuel for its locomotives and its dispatch system.

The load out area infrastructure includes three trailers housing a dispatch office, a dry room and a lunch room, each able to receive up to six workers. Potable water for these facilities will be supplied in bottles and a provision for chemical, maintenance free toilets has been made to avoid the installation of sewage containment units. The product loading loaders will have a designated area on an open pad for light maintenance and oil changes.

18.2.12 Permanent Camp

The permanent workers camp is located about 2 km from the processing plant. The modular, trailer type camp contains a total of 144 single-beds rooms and ancillary facilities. The design provides that two dormitory wings, each having two floors, are connected by a central core area. The central core will include a reception, offices, kitchen and dining area, laundry area, recreational area and gym. The reception area, used to control arrivals and departures of workers, will consist of a waiting area, temporary luggage storage, washrooms and camp management offices. The plant administration office is located within the camp facility and consists of five offices and twenty workstations intended mainly for operations management. The kitchen and dining area, serving breakfast and dinner, will accommodate 80 people at a time.

The two dormitory wings each contain 72 rooms on two floors. Each room is provided with individual toilet, sink and shower, a phone and television with cable access. Wireless internet will be available in each room. The facilities will be designed in such a way that it will be possible to add dormitory modules to the central core, should it become necessary during operations.

Laundry facilities will be located on each floor and will be available for personal laundry, while work clothes and bed linens will be washed in the central core.

18.2.13 Telecom

The Telecom, IT and networking systems designed for the Project include:

- UHF/VHF mobile radio;
- Telephony services;
- Internet access;
- Engineering IT Services (hardware and software for engineering applications);
- Corporate IT services (hardware and software for corporate applications);
- Process Control Networking (links between parts of the process);
- Wide Area Networking (link to the Internet and external phone lines);
- Campus Area Networking (wired and wireless links between facilities);
- Local Area Networking (wired and wireless links within facilities);
- Network Security;
- Cable TV services;
- Emergency backup communications.

These services will be installed progressively depending on when they are needed during the Early Works, Construction and Operation phases of the project.

18.2.14 Waste and Overburden Piles

An area is designated for waste piles segregating waste rock, overburden, topsoil and low grade material considered as waste. Design of the waste piles is discussed in Chapter 16 of this Report.

18.2.15 Low Grade Stockpile

During mining operations, low grade materials grading 52-55% Fe will be stockpiled for processing at the end of mine life. The stockpile, located between the mine and processing facility, will be constructed on a leveled pad made of appropriate mine waste materials.

18.2.16 Other Site Infrastructure

Laboratory

An on-site laboratory is provided for sample preparation and chemical analysis for samples collected from the mining operation, process and product stockpiles. The laboratory is housed within three modular trailers. The sample preparation area contains crushers, pulverisers and sieves. The analytical area contains an XRF machine for chemical analysis and all required auxiliaries including a fluxer, furnace and an assortment of labware. Each area will be equipped with appropriate safety equipment.

Explosives magazine

Explosives will not be produced or stored on site. Explosive accessories will be stored in a magazine located near the mine and will be managed by the retained blasting contractor. An area for locating an explosives magazine has been provided on the site.

Guardhouse

The guardhouse consists of a trailer located ahead of the junction where the new access road extension joins the new product haul road. The guard is there to monitor and control traffic and access. The trailer will be complete with two workstations, a lunchroom and self-contained washroom facilities.

18.3 Surface Water Management

The design provides that perimeter trenches be constructed along the north and south of the open pit and Joyce Lake, as recommended by Stantec. The catchment trench system collects surface run-off water that normally drains into Joyce Lake and discharges it into the watershed where Joyce Lake naturally drains. These trenches are also used to collect water pumped from the open pit perimeter wells and water pumped from the trench system at the bottom of Joyce Lake. This system is designed to collect surface water and precipitation inside the Joyce Lake footprint to avoid draining into the open pit.

18.3.1 Joyce Lake Initial Drainage and Dewatering During Operations

Joyce Lake is of variable depth, from approximately 2 m near its discharge to about 20 m at its intersection with the open pit. Total water volume contained is estimated at 3 Mm^3. The mine plan requires that Joyce Lake be drained by the end of the first year of mining operations however; construction and water management strategy requires that the lake begin being drained during the construction period. Stantec provided rates and volumes for draining the lake. Water will be pumped using a floating barge and a series of pumps sized to provide the required flowrates to allow for draining over a non-consecutive period of four to six months. Consideration was given to constrain pumping rates in order to not exceed actual maximum rates for flowing from Joyce Lake into the watershed. As such, during the construction period, it is planned for two thirds of Joyce Lake to be emptied between the months of August and October. The remaining third of the lake will be emptied progressively during the first year of operations.

Once emptied, any water from surface drainage and from direct precipitation into Joyce Lake would naturally drain into the open pit. In order to minimize such water flowing into the pit, Stantec has proposed, at a conceptual level, a trench system within Joyce Lake, allowing for this water to be collected within a basin excavated in the overburden at the bottom of the lake and to then be pumped directly into the perimeter ditches. This system is constructed during the first year of mining operations and is accounted for as part of sustaining capital.

18.3.2 Open Pit

Parameters for dewatering of the open pit were provided by Stantec. The maximum pumping rate is indicated to be in the order of 17 L/s. Water is pumped from the open pit into the same settling basin that is treating water from the overburden and waste rock stockpiles. Mine dewatering is part of the open pit mine operations.

18.3.3 Pit Perimeter Deep Well Dewatering

Following its hydrogeological study, BluMetric Environmental recommended that a perimeter deep well dewatering strategy be adopted as part of the mine dewatering strategy. Perimeter dewatering is expected to control the level of the water table in order to keep the open pit dry and to support pit slope design parameters developed by LVM in its pit stability geotechnical study. BluMetric Environmental recommended the number of perimeter wells, their depths and the flowrates from each of the wells. At least seven wells, having diameters of 203 mm (8 inches), will be required to a maximum depth of 220 m. One well will be installed before construction and the six remaining wells will be installed during the construction period. Each well will have a dedicated pumping station consisting of a pump with an electric motor and a local generator to provide electric power. It is expected that the water pumped from each well will be relatively clean and can be directed straight into the surrounding watershed via the north/south perimeter trenches. Access to the wells is by a road constructed adjacent to the trenches.

18.4 Railway Transportation

Rail transportation will be a contracted service provided by the operators of the railway network connecting Schefferville to the port facility. As such, LCIO will not build and /or own any infrastructure outside of the Project rail loop and the product and fuel railcars. All other support equipment and services will be part of a master agreement that LCIO will put in place with railway transportation service providers.

LCIO has performed an in-house train logistics study and provided design parameters to BBA for this Feasibility Study. Based on a 88-hour cycle time, for transportation of 2.5 Mt (dry) per year of product, railway transportation logistics dictate that two train sets each composed of 240 railcars and three locomotives are required, as 110 train sets per year need to be moved. Each train set will deliver a nominal 24,000 wet tonnes of product (assumed average of 6% moisture). Design at the train load out is based on 10-hour loading time for each train set. Operations at the rail loop are planned to take place during the 240 summer days per year, as no production or rail transportation is planned during the winter months.

18.5 Port

LCIO has informed BBA that product from the Project will be transported to the IOC port facility in Sept-Îles, Quebec. LCIO will in effect contract IOC to provide the unloading, stockpiling and ship loading services and as such will not own or operate any infrastructure at the port terminal.

19 MARKET STUDIES AND CONTRACTS

LCIO has performed its own internal market review for iron ore products over a period of six months ending in December 2014. It has also provided a summary of information related to its discussions with third part service suppliers for rail transportation, product unloading and ship loading at port.

19.1 Iron Ore Market Overview

The developing world, and in particular Asia, will be the growth engine for the next decade. The developed world demand outlook is more moderate and so the majority of the growth in materials demand is expected to come from developing world consumption, supported by the continued urbanization of the major developing economies, including China and India.

The large increase in developing world demand for metals (in particular China) has replaced much of the demand from the industrialized world. The world's manufacturing industries have continued to move from high cost developed countries to low labour cost countries and a significant portion of their production has been exported back to the developed world. But the increase in consumption by the developing countries has begun to increase labour costs, which has resulted in some labour intensive manufacturing beginning to return to the developed world.

Developing world end-use metal consumption per capita will slowly catch up to the developed world levels. This is because consumption in the developing world is focused on metal intensive products such as appliances, furniture and homewares, compared to services that dominate industrialized world spending.

The quality of construction in the developing world is improving, resulting in a larger portion of developing world steel used in construction being galvanized (increasing demand for zinc) or upgraded to stainless steel (increasing demand for nickel and chromium). This results in higher quality, at a higher cost.

As the Chinese economy matures and shifts away from capital-intensive growth of the last two decades, metals demand growth is expected to moderate.

The price of iron ore has declined by nearly 50% in 2014 as mining companies, including Rio Tinto Group and BHP Billiton Ltd., expanded production in Australia, resulting in an oversupply of iron ore. It is expected that more of China's higher cost iron ore supply will exit the market, as the lower cost Australian supply continues to flood the market. The Australian Bureau of Resources and Energy Economics estimated that "global trade in iron ore increased by 10% in 2014 to 1.35 billion tonnes, driven by a 24% increase in Australian exports and a 10% increase in Brazilian exports. China's imports are estimated to have increased by 118 million tonnes as steel mills continued to switch from domestics to cheaper foreign sources of iron ore."

As noted in Australia's Resources and Energy Quarterly, December 2014 – "2015 world trade in iron ore is forecast to increase by 2.8% to 1.4 billion tonnes, supported by a 7% increase in Australian and Brazilian exports. However, this increase is forecast to be partially offset by a reduction in exports from high cost producers."

Australia & New Zealand Banking Group Ltd. recently said in a report "that any recovery in the price of iron ore will be driven by supply cuts, including high-cost mines in China, where almost the entire industry is loss-making at current prices now." They further noted that prices are set to remain weak in 2015, but appear to be "oversold" and there is potential for a relief rally in the second half of 2015.

19.1.1 China - Iron Ore Imports

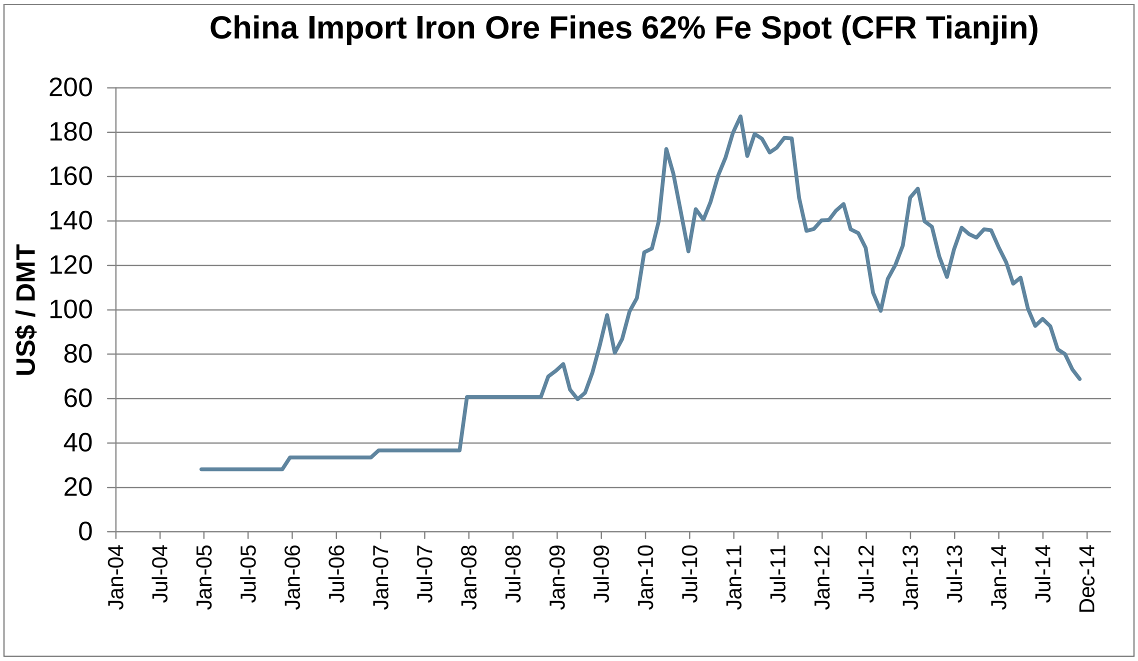
China is estimated to have imported a record 938 million tonnes of iron ore in 2014, up 14% from 2013. However, this increase led to record high levels of port inventories that peaked at 106 million tonnes in June 2014 and only declined marginally in the six months to December.

Australia's Resources and Energy Quarterly forecasts that "China's 2015 iron ore imports will increase by a further 3.7% and total 973 million tonnes, supported by increased demand for seaborne ore. Low steel industry profitability is expected to eventually push mills to source the cheapest iron ore available and switch increasingly to low cost imports."

19.1.2 Australian Iron Ore Exports

In 2014, Australia's exports of iron ore were estimated to have increased by 24% to 718 million tonnes. This growth was driven by an expansion of production and infrastructure capacity in the Pilbara region.

Following the slump in prices from June to October 2012, prices remained above US$120/t CFR for 62% Fe content China fines with a sharp down turn in the fall of 2012, reaching US$99 CFR for 62% Fe content fines and then a restocking phase pushed prices towards US$135/t in 2013. As new capacity came on-stream, the industry's price started to gradually drop and by the end of 2014 it had reached a low of approximately US$65 CFR for 62% Fe content fines. Figure 19-1 presents historical prices.



Source : IndexMundi

Figure 19-1: China Import Iron Ore Fines 62% Fe spot (CFR Tianjin port), US$ DMT

Going forward, it appears likely that the US$70-80/t price level will be repeatedly tested until 2017-2018 when it is expected that the oversupply will be exhausted and demand will meet supply. Going into 2018-2020, it is expected that the baseline scenario for the iron ore industry is that prices will trend towards the US$100 to US$110/t range.

19.1.3 Market Opportunities and Strategy

Located approximately 600 km north of Sept-Îles, Quebec, the Schefferville area of the Labrador trough is a prolific DSO iron ore district initially exploited by IOC in the 1950s through the 1980s. IOC made investments in the town of Schefferville and also built the QNS&L railway, connecting Schefferville to Ross Bay Junction and Sept-Îles, and indirectly invested in the town's utilities and airport. Investment was also made in Sept-Îles for the port and ship loading facilities to transport iron product to market. Falling iron ore prices in the 1980s and demand for alternative iron ore products resulted in closing of IOC's DSO Schefferville operations in 1982.

Since 2005, resurgence in iron ore demand has renewed interest in the Schefferville area, attracting large investments in exploration and development. Development in the area is facilitated by the existing rail line, IOC port and ship loading facilities in Sept-Îles, as well as the multi-user port currently under construction in the Sept-Îles area.

19.1.4 LCIO Partnership

WISCO is a leading conglomerate and one of the major subsidiaries of Wuhan Iron & Steel (Group) Corporation (WISCO Group), headquartered in Wuhan in the province of Hubei in the People's Republic of China. WISCO is an important production base for steel sheets and plates in China, and owns a complete set of processing plants comprised of mining, coking, iron making, steel making, rolling and auxiliary facilities. After its merger and reorganization with Ezhou Iron & Steel Company, Liuzhou Iron & Steel Company and Kunming Iron & Steel Company, WISCO has become a leading conglomerate with an annual production capacity of 40 million tons, ranking fourth in the worldwide steel industry. In 2014, WISCO ranked No.310 on the Global Fortune 500 list.

The interest in Joyce Lake DSO Project is held through LCIO, a joint venture company in which Century shares ownership with WISCO Attikamagen, a subsidiary of WISCO International. LCIO has a 100% registered interest in the Attikamagen Properties, which include the Joyce Lake DSO Project. The ownership and management of LCIO is governed by a shareholders agreement dated December 19, 2011 among Century, Century Holdings, WISCO and WISCO Attikamagen (Attikamagen Shareholders Agreement). This shareholders agreement is described in detail in Chapter 4 of this Report.

19.1.5 WISCO Off-Take Agreement

According to the Attikamagen Shareholders Agreement, upon production from the Project, WISCO Attikamagen will have the right to purchase from LCIO a percentage of products equal to its equity share interest in LCIO at market value and on standard commercial terms. WISCO will also have the right to purchase an additional 20% of the production from the Project at a price to be agreed upon between Century and WISCO.

The Project will produce low grade lump and sinter products from stockpiles accumulated over the course of the mining operation. Low grade stockpiles will be processed once the high grade ore has been exhausted.

19.2 Iron Ore Pricing for Project Financial Evaluation – Forward Looking Information

Recent iron ore market and price volatility has made forecasting difficult. Prices at the end of 2014 are likely near market lows and consolidation, followed by price increases, are anticipated over 2016-2020, as described earlier. LCIO's internal forecasting is based on confidence of continued Chinese iron ore demand and a recovery in the sustained long term price of iron ore products.

For this Feasibility Study, the long term benchmark iron ore price base case is forecasted at US$95/DMT CFR China for 62% Fe sinter fines. This price forecast is based on the average consensus iron ore price forecast from seven analysts reports shown in Table 19-1. This price has been used as the basis for the Feasibility Study economic analysis presented in Chapter 22. A sensitivity analysis at various prices above and below the aforementioned base price was also performed as part of the economic evaluation of the Project.

Table 19-1: Analyst long term price forecast ($US/DMT, 62%Fe sinter fines CFR China)

Company	Date	2014E	2015E	2016E	2017E	2018E	LT
RBC	09/Nov/14	$111.50	$105.00	$100.00	$100.00	$90.00	$80.00
BMO	29/Sep/14	$106.00	$95.00	$105.00	$100.00	$115.00	$109.00
CS	24/Sep/14	$100.00	$89.00	$87.00	$90.00	-	$90.00
Canaccord	2/Dec/14	$96.80	$70.00	$77.50	$85.00	-	$85.00
Metal Expert Consulting	31/July/14	$104.00	$105.00	$110.00	-	-	$120.00
Scotia Bank	6/Oct/14	$99.00	$88.00	$85.00	$80.00	$85.00	$100.00
Goldman Sachs	6/Aug/14	$106.00	$80.00	$82.00	$82.00		$80.00
Average (Consensus)		$103.33	$90.29	$92.36	$91.17	$96.67	$94.86[(1)]

1. Rounded to US$95 for financial evaluation purposes

Analyst price forecasts for 62%Fe DMT CFR China were obtained during the period July 2014 through December 2014, when LCIO collected research on forward looking price forecasts for use as the base case benchmark price in the Feasibility Study economic analysis. A cut- off date for data was established as of December 31, 2014.

CAUTION: *Readers are cautioned that the period for collection of "forward looking information" related to forecasts for iron or selling price was July through December 2014 and the effective date of the Feasibility Study NI 43-101 Technical Report is March 2, 2015. During the first two months of 2015, the benchmark price for 62%Fe per DMT sinter fines CFR China has seen significant volatility and has occasionally reached levels below US$60 per DMT. It is unlikely that LCIO will develop the Joyce Lake DSO project until iron ore prices recover to above US$95/t.*

In its analysis, LCIO also collected historical data to track the 3-year running average selling price for 62%Fe DMT CFR China and this information is shown graphically in Figure 19-2. As of December 2014, the three-year running average iron ore price for 62%Fe sinter fines CFR China was US$118.45/DMT. This data is presented for information purpose only and was not used for determining the projected long term price used for the Feasibility Study economic analysis.

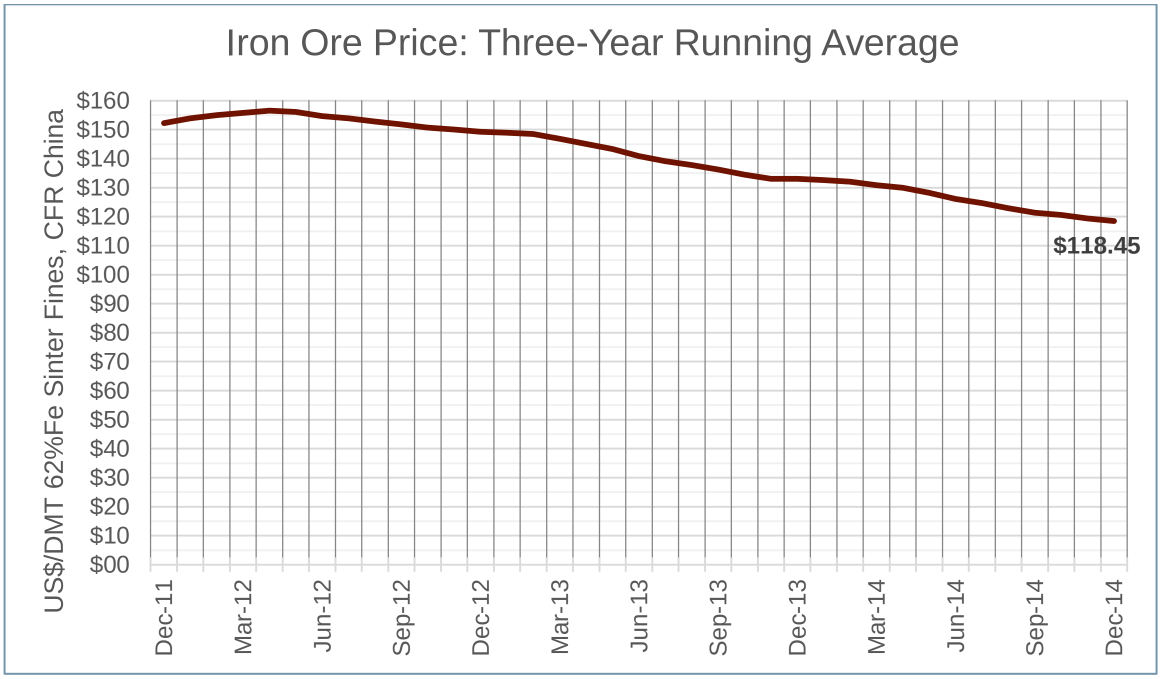


Figure 19-2: Iron Ore Price Based on Three-Year Running Average
(Source: Metals Bulletin Iron Ore Monthly Index)

19.2.1 Premiums and Penalties

The Joyce Lake DSO project will initially produce a product with a nominal Fe grade of 62% Fe. At the end of the mine life the Project will process a low-grade stockpile to generate a product at about 53% Fe. LCIO has reviewed published data for the past 6.5 years to derive premiums and penalties related to product size (mainly a selling price premium for lump product applied to the sinter fines base product) and chemistry (mainly for %Fe, %SiO_2 and %Mn).

The aforementioned premiums and penalties are applied to the price of the base iron ore product of US$95.00 per DMT, CFR China for 62% Fe sinter fines. Table 19-2 presents the premiums and penalties used to derive the net product selling price for the regular grade 62% product.

Table 19-2: Premiums and Penalties for 62% Fe products per DMT

Item	Specification	Premium / Penalty ($US)
Base 62% Fe Sinter Fines CFR China	62% Fe	$95.00
Ocean Freight to China	$/net tonne (wet)	$15.00
FOB Port Sept-Îles	$/DMT	$79.04
Fe premium (for each 1% change)	Fe >62%	$1.50/t
Fe penalty (for each 1% change)	Fe 62%<x>60%	$1.50/t
Fe penalty (for each 1% change)	Fe <60%	$3.00/t
SiO_2 penalty (for each 1% change)	SiO_2 >4.5%	$0.75/t
Mn penalty (for each 0.1% change)	Mn > 1%	$0.20/t
Lump premium	$/DMT	$15.00/t

For the low grade product, LCIO has developed a separate table. From its historical data analysis, it was determined that sintered fines grading 58% Fe, compared to 62% Fe sinter fines, sold for an average price of US$12.00 lower price. As such, premiums and penalties were applied accordingly to the low grade product, as presented in Table 19-3.

Table 19-3: Premiums and Penalties for products of 58%Fe and below

Item	Specification	Premium / Penalty ($US)
Base Case 58% Fe Sinter Fines CFR China	58% Fe	$83.00
Ocean Freight to China	$/net tonne (wet)	$15.00
FOB Port Sept-Îles	$/DMT	$67.04
Fe premium (for each 1% change)	Fe >58%	N/A
Fe penalty (for each 1% change)	Fe 58%<x>56%	$2.00/t
Fe penalty (for each 1% change)	Fe <56%	$4.00/t
SiO_2 penalty (for each 1% change)	SiO_2 >10%	$0.75/t
Mn penalty (for each 0.1% change)	Mn > 1%	$0.20/t
Lump premium	$/DMT	$15.00/t

It should be noted that there are also penalties applicable to other deleterious elements, as well as to particle size (oversize and undersize) in both lump and sinter fines products. It is assumed that penalties pertaining to these parameters will not apply as the quality of the Joyce Lake DSO products will not attract these penalties.

The product pricing information presented was provided to BBA in order to determine revenues based on the Project mining and production plans.

19.3 Ocean Freight Costs to China – Forward Looking Information

For the Project economic analysis, ocean freight costs from port in Sept-Îles to a China port are assumed to be US$15.00 per net tonne (net tonne includes weight of moisture hence wet tonne). This rate is based on loading vessels of greater than 170,000 tonne capacity (Cape Size Vessels).

In its analysis LCIO first reviewed recent ocean freight rates that are approximately US$11.55 per net tonne. Current rates have been impacted by the significant drop in oil prices. Furthermore, ocean freight rates have experienced significant volatility over the past five years. Based on these two important facts, LCIO has applied a 30% factor to current ocean freight rates to estimate the US$15.00 rate used in the Feasibility Study economic analysis.

19.4 Currency Exchange Rate – Forward Looking Information

The C$ to US$ exchange rate used in the Project economic evaluation analysis is C$1.00 = US$0.80. The exchange rate used in the Feasibility Study was set prior to December 31, 2014 and was based on forward contracts transacted on the futures market. The following forward rates have been updated to March 2015 as typical actual forward rates for the US dollar compared to the Canadian dollar at 3 months 0.7900, 12 months 0.7856, 2 years 0.7792, 5 years 0.7694. The Feasibility Study uses a conservative flat rate of 0.8000 US dollar per Canadian dollar for each year of the Project life.

19.5 Rail Transportation, Port Handling and Ship Loading Services

LCIO expects to enter into contractual arrangements with three entities for the transportation and handling of iron ore products:

- The TRT railway for rail services between the LCIO rail loop and Ross Bay Junction.
- Quebec North Shore and Labrador Railway (QNS&L) between Ross Bay Junction and the port facilities.
- The IOC port at Sept-Îles for rail car dumping, stockpiling and ship loading services.

LCIO has not yet entered into formal negotiations or agreements with any of the aforementioned service suppliers. Also, LCIO has not confirmed costs of a capital or of an operational nature related to these service providers. Any future agreements with service providers will likely be confidential. LCIO has however determined that there is sufficient capacity at TRT and QNS&L, as well as at the IOC port facility, to handle its products, this even when taking into account plans for production by Tata Steel Minerals Canada and Labrador Iron Mines as well as IOC expansion plans.

Typical rail transportation service agreements in the Labrador Trough have historically involved take or pay contracts with the user supplying its own rail cars. Locomotives are usually supplied by the service provider possibly through a leasing arrangement. LCIO has assumed that an agreement with QNS&L will also provide the required locomotives that will run through for use on both the TRT and QNS&L railroads.

While LCIO has not negotiated agreements or committed to terms of agreement, it has determined the expected cost for railing and ship loading of iron ore for use in the economic analysis in this Feasibility Study. These costs are presented on a consolidated basis in order to maintain confidentiality. Arrangements regarding take or pay provisions are similary not disclosed but will require that LCIO commit for an extended period of time.

20 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

Stassinu Stantec Limited Partnership (Stassinu Stantec) and Génivar (now WSP) have been retained as the environmental consultants for the Joyce Lake DSO Project. Under their joint mandate, the following baseline environmental studies were conducted in support of the Environmental Assessment (EA) and the Feasibility Study.

- Fish and Fish Habitat Baseline Study (Génivar 2013)
- Fish and Fish Habitat Baseline Study Complementary Report (WSP 2014a)
- Avifauna Baseline Study (Génivar 2013)
- Mammal and Herpetofauna Baseline Study (Génivar 2013)
- Vegetation Baseline Study (Génivar 2013)
- Rare Plant Survey (WSP 2014b)
- Air Quality Modelling (WSP 2015a)
- Noise Modelling Study (WSP 2015b)
- Phase 1 Assessment for Acid Rock Drainage and Metal Leaching (ARD/ML) (Stassinu Stantec 2013)
- Baseline Hydrogeology Scoping Study (Stantec 2013)
- Characterization and Preliminary Treatability Testing of Tailings Effluent (Stassinu Stantec 2013)
- Surface Water Baseline Study (Stassinu Stantec 2014)
- Water and Sediment Quality Baseline Study (Génivar 2013)
- Historic and Heritage Resources Baseline Study (Stassinu Stantec 2014)
- Contemporary Aboriginal Use of Lands and Resources for Traditional Purposes – Baseline Study (Stassinu Stantec 2014)
- Socio-Economic Baseline Study. Economy, Employment and Business (Stassinu Stantec 2015)
- Sediment Pond Design (Stassinu Stantec 2013)
- Air Quality Modelling (WSP 2015a)
- Noise Modeling Study (WSP 2015b)
- Closure and Reclamation Plan (WSP 2015c)

The following additional studies were conducted by other consultants in support of the EA and Feasibility Study.

- Joyce Lake and Area DSO Project – Hydrogeological Study (BluMetric Environmental 2015)
- Joyce Lake and Area DSO Project Geotechnical Engineering Feasibility Study – Open Pit Design. (LVM 2014)
- Joyce Lake and Area DSO Project Geotechnical Feasibility Study – Surrounding Areas (LVM 2014)

In 2012 the EA process for the Project was initiated with the filing of a Project Description with the Canadian Environmental Assessment Agency and with the filing of a Provincial Registration Document with the Government of Newfoundland and Labrador, Department of Environment and Conservation (NLDOEC). Updated Project information was also provided in a Supplemental Information Package to government authorities in Q1 2013 and an additional Project Update was submitted in Q4 2014. These documents are available on government websites for public review. The Environmental Impact Statement (EIS) is currently being prepared for filing with provincial and federal authorities. The EIS will be a public document and will undergo a review in accordance with provincial and federal assessment processes.

20.1 Environmental Setting

The Joyce Lake Property is located within an area of rolling hills and valleys reflecting the structure of the underlying bedrock. Elevation in the DSO Project area can vary from approximately 470 masl on the shores of Iron Arm up to approximately 560 masl at the high point on the Iron Arm peninsula. Figure 18-1 shows the environmental features in the area including, watercourses and water bodies, wetlands, seasonal camps, existing roads, and planned infrastructure layout.

There is no industrial activity within 25 km of the Project area and, as a result, regional and Project area baseline air quality is very clean and existing noise is reflective of natural conditions in the area. There are seasonal cabins along Iron Arm and also by Astray Lake; hence, modeling for noise and air quality was conducted to determine the potential for interaction with the occupants of these cabins and other receptors. The direction of the prevailing winds is from northwest to southwest.

As previously noted, a range of surveys were carried out within the proposed Project footprint and larger region to characterize the existing environmental conditions.

There are no designated sensitive areas or special areas in the Project footprint, including designated wildlife areas, stewardship zones, parks, and natural areas. Non-designated sensitive areas can include areas of importance to species of conservation concern, such as wetlands, which are located throughout the Project area. These and other potentially non-designated sensitive areas are documented and evaluated in the EIS.

The biophysical environment in which the Project lies is within the Mid- Subarctic Forest Ecoregion and the High Subarctic Tundra Ecoregion of Western Labrador. Habitat types common to Western Labrador are found throughout the Project area. These habitat types potentially support a range of wildlife species that are common throughout the region such as migratory caribou, moose, black bear, grey wolf, Canada lynx, and a variety of small mammals.

There were no observations of any vascular plant species listed under Schedule 1 of the *Species at Risk Act* (SARA) or the *Newfoundland and Labrador Endangered Species Act* (NLESA) during surveys of the PDA. In general, the examination of existing information and the results of field studies indicates that habitats in the region support a diversity of flora species common to Labrador. There are eight species of conservation concern known or thought to be present within (or in close proximity to) the Project area. Several bird species that may occur in the region are listed as species at risk or of conservation concern, such as Olive-sided Flycatcher (*Contopus cooperi*), Grey-cheeked Thrush (*Catharus minimus*), and Rusty Blackbird *(Euphagus carolinus*).

Project Area

At least two mammal species of conservation concern may occur in the Project area: pygmy shrew (*Sorex hoyi*) and least weasel (*Mustela nivalis*); both are both considered rare by the Atlantic Canada Conservation Data Centre and vulnerable to extirpation from the province. There are no known fish species at risk within the regional Project area.

Baseline water quality and sediment quality results show that existing surface water and sediment quality is good, with several parameters occasionally and slightly exceeding ecological water and sediment quality guidelines. The aquatic environment includes a number of large lakes, ponds, and streams in the Project area that ultimately drain into the Smallwood Reservoir and down into the Churchill River to the Atlantic Ocean. Based on surveys conducted in 2012 and 2013, fish species and habitat in the Project area are common to western Labrador and none are considered to be of conservation concern. Aboriginal and recreational fisheries lie in close proximity to the Project and interactions with these fisheries are assessed in the EIS.

In terms of the socio-economic environment, the areas most likely to interact with the DSO Project are the nearby community of Schefferville, the Innu community of Matimekush-Lac John, and Naskapi community of Kawawachikamach. These three communities are located in Québec near the provincial border. In addition, the Project will interact with the primary places of residence for the labour force in western Labrador (e.g., Labrador City, Wabush, Churchill Falls) as well as with the Innu Nation of Labrador, the NunatuKavut Community Council and the Innu First Nation of Uashat mak Mnai-Utenam. The Project will interact with land and resource use by aboriginal peoples and the general public, and will also interact with historic and cultural resources. These interactions are assessed in the EIS.

The EIS provides detailed descriptions of the existing biophysical and socio-economic environments that could be affected by the Project for each Valued Component (VC).

20.2 Jurisdiction, Applicable Laws and Regulation

The infrastructure for the Project is located wholly on provincial Crown Land. The surface rights belong to the Government of Newfoundland and Labrador, with the exception of the location of the intersection of the new rail loop with Tshiuetin Rail Transportation. LCIO will submit an application to the Province for a mining lease on Crown Land, and will enter into an agreement with TRT for use of their land to connect to the new rail loop. Iron ore products will be shipped on an existing rail to Sept-Îles in Québec and no changes to Port Authority or adjacent lands in Québec are required for this Project to proceed.

The Project is subject to environmental assessment in accordance with provincial and federal requirements. Mining projects in the Province of Newfoundland and Labrador are subject to environmental assessment under the Newfoundland and Labrador *Environmental Protection Act*, and associated Environmental Assessment Regulations. The Project is also subject to a Federal environmental assessment under the *Canadian Environmental Assessment Act, 2012* and the associated Regulations Designating Physical Activities (Section 15(a)).

The provincial and federal EA processes are public, and proceed in parallel. An overview of the environmental assessment processes is provided in the sections below.

Federal environmental assessment is required because the Project triggers the *Canadian Environmental Assessment Act*, 2012 and Section 15(a) of the Regulations Designating Physical Activities since it involves the construction, operation, decommissioning and abandonment of a metal mine, other than a gold mine, with an ore production capacity greater than 3,000 t/d. Designated Projects require a "screening" by the Agency to determine whether an EA is required. The federal decision-making and coordinating authority is the Canadian Environmental Assessment Agency (the "Agency). Other federal departments may also provide specialized knowledge or expert advice through both the federal and provincial EA processes.

To initiate the federal process, a Project Description document was submitted to the Agency in November 2012 along with a Summary Document that was provided in both official languages. The Summary Document was distributed by the Agency to federal departments, as appropriate, and is posted on the Agency website for access by the general public. A Supplemental Information Package was provided to the federal Agency and Newfoundland and Labrador Department of Environment and Conservation (NLDOEC) in February 2013. Final EIS Guidelines were issued by the Agency in March 2013.

The provincial environmental assessment process is initiated by submitting a formal registration of the Project to NLDOEC for review. At the conclusion of the review period, the Minister advises the proponent whether the Project will require an Environmental Preview Report (EPR), an Environmental Impact Statement (EIS), or if the Project has been released or rejected. The provincial process was initiated in November 2012 with submission of the Project Description document, which served as the registration. The Minister of NLDOEC informed LCIO in December 2012 that an EIS is required for the Project. A Supplemental Information Package was provided to the NLDOEC in February 2013 and Final EIS Guidelines were issued in November 2013.

The EIS Guidelines establish the nature, scope and minimum information and analysis required in preparing the EIS.

The EIS, to be submitted in Q1 2015, will be reviewed by the separate provincial and federal committees, including subject area experts, and will be available for public review and comment. Review comments from the committees and from the public will be considered when a determination of the environmental implications and significance of adverse environmental effects of the Project is made by the federal and provincial governments.

At the completion of the EIS review period, the responsible provincial and federal Ministers will each decide if additional information is required. Upon a determination of sufficient EIS information, the two levels of government will each decide if the Project may proceed and will issue their decisions separately. The provincial and federal governments will each determine if permits/authorizations may be issued, and conditions that may apply.

20.3 Environmental Studies

As noted in Section 20.1, a number of environmental baseline studies have been undertaken in support of both the EA and Feasibility Study. Details of the environmental studies and the results are presented in Appendices to the EIS. An analysis of the Project environmental effects is presented for each VC in the EIS.

20.4 Environmental Permitting

Following release from the federal and provincial EA processes, the Project will require a number of approvals, permits and authorizations. The proponent will also be required to comply with any other terms and conditions associated with the EIS release issued by the provincial and federal regulators. A preliminary list of permits, approvals, and authorizations that may be required for the DSO Project is presented in Table 20-1, subject to confirmation with the responsible agencies following the completion of the EA process. Permits and authorizations may also be required from other jurisdictions, such as municipalities, if any are affected.

These permits, approvals, and authorizations will be required at various stages throughout the mine life.

Table 20-1: Potential Permits, Approvals and Authorizations Anticipated to be Required

Permit, Approval or Authorization	Issuing Agency
Provincial	
Release from Environmental Assessment Process	NLDOEC – Environmental Assessment Division
Permit to Occupy Crown Land	NLDOEC – Crown Lands Division
Permit to Construct a Non-Domestic Well Water Resources Real-Time Monitoring Certificate of Environmental Approval to Alter a: body of water; culvert installation; fording; stream modification or diversion; and other work within 15 m of a body of water (site drainage, dewater pit, settling ponds)	NLDOEC – Water Resources Management Division
Certificate of Approval for Construction. Certificate of Approval for Operation Certificate of Approval for Generators Certificate of Approval for Industrial Processing Works Approval of Emergency Response Plan. Approval of Waste Management Plan Approval of Environmental Contingency Plan Emergency Spill Response Approval of Environmental Protection Plan	NLDOEC – Pollution Prevention Division
Permit to Control Nuisance Animals	NLDOEC – Wildlife Division
Pesticide Operators Licence	NLDOEC – Pesticides Control Section
Blasters Safety Certificate Magazine Licence Approval for Storage and Handling Gasoline and Associated Products Approval for Temporary Fuel Cache Fuel Tank Registration Approval for Used Oil Storage Tank System (Oil / Water Separator) Approval for Fire, Life and Safety Program Certificate of Approval for Waste Management System	Service NL

Permit, Approval or Authorization	Issuing Agency
Provincial	
Approval of Development Plan, Closure Plan, and Financial Assurance Mining Lease Surface Rights Lease Quarry Development Permit	Newfoundland and Labrador Department of Natural Resources – Mineral Lands Division
Operating Permit to Carry Out an Industrial Operation during Forest Fire Season on Crown Land Permit to Cut Crown Timber Permit to Burn	Newfoundland and Labrador Department of Natural Resources – Forest Resources
Approval to Construct and Operate a Railway in Newfoundland and Labrador	Newfoundland and Labrador Department of Transportation and Works
Federal	
Release from Environmental Assessment Process	CEA Agency
Fisheries Act Authorization for any loss of fish habitat of a species from a commercial, recreational or Aboriginal (CRA) fishery	Fisheries and Oceans Canada
Designation of a Tailings Impoundment Area	Environment Canada
Approval to Interfere with Navigation	Transport Canada
Effluent Monitoring and Aquatic Environmental Effects Monitoring in accordance with the *Metal Mining Effluent Regulations* under the *Fisheries Act*	Environment Canada
Licence to Store, Manufacture or Handle Explosives	Natural Resources Canada
Approval to Construct a Railway	Canadian Transportation Agency

20.5 Tailings Management

Tailings will not be produced by this Project. Therefore, there is no need for tailings management.

20.6 Waste and Overburden Stockpiles

A ditch system will be established around the footprint of the waste rock, low grade material and overburden stockpile area. Water collected in these ditches will be directed to settling ponds. Water that is collected in the ditches and sumps will be treated as necessary prior to discharge into the environment

20.7 Geotechnical

The open pit geotechnical site investigation was performed to gather rock mass characteristics for the preparation of a preliminary Engineering Geology Model.

The stratigraphic conditions encountered within boreholes consist typically of a downward sequence of overburden or highly weathered bedrock followed by bedrock.

Table 20-2 illustrates the stratigraphy encountered at each borehole location in terms of depth and elevation.

Table 20-2: Subsoil Stratigraphy Observed in Boreholes

Borehole Elevation (m)	Length Geodesic Elevation (m)			
	Overburden or Highly Weathered Bedrock[1]	Iron Formation	Shale	Sandstone
BH-P-01 [527.85]	0.00 – 7.00 [527,85 – 520,85]	7.00 – 118.90 [520,85 – 416.12]	118.90 – 134.10 [416,12 – 401,84]	134.10 - ≥160.00 [401.84 - ≤377,50]
BH-P-02 [522,18]	0.00 – 3.00 [522,18 – 519,18]	3.00 – ≥173.00 [519,18 – ≤372.36]	---	---
BH-P-03 [526,33]	0.00 – 9.00 [526,33 – 517,87]	9.00 – 78.00 [517,87 – 453.03]	78.00 – 108.50 [453,03 – 424,37]	108.50 - ≥160.70 [424.37 - ≤375,32]
BH-P-04 [519,26]	0.00 – 1.50 [519,26 – 517,85]	1.50 – ≥160.00 [517,85 – ≤368.91]		

1. Thickness of overburden may be lower than indicated since it was impossible to collect samples

From a thickness of 3 to 9 meters, either overburden or highly weathered rock was found at the surface within boreholes BH-P-01 to BH-P-04.

It should be noted that in all borehole locations, visual observations showed that overburden seems to be thin and that rock outcrops are frequent. No recovery was possible down to a certain depth when initiating the boreholes. It is therefore impossible to assess if the first runs are in highly weathered bedrock or in overburden.

Iron Formation (Rock Type A and B and Group I)

The Iron Formation consists of iron oxide with white and red chert, fine to medium grained, dark grey, with centimetric bands of white to reddish medium grained chert and millimetric bands of fine grained red chert. We note the presence of nodules of white chert and pockets of iron oxide.

This formation is highly fractured with limonite in most fracture. Mostly non-magnetic with few weakly magnetic zone were observed. This formation is also highly weathered with very low RQD values. Two main lithologies have been identified within Iron Formation:

- Massive, weakly to highly hydroxidized (limonite, goethite) Iron Oxide (Hematite) with chert (white, gray or red) - rock type A;
- Mainly massive, weakly to highly hydroxidized (limonite, goethite) Iron Oxide (Hematite) – rock type B.

No thicknesses of more than 5 meters have been identified for rock type A and B From a geomechanical point of view, these 2 lithologies were grouped (group I).

In the PEA, 3 members of units have been identified within the Iron Formation from a geological point of view. From a geomechanical point of view, all these members were grouped in one lithology (Group I).

Shale (Rock Type C and Group II) from Ruth Formation

This rock unit was only intercepted in BH-P-01 and BH-P-03. The shale unit consists generally of black shale with a zone of interbedded siltstone. This formation is not weathered and medium to high RQD values were measured.

Sandstone (Rock Type D and Group III) from Wishart Formation

As mentioned in the PEA document, the lithology was described as a sedimentary quartzite (metamorphic sandstone) and arkose, a quartz and feldspar clastic deposit. For the purpose of this study, this unit was described as grey sandstone from on-site geologists since no petrographic analysis has been performed on the sample.

Similar to shale rock unit, the sandstone was only intercepted by BH-P-01 and BH-P-03. Grey sandstone, fine to medium grain centimetric interbedded with black shale. This formation is not weathered and high RQD values were measured.

Classification of Rock Units

Arising from the previous section, three principal lithologies have been identified in the Pit area:

- Banded Iron Formation (Group I);
- Shale (Group II);
- Sandstone (Group III).

An essential part of a rock mass characterization program is the evaluation of intact rock strength for the various geological units. Laboratory testing of selected rock samples was carried out to measure the intact rock properties.

Intact Rock Strength Material Properties

Rock laboratory testing was performed on the selected samples obtained from iron oxide (Group I), shale (Group II) and sandstone (Group III) rock units of the site under investigation in the Project. The samples were selected to cover all major rock units at the site. The samples were sent to the Rock Mechanics Laboratory of Laval University. Overall 66 samples were strength tested. In addition to the samples tested at Laval University, one batch of rock samples was sent to the LVM's rock and soil laboratory in Boucherville. Among the total samples that were sent to Boucherville, 31 samples were subjected to strength tests.

Of the 66 tested rock samples at Laval University, 27 rock samples were tested for uniaxial compressive strength (UCS), 33 samples for Brazilian Indirect Tensile Strength and 6 samples for triaxial compressive strength. Of the 31 samples tested at the Boucherville laboratory, 3 rock samples were tested for uniaxial compressive strength (UCS), 9 samples for Brazilian Indirect Tensile Strength and 19 samples for point load test.

The UCS, triaxial and Brazilian testing data for rock type A and B (hematite with white chert and mainly iron oxide) were used to develop the strength envelops for the iron oxide rock units.

Investigations by the four geotechnical drillholes indicate that, at present stage of the Project, it is not possible to clearly delineate the spatial distribution of rock types A and B. The iron oxide with cherts (rock type A) is randomly intercepted along the geotechnical boreholes similar to the iron oxide with limonite alteration or hematite with hydroxide (rock type B); resulting in an extremely heterogeneous rock mass. This complexity needs to be addressed in the future geotechnical investigations. Due to the lack of information regarding the approximate distribution of the rock type A and B in the iron oxide zone, for this study, it was decided to combine the laboratory strength results for the rock types A and B and to deal with a broader range of rock matrix properties. It is recognized that the average values obtained by combining the test results for the rock type A and B would be more influenced by the results of rock type B, due to the greater number of tests available for this rock type.

Table 20-3 summarizes the lab testing results for the main rock units in the pit area.

Table 20-3: Intact Rock Strength Material Properties

Properties		Lithology		
Parameter	Value	Iron Formation	Shale	Sandstone
Unconfined Compressive Strength, σ_{ci} (MPa)	***Mean***	***60***	***96***	***195***
	Min	25	44	104
	Max	105	138	256
Brazilian Test, σ_T (MPa)	***Mean***	***7***	***10***	***14***
	Min	3	4	10
	Max	14	17	19
Unit Weight, γ (kN/m^{3})	***Mean***	***32,5***	***27,6***	***26,4***
	Min	23,9	25,9	25,3
	Max	48,8	30,7	27,7
m_i		8	9	14

The m_i values of the Hoek-Brown failure criterion of intact rock obtained for the shale and sandstone rock units (rock type C and D) were found to be characteristic when compared to typical values usually encountered for similar rock types. Typical m_i values reported for the shale and sandstone rock units range between 4-8 and 13-21, respectively. The derived m_i value for the iron oxide rock unit (rock type A+B) is relatively in the range of the m_i values typically reported for fine to very fine grain sedimentary rocks.

The value of σ_{ci} obtained from the combination of all testing results for iron oxide samples (combination of rock type A and B), including UCS, triaxial and Brazilian test data, is slightly lower than the corresponding average UCS value of all tested samples. Therefore, at this stage, the average UCS value of all tested samples for rock types A and B (~ 60 MPa), was used to represent the intact rock strength of the iron oxide rock unit in the geomechanical pit design procedure.

Rock Mass Model

The rock mass strength is estimated using the Hoek-Brown failure criterion, which is expressed by:

$$\sigma_1 = \sigma_3 + \sigma_{ci}\left(m_b \frac{\sigma_3}{\sigma_{ci}} + s\right)^a$$

Where:

> m_b is the value of the constant *m* for the rock mass;
>
> *s* and *a* are constants that depend upon the characteristics of the rock mass;
>
> σ_{ci} is the uniaxial compressive strength (UCS) of the intact rock; and
>
> σ_1 and σ_3 are the axial and confining principal stresses, respectively.

Table 20-4 presents the Hoek-Brown parameters obtained for the different rock masses at the project area. The same Table shows the equivalent Mohr-Coulomb cohesion and friction angle for the same rock masses.

It should be noted that the influence of blast damage on the near surface rock mass properties has been taken into account using D factor, which depends upon the degree of disturbance due to blast induced damage and stress relaxation. Based on the evaluation of excavation method, this factor is considered equal to 0.7 corresponding to good quality blasting and mechanical excavation for the final pit wall profile.

Hoek Brown Failure Envelopes for iron oxide rock mass yields a rock mass strength of 3.5 MPa.

Table 20-4: Summary of Inferred Rock Mass Strength Parameters

Property		Value	Comments
Intact Rock Properties –Iron Formation			
Unit Weight (kN/m^3)		32,5	Average Lab Test
Intact Uniaxial Compressive Strength, σ_c (MPa)		60	Average Lab Test
mi		8	Calculated
Rock Mass Properties –Iron Formation			
Geological Strength Index (GSI)		35	Evaluated Based on Observation
Disturbance factor D		0,7	Mechanical Excavation [1]
Generalized Hoek-Brown failure criterion	a	0,516	Estimated with RocData
	m_b	0,225	
	s	1,00E-04	
Mohr-Coulomb	c, (MPa)	0,347	Estimated with RocData
	ϕ (°)	30,28	
Intact Rock Properties – Shale			
Unit Weight (kN/m^3)		27,6	Average Lab Test
Intact Uniaxial Compressive Strength, σ_c (MPa)		96	Average Lab Test
mi		9	Calculated
Rock Mass Properties – Shale			
Geological Strength Index (GSI)		50	Evaluated Based on Observation
Disturbance factor D		0	No effect
Generalized Hoek-Brown failure criterion	a	0,506	Estimated with RocData
	m_b	1,509	
	s	0,0039	
Mohr-Coulomb	c, (MPa)	1,453	Estimated with RocData
	ϕ (°)	45,62	

Rock Mass Stability Assessment

Based on the preliminary Engineering Geological Model developed for the rock masses encountered in the Joyce Lake pit area, the iron oxide rock mass quality is considered as "weak". Kinematic failure modes in rock slopes typically include planar, wedge and toppling failures. These failure modes can be identified by using stereographic analysis of peak pole concentrations of the discontinuity data. The highly fractured rock mass and the variability of the banding direction with depth does not allow assessment of the stability with kinematic analyses at this stage. Consequently, the potential instability mode in the pit slopes is likely to be controlled by rock mass strength rather than structure, even at bench scale. For this reason, the slope design process was performed with analyses of the overall and inter-ramp slope angles, to determine a slope angle that meets the stability acceptance criteria presented in Table 20-5.

Table 20-5: Acceptance criteria for the pit slope design

Slope Scale	Consequences of Failure	Acceptance Criteria		
		FOS (min) (Static)	FOS (min) (Dynamic)	POF (max) P[FOS≤1]
Bench	Low to High	1.1	N/A	25%-50%
Inter-ramp	Low	1.15-1.2	1.0	25%
	Medium	1.2	1.0	20%
	High	1.2-1.3	1.1	10%
Overall	Low	1.2-1.3	1.0	15%-20%
	Medium	1.3	1.05	5%-10%
	High	1.3-1.5	1.1	≤5%

Conventional Limit Equilibrium Analyses (LEA) are often conducted to evaluate the maximum overall slope angle for pit walls with an acceptable factor of safety. Slope stability assessment was performed using limited equilibrium analysis according to the Morgenstern-Price solution for circular slip surfaces.

The inputs for the LEA analysis are listed below:

- Slope configuration, defined by the slope height and inter-ramp slope angle.
- Material properties, assigned to the entire slope based on the dominant rock type (weighted density, cohesion and friction angle, obtained from the rock mass properties).
- Water Table, coinciding with the surface of the pit, to simulate the worst-case scenario.
- Seismic loading, simulated by an application of static forces, that represent seismic inertial forces resulting from potential ground accelerations caused by an earthquake (pseudo-static method).

The seismic loading requires the input of seismic parameters such as peak ground acceleration (PGA) and the seismic coefficient (k). The PGA value was determined from Natural Resources Canada – Earthquakes Canada, 2013 based on the interpolation using the Shepard's method from a 10 km spaced grid of points. The value of PGA in the area of the proposed pit is 0.036 g, determined for a 2% in 50 years (0.000404) probability of exceedance according to Canadian National Building Code 2010.

A series of multiple analyses was conducted to assess the influence of the underground water table position with regard to the pit slope surface. A distance of 15 meters was set as a minimum distance to avoid frost penetration to mitigate icing damage in the rock mass and also to avoid water pressure buildup in the slope wall due to icing restricting seepage flow. At the present stage of the hydrogeological study, a peripheral system of deep wells is considered for the underground water table control. Therefore, respecting a distance of 25 meters between the slope and the water table was considered feasible and was retained for the base case. Figure 20-1 presents the plotted curves where safety factors are plotted for 15 m and 25 m distances and different Inter Ramp Angles (IRA) for the pit slope. It can be seen that for the last case, an IRA of 47^0 is acceptable and is retained as the design value. Based on the assumptions of using good controlled production blasting practices and trimming and forming of the final benches with mechanical excavation (D=0.7), the minimum safety factor of 1.3 obtained from the analyses is found to meet the required minimum safety factor of 1.2 based on common engineering practice for static loading conditions. For dynamic loading conditions, a safety factor of 1.27 was obtained.

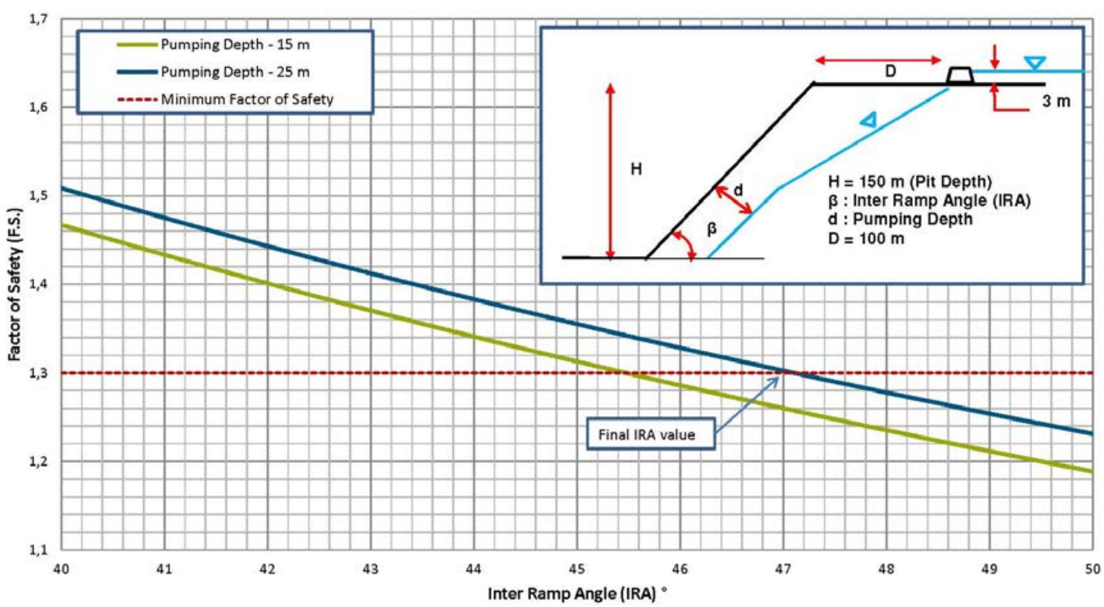


Figure 20-1: Safety Factor Vs. Inter-Ramp Angle Depending on Distance (15 m and 25 m) between Slope and Water Table

20.8 Hydrogeology

For the dewatering of Joyce Lake and planning for general site water management, hydrogeological studies were undertaken in 2014 to determine the connectivity of groundwater in the target rock to surface water in Joyce Lake and to the water table for the surrounding watershed. Hydrogeological information will be used along with the pit construction design to develop a dewatering plan for Joyce Lake.

The hydrogeological study for the Project was completed by BluMetric Environmental, a division of Blumetric Environmental. The work included four vertical boreholes that were drilled in order to conduct packer testing to obtain hydraulic conductivity information. Additionally, monitoring wells were installed to determine bulk hydraulic properties, and three-dimensional groundwater flow modeling was completed to assess drawdown effects in the pit area.

From the Joyce Lake Hydrogeological Study performed by BluMetric Environmental:

The main aquifers appear to be found in fractured bedrock. Under the current study, distinctive local groundwater flow systems of fractured rock systems are identifiable. The drilling campaign from the current study produced boreholes along the eastern and western limbs of the syncline. These boreholes intercepted several fracture zones over the length of the borehole. An attempt to correlate packer test results and interpretations with stratigraphy revealed both closed fracture zones interpreted as areas with limited groundwater flow and other zones where the fracture density in the rock mass is observed to be high and which is associated with regions in bedrock where groundwater flow could be high. Stratigraphic interpretations were drawn from correlations using current and LCIO's core log reports.

The contours in the vicinity of the proposed pit are based on groundwater elevations measured October 13, 2014 at five of the six installed monitoring wells. The sixth monitoring well, BH-P-04, had not yet been constructed on that date and the groundwater elevation was measured on October 18, 2014. These 2014 elevations were combined with groundwater elevations measured in October 2012 (Stassinu Stantec, 2013a) to determine groundwater flow directions in the vicinity of the proposed pit. Groundwater elevations range from approximately 505 masl near Joyce Lake, which correspondingly has an elevation of approximately 505 masl, to approximately 511 masl northwest of Joyce Lake on the southwest flank of the syncline. Groundwater flows toward Joyce Lake. The groundwater flow velocity in the area of the pit can be calculated using the following equation:

$$v = \frac{Ki}{n_e}$$

Where:

K = hydraulic conductivity (m/s)

i = hydraulic gradient (dimensionless)

n_e = effective porosity (dimensionless)

Horizontal hydraulic gradients in the pit area range from approximately 0.014 to 0.039. The bulk hydraulic conductivity in the pit area ranges from 10^{-7} to 10^{-6} m/s. Effective porosity in the study area has not been measured, and is not easily determined. The effective porosity is estimated to be 0.005. Based on these values, groundwater flow velocities in the pit area are estimated to range from 9 to 200 m/yr.

Due to the need to use HQ-coring equipment for drilling and the limited time available, it was not possible to install nested monitoring wells to assess vertical gradients.

Beyond the immediate area of the pit, groundwater is inferred to flow toward Joyce Lake from a catchment area of approximately 1.82 km^2 (Stassinu Stantec, 2013a). Groundwater elsewhere on the peninsula reports directly to Attikamagen Lake or other smaller surface-water features.

Table C-1 in Appendix C of the Hydrogeological Study Report (BluMetric Environmental, 2015) summarizes the chemical results for the collected groundwater. The results were compared to Schedule 4 of the Metals Mining Effluent Regulations (MMER), the Canadian Water Quality Guidelines for Aquatic Protection, and Schedule A of Newfoundland and Labrador Regulation 65/03 (NL 65/03). All of the results were well below Schedule 4 MMER and Schedule A of NL 65/03. Copper concentrations were above the WQI criterion for samples taken from monitoring wells JGW-1, JGW-3, and BH4 at 7.5, 9.9, and 4.7 µg/L respectively, while the zinc concentration was above the CWQG criterion for the sample collected from monitoring well JGW-1 (69.2 ug/L versus 30 ug/L).

Hardness concentrations ranged from 7.9 to 61.8 mg/L, alkalinity ranged between 14.9 and 53.1 mg/L (as $CACO_3$) total dissolved solids (TDS) ranged from 40 to 130 mg/L, and acidity results were between 11.6 and 15 mg/L.

Iron results were variable, from a low of < 20 to 929 µg/L, which are still more than one order of magnitude less than the NL 65-03 criterion of 10000 µg/L. Manganese concentrations were quite elevated, from a low of 414 to a high of 5140 µg/L, these concentrations are of less concern because there are no standards for manganese.

Pit dewatering will be accomplished using large diameter dewatering wells that will be constructed with well screens surrounded by sand filter packs that will be thoroughly developed. It is expected that the dewatering wells will show improved water quality over the groundwater quality from samples already taken from the monitoring wells because of the filter pack and well development. This improvement of water quality has been our experience with another project in the Schefferville area. The water quality of the groundwater extracted from the dewatering wells is expected to be suitable for direct discharge to receiving water bodies given the groundwater results reported above. Water samples should be analyzed from each dewatering well after development to ensure the water is suitable for discharge.

Operation of the open pit mine will require dewatering to ensure that the water table is maintained below the bottom of the pit and more than 25 m from the pit walls. The most effective pit dewatering approach is considered to be a pit perimeter dewatering well system. The predicted maximum rate of dewatering is 5,710 m^3/day for the base case scenario where Joyce Lake is dewatered before pit development begins. This would be accomplished using at least seven dewatering wells. The estimated maximum dewatering rate, if Joyce Lake is not fully dewatered prior to pit development, is 7680 m^3/day. The groundwater model estimates that as many as ten dewatering wells may be required under this scenario.

Surface water features in the vicinity of the pit will be affected by the pit dewatering system. These impacts will range from complete dewatering at Pond A to minimal impacts at Attikamagen Lake. Mitigative measures will be required for surface-water bodies that contain fish or are fish habitat. Mitigative measures could include diverting water from the pit dewatering system to the surface-water bodies that are affected by the dewatering system.

20.9 Water Management

Stormwater management facilities consisting of sediment ponds, berms, drainage ditches, and pumps will be used to collect and contain surface water run-off from waste rock, lowgrade ore and overburden stockpiles, open pit, run-of-mine, processing plant, rail yard, and accommodation camp. Sediment ponds will be designed to provide on-site storage of local run-off, with controlled releases permitted after appropriate settling and water quality sampling indicates the water is suitable for release.

In the pit, drainage and terracing will be implemented such that surface water can be collected within sumps to allow suspended solids to settle prior to release to the environment. There will be perimeter dewatering wells installed around the pit. Collected water will be pumped to settling ponds for treatment.

Run-off from stockpiled material areas (i.e*.,* overburden, waste rock, and iron ore) will be managed and captured through the use of diversion ditches and settling ponds, and treated to meet regulated limits prior to discharge.

20.10 Water Quality

Water quality sampling studies were completed by Génivar (now WSP) in August 2012 in waterbodies in the Project area to characterize baseline conditions in watersheds potentially affected by the Project.

The water samples were analyzed for a wide range of parameters, including conductivity, pH, hardness, apparent colour, turbidity, total dissolved solids, total suspended solids, dissolved inorganic carbon, dissolved organic carbon, total organic carbon, alkalinity, as well as various other general chemistry and metal parameters.

The main results were:

- In general, the waterbodies are characterized by good quality water and results are typical of low-productivity waters;
- Joyce Lake is sensitive to acidification due to low pH and low alkalinity;
- Hardness is generally low and therefore some heavy metals have lower concentration toxicity thresholds;
- The Canadian Water Quality Guidelines were exceeded for aluminum, total chlorine, copper and zinc in some waterbodies in the Project area.

20.11 Rehabilitation and Closure

A Rehabilitation and Closure Plan will be developed for the Joyce Lake DSO Project as required under the Newfoundland and Labrador *Mining Act*, and in consultation with federal and provincial government agencies. Section 10.1 of the Newfoundland and Labrador *Mining Act* and Section 8.2 of the *Mining Regulations* under the *Mining Act* require that the lessee provide financial assurance to be included in the Rehabilitation and Closure Plan and, as part of the plan, provide an estimate of the cost of completing the work set out in the plan. This Plan will address the requirements set under the Newfoundland and Labrador *Mining Act*, Chapter M-15.1, Sections 8, 9, and 10.

LCIO retained the professional services of WSP to develop a conceptual Rehabilitation and Closure plan for the Project. The objective of the Rehabilitation and Closure Plan is to return the Project site to pre-development conditions as soon as possible.

Specifically, the Rehabilitation and Closure Plan will describe how:

- The site (e.g., the open pit) will be secured with barricades and signage as necessary;
- The infrastructure not required post-closure will be dismantled and removed;
- Equipment or machinery will be recovered and sold on recovery and used markets;
- Hazardous materials and waste will be managed safely and removed;
- Any buried pipelines will be removed or filled with a filler concrete or cement grout upon receiving approval from the minister;
- The footprints of all dismantled sites will be leveled for appropriate drainage, and covered in soil to promote re-vegetation;
- The overburden stockpile will be completely utilized to rehabilitate the mine site;
- The overburden and run-of-mill stockpile footprints will be scarified and re-vegetated;
- The mine site will be progressively restored.

The estimated cost for the rehabilitation and closure work is C$4.3M, and this includes the cost of post-closure monitoring.

20.12 Consultation and Engagement

LCIO is committed to engaging relevant Aboriginal and non-Aboriginal communities and stakeholder groups throughout the development and operation of the Project. LCIO continues to engage Aboriginal groups with established or asserted rights for the purpose of sharing information on the Project, and addressing questions, issues, or concerns with regard to the Project and its potential effects. These ongoing Aboriginal and stakeholder engagement processes have been a vital and integral input to Project planning and design, and to the EIS. Aboriginal and non-Aboriginal community and stakeholder engagement will continue over the life of the Project.

Consultation and engagement with Aboriginal groups began in 2010 and is ongoing. Since the initiation of engagement activities, LCIO has held more than 30 meetings and phone calls with the Innu Nation of Labrador, Naskapi Nation of Kawawachikamach, Innu of Matimekush-Lac John, and Innu of Uashat mak Mani-Utenam.

The Century website (http://centuryiron.com/) contains publicly-available information on its current projects, including the Attikamagen property and the Project. The website contains information about the Project, as well as a number of Project-related documents:

- Preliminary Economic Assessment (PEA) Study Report for the Joyce Lake DSO Project;
- Technical Report on the Attikamagen Project;
- NI 43-101 Technical Report Joyce Lake DSO Iron Project Newfoundland & Labrador;
- NI 43-101 Technical Report on the Mineral Resources of the Hayot Lake Taconite Iron Project; and
- Attikamagen - Technical Report.

LCIO has also given numerous presentations to industry and the public regarding the Project and its overall activities.

Issues and concerns raised during consultation and engagement with stakeholders, regulators and Aboriginal groups regarding effects of the Project include:

- Wildlife;
- Fisheries and Fish Habitat;
- Consultation;
- Employment;
- Impact Benefits Agreements;
- Water Quality;
- Waste Management;
- Noise;
- Fuel Storage;
- Transportation.

21 CAPITAL AND OPERATING COSTS

The Joyce Lake DSO Project scope covered in the Feasibility Study is based on the construction of a greenfield facility having a nominal annual production capacity of 2.5 Mt of combined lump and sinter fines products. The Capital and Operating Cost Estimates related to the mine, process plant and site infrastructure have been developed by BBA. Costs related to the railway transportation, port handling and ship loading at the port terminal have been provided by LCIO. BluMetric Environmental and Stantec have provided designs for basis of cost estimating for implementing the perimeter dewatering plan and surface water management plan. Table 21-1 presents a summary of total estimated initial capital costs for the Project.

Table 21-1: Summary of Capital Cost Estimate

Cost Area	Initial Capital
Mining Pre-Stripping	$15.3M
Mining Equipment	$23.3M
Project Infrastructure	$139.1M
Railcars	$42.0M
Other Site Mobile Equipment	$25.9M
Contingency	$13.9M
TOTAL	**$259.6M**

The total initial capital cost, including Indirect Costs and contingency was estimated to be $259.6M. This Capital Cost Estimate is expressed in constant Q4-2014 Canadian Dollars. It should be noted that the aforementioned cost estimate excludes sustaining capital (capital required to support operations starting in the first year of operation) and salvage value. Also excluded are assurance payments for closure and rehabilitation; provisions for deposit payments typically required to secure third party services. These costs and credits are treated separately within the project Economic Analysis and are discussed in Chapter 22 of this Report.

Table 21-2 presents a summary of estimated average LOM operating costs per dry metric tonne of combined lump and fines products.

Table 21-2: Estimated Average LOM Operating Cost ($/t Dry Product)

Cost Area	LOM Average Cost per tonne (C$ / DMT)
Mining	$12.98/t
Low Grade Stockpile Reclaim	$0.25/t
Perimeter Dewatering and Water Management	$0.34/t
Processing and Handling	$2.25/t
Product Hauling	$3.52/t
Load-out and Rail Loop	$1.11/t
Site Administration & Services (Site)	$2.45/t
Site Administration (Room & Board and FIFO Air Tickets)	$1.71/t
Rail Transportation, Port and Ship loading	$32.60/t
Corporate G&A	$1.05/t
TOTAL	**$58.25/t**

The total estimated operating costs are $58.25/t of dry product. Royalties and working capital are not included in the Operating Cost Estimate but are treated separately in the Economic Analysis presented in Chapter 22 of this Report.

21.1 Basis of Estimate and Assumptions

The Capital Cost Estimate pertaining to the mine site, the processing area, the load-out and rail loop area and other site infrastructure was performed by a professional estimator on BBA's estimation team. Operating costs were estimated by BBA's process and engineering department.

21.1.1 Type and Class of Estimate

The Capital Cost Estimate for the Feasibility Study is meant to form the basis for overall project budget authorization and funding and, as such, forms the "Control Estimate" against which subsequent phases of the Project will be compared and monitored. The accuracy of the Capital Cost Estimate and the Operating Cost Estimate developed in this Study is qualified as -10% / +15%. All estimates exclude taxes and duties.

21.1.2 Dates, Currency and Exchange Rates

This cost estimate is calculated and presented in constant Q4-2014, Canadian Dollars (C$). The exchange rate used is C$1.00 = US$0.80. Escalation and inflation were not considered.

21.1.3 Labour Rates and Labour Productivity Factors

The hourly Crew Rates used in the estimate were developed by BBA and are based on current applicable Construction Collective Bargaining Agreements and on BBA's experience on other projects in the region. Crew Rates include Direct, Indirect and Construction Equipment. The rates were developed as "all-in" rates.

Direct rates include a mix of skilled, semi-skilled and unskilled labours for each trade as well as the fringe benefits on top of gross wages. Direct supervision by the Foremen and Surveyors is built into the Direct Costs. For the purpose of defining the "Work Week", all estimated costs for labour are based on 10 hours per day, 7 days per week, for a 70 hour "Work Week". Work will be performed on a fly-in fly-out basis respectively of 4 weeks of work followed by 2 weeks rest. The average crew rate considers 40 hours at the base rate coupled with 30 hours overtime at a multiplier of two times the base rate.

The Indirect Cost component consists of allowances for small tools, consumables, supervision by the General Foremen, Management Team, Contractors on site temporary construction facilities, mobilization / demobilization, Contractor's overhead and profit. It also includes the costs related to the transportation of the fly-in fly-out FIFO employees.

The Construction Equipment rates were developed by BBA for each discipline (by speciality). They take into consideration the rates proposed by "La Direction Générale des Acquisitions du Centre de Services Partagés du Québec". Labour rates are based on "Construction Labour Relation Association of Newfoundland and Labrador". Table 21-3 presents the average all-in crew rates for the various disciplines.

Table 21-3: Labour Rates Used for Cost Estimation

Discipline	Average Hourly Rate
Civil	$169.65
Architectural	$123.10
Mechanical	$142.15
Piping	$143.20
Electrical	$155.57

Project Construction Performance is an important concern of project owners, constructors and cost management professionals. Project cost performance depends largely on the quality of project planning, work area readiness, preparation and the resulting productivity of the work process made possible in project execution. Labour productivity factors have been developed for each discipline and applied as a productivity loss factor to the base man-hours developed for each discipline. Factors accounted for include, but are not limited to, the following:

- Site location
- Weather conditions (Winter conditions are expected to dominate from November 15th to April 15th)
- Extended overtime
- Work over several distant staging areas
- Accessibility to work area
- Overcrowded tight work areas
- Height, scaffolding
- Work complexity
- Availability of skilled workers
- Labour turnover
- Health and Safety considerations
- Supervision
- Fast-track requirements
- Materials and equipment over handling

Table 21-4 presents the labour productivity factors applied in the Capital Cost Estimate.

Table 21-4: Productivity Factors Used for Cost Estimation

Discipline	Productivity factor
Earthworks	1.481
Architectural / Building	1.391
Mechanical Works	1.406
Piping Works	1.449
Electrical Works	1.430
AVERAGE	**1.426**

In parallel with the estimating process, budgetary quotation requests were sent to Heavy Civil / Earthworks contractors familiar with work in the Schefferville and Northern Labrador area. Four budgetary proposals were received. The three lower proposals are based on open shop labour executing the work and yielding comparable results to BBA's estimate developed with its internal database.

21.1.4 General Direct Capital Costs

This Capital Cost Estimate is based on the construction of a greenfield facility having a nominal production capacity of 2.5 Mtpa of lump and sinter fines products. The design of the ore processing plant area, consisting of the run-of-mine stockpile, a two-line crushing and screening plant, and the product stockpiles has been based on process design testwork and on material handling logistics.

The general site plan developed in the Feasibility Study has been used to estimate engineering quantities and generate Material Take-Offs (MTOs). Equipment costs and major buildings and other infrastructure components have been estimated using budgetary proposals obtained from Vendors. Labour rates have been estimated as previously described.

BBA has developed its Capital Cost Estimate on the following assumptions and estimation methodology:

- Mining equipment quantities and costs have been developed by BBA's mining group based on the mine plan developed in the Study. Mining equipment costs were estimated from BBA's recently updated database of Vendor pricing.
- Mine pre-stripping costs incurred in the pre-production period have been capitalized.
- Waste materials from the mining operation, used for construction of roads and pads, are assumed to be delivered by the Owner's mining fleet and personnel to specifically defined locations.
- Civil earthwork quantities for construction of roads and pads have been estimated by BBA's civil engineering team based on drawings, detailed topographical data and site geomorphological and geotechnical studies performed by LVM. It is assumed that the site geotechnical studies are reasonably representative of actual soil conditions.
- It is assumed that heavy civil work is awarded to reputable contractors familiar with local conditions on a unit cost basis.
- Borrow materials, other than waste material coming from the open pit mining operation, originate from the rail loop cut and fill quantities, as well as from a local quarry on the south side of the rock causeway, as identified in the LVM site geotechnical study.
- Bridges and culverts have been engineered and estimated by BBA based on recommendations from Stantec water management team.
- Capital costs for the main service buildings such as mine garage, truck wash warehouse and offices have been estimated based on Vendor budget proposals. These are generally pre-fabricated or pre-engineered structures built directly on leveled pads.
- The permanent camp and supporting infrastructure were defined and estimated by BBA with a detailed functional specification based on an estimated number of rooms. BBA obtained budget proposals from Vendors.

- Mechanical, Electrical and Process Equipment capital costs were estimated by BBA engineering disciplines based on the defined design criteria.
- Mobile equipment fleet for ore and product handling such as wheel loaders and haul trucks were sized by BBA based on material handling logistics. Budget prices were obtained from Vendors.
- The railcar fleet was determined by LCIO based on cycle times derived from an internal study. BBA obtained budget unit pricing for railcars from Vendors.
- Diesel fuel storage capacity and capital costs estimate were based on monthly and seasonal fuel requirements for mobile equipment and power generation.
- The central electric power generating station and the stand alone generator set capacities were estimated by BBA based on estimated power requirements. A motor list and a single line diagram were developed and budget prices were obtained from Vendors or were derived from BBA's current updated database.
- Telecommunication capital and operating costs were based on a design developed by BBA and Vendor budget proposals.
- The operating cost fuel component for mining and power generation was based on a diesel fuel price of C$ $1.10 per litre delivered to the mine site.

21.1.5 Indirect Costs

Indirect Costs included in the capital cost estimate include the following items:

- Owner's costs were provided by LCIO based on the owner's team that will be in place during the engineering and construction phase of the project. These costs include items such as executive management, corporate support for engineering, procurement and contract administration, construction, HSE and community affairs management. Also included are costs for permits, legal fees and insurance.
- EPCM Services Costs were developed by BBA and were based on project schedule and scope of work. Construction management takes into consideration that the project is staged over several areas simultaneously over a relatively long distance as the mine site and rail loop are connected by over 43 km of road.
- Temporary construction facilities include construction trailers, generators and other such items and were estimated by BBA based on vendor prices for major items. LCIO has tentatively secured accommodations for construction workers and has provided BBA with costs agreed to with parties providing such accommodations. LCIO also has provided access to its exploration camp south of Iron Arm and to housing in Schefferville.
- Construction operation and maintenance include costs such as room and board for complete construction crews.

- Third party services include services such as security guards, nurse, Owner's surveyors and other such services.
- Overhead expenses include mainly umbrella insurance for construction.
- Common and distributable costs include costs such as freight of all imported equipment and materials from point of origin to the site, first fills, spare parts and vendor reps.

It is important to note that indirect costs are based on a specific project execution schedule, as presented in Chapter 24. This schedule assumes that construction begins in the month of March of any given year and production starts in the month of March of the following year.

21.1.6 Contingency

Contingency provides an allowance to the Capital Cost Estimate for undeveloped engineering detail within the Scope of Work covered by the estimate. Contingency is not intended to take into account items such as labour disruptions, weather-related impediments, changes in the scope of the Project from what is defined in the Study, nor does contingency take into account price escalation or currency fluctuations. A contingency of 10% of the sum of Direct and Indirect Costs has been attributed to the Capital Cost Estimate developed in this Study. This contingency is not applied to mining and other site mobile equipment nor to railcars.

21.1.7 Exclusions

The following items are not included in this Capital Cost Estimate:

- Inflation and escalation. The estimate is in constant Q4-2014 Canadian Dollars;
- Costs associated with hedging against currency fluctuations;
- All taxes and duties;
- Project financing costs including, but not limited to, interest expense, fees and commissions.
- Costs incurred prior to project approval and start of detailed engineering are considered as sunk costs and are not part of this capital cost estimate or project economic analysis.

21.2 Estimated Capital Costs

Project Initial Capital Costs have been estimated at $259.6M, as indicated previously in Table 21-1. Details of these costs are provided in the following sections. All Capital Costs indicated are in Q4-2014 Canadian dollars.

21.2.1 Mining Capital Costs

Mining capital costs are comprised of two components, pre-stripping (pre-production) costs and mine equipment costs. Pre-stripping costs consist of costs incurred for preparing the open pit for ore production. These costs are calculated based on the mine plan presented in Chapter 16 and consist of the costs for removal of topsoil, overburden and waste rock based on an owner operated equipment fleet. Based on the project implementation schedule, mining pre-stripping begins in the month of July and ends in December (6 months). Ore mining operations begin in January of the following year with processing beginning at the end March. Mine pre-stripping costs (July to December) have been estimated at $15.3M.

A mining equipment list and schedule were developed in order to implement the mine plan for the Project, as presented in Chapter 16. A breakdown of mining equipment and costs by year is shown in Table 21-5. The initial equipment fleet required to undertake the pre-stripping operation is valued at $23.3M. An additional $15.0M will be required in sustaining capital for equipment additions over the first and second year of operation and is not included in the initial capital estimate.

Table 21-5: Schedule of Mining Equipment Purchase

Equipment	Initial Capital		Sustaining Capital			
	PP-1		Y1		Y2	
	No. units	Cost	No. units	Cost	No. units	Cost
Trucks (96 tonnes)	5	$7.54M	4	$6.04M	3	$4.52M
Shovel (10 m^3)	1	$3.10M	1	$3.10M	-	-
DTH drill (8.5)	2	$5.30M	-	-	-	-
Wheel Loader (10.7 m^3)	1	$2.24M	-	-	-	-
Pre-Split Drill (4 in.)	-	-	1	$1.16M	-	-
Grader (14')	1	$0.48M	-	-	-	-
Track Dozer	3	$2.24M	-	-	-	-
Water Truck	1	$0.50M	-	-	-	-
Sand Spreader Body	1	$0.12M	-	-	-	-
Fuel/Lube Truck	1	$0.66M	-	-	-	-
Service Truck	1	$0.23M	-	-	-	-
Skid Steer	1	$0.06M	-	-	-	-
Pick-up Truck	2	$0.12M	-	-	-	-
Lighting tower w/ diesel generator	4	$0.09M	-	-	-	-
Dewatering Pump + Booster	2	$0.30M	1	$0.15M	-	-
Tire Changer	1	$0.33M	-	-	-	-
Surveying Equipment	1	$0.03M	-	-	-	-
TOTAL	**$23.33M**		**$10.44M**		**$4.52M**	

21.2.2 Project Infrastructure Capital Costs

The initial infrastructure capital cost to develop the Project is estimated to be $153.1M, including direct, indirect and contingency, is shown in Table 21-6. It should be noted that these costs exclude sustaining capital costs that have been estimated at $1.3M, required in the first year of operation to implement the Joyce Lake water management plan.

Table 21-6: Project Infrastructure Capital Costs

Cost Area	Capital Cost
Project Infrastructure Direct Costs	$110.5M
Indirect Costs	$28.7M
Contingency	$13.9M
TOTAL	**$153.1M**

A breakdown of the project infrastructure direct capital costs, estimated at $110.5M are presented in Table 21-7 and described in further detail.

Table 21-7: Breakdown of Project Infrastructure Direct Costs

Cost Area	Direct Cost
Roads, Bridges and Causeway	$47.3M
Permanent Camp (144 beds)	$11.5M
Telecom	$3.0M
Rail Loop and Stockpile Area	$19.7M
Process Plant Area	$3.9M
Power Plant and Electrical Distribution	$6.9M
Perimeter Dewatering System	$5.6M
Mine Truck Shop, Wash Bay and Warehouse	$8.1M
Laboratory Facilities	$1.1M
Various Sedimentation Ponds	$1.3M
Other Site Prep and Infrastructure	$2.1M
TOTAL DIRECTS	**$110.5M**

Roads, Bridges and Causeway

This item consists mainly of civil works for the following project components. The total direct cost was estimated at $47.3M. These were described in detail in Chapter 18.

- Repair and upgrade of the existing 14.8 km access road from Schefferville to the LCIO exploration camp located to the south of the Iron Arm waterway.

- The construction of a new 4.3 km service road connecting the Schefferville access road to the project product haul road.
- The construction of a new 43 km product haul road from the ore processing pad at the mine area to the product storage pad at the rail loop.
- The construction of three bridges along the product haul road.
- The construction of the 1.2 km rock causeway, including two bridges.

Permanent Worker Camp

The direct cost for purchase, delivery and installation of a 144 bed workers camp, which includes a kitchen and dining hall, laundry facilities and administrative offices was estimated at $11.5M.

Telecom

The purchase, delivery and installation of the telecommunications network, including two trailer-mounted telecom towers and local antennas located at the rail loop, truck wash, process plant and guard house areas. The direct capital costs for all telecom equipment and infrastructure was estimated to be $3.0M.

Rail Loop and Stockpile Area

The direct capital costs for construction of the rail loop and stockpile area were estimated at $19.7M. The infrastructure includes a 6.9 km rail loop track connecting to the existing Schefferville rail line, a 600 m x 100 m pad for the lump and fines product stockpiles, as well as an equipment maintenance area and rail loop office.

Processing Plant and Laboratory

The direct capital costs associated with the processing plant were estimated at $3.9M. The two-line modular plant consists of primary and secondary crushing along with vibrating grizzly, product screening equipment and conveyors. Costs were based on a budget proposals form vendors based on a scope of supply for the complete package.

Power Plant and Electrical Distribution

The direct capital costs for the central power generation plant, the supporting fuel dispensing system and the electrical distribution system to the various areas supplied were estimated at $6.9M. The power plant is described in detail in Chapter 18.

Perimeter Dewatering System

The six perimeter well system, including drilling of six boreholes, electric pumps powered by local generators, and piping for evacuating water were estimated to have direct capital costs of $5.6M.

Mine Truck Shop, Wash Bay and Warehouse

The mine truck shop, wash bay and warehouse facility were estimated at $8.1M, based on vendor budget proposals.

Laboratory

A modular laboratory, comprised of a sample preparation area, limited sample storage, and analytical equipment, has been included and the cost was based on vendor budget proposal. The estimated direct cost is $1.1M. Lump and fines products, as well as mining samples, will be assayed in the included facility. The laboratory will generally not be operated during the winter months as predominantly waste will be mined.

Various Sedimentation Ponds

Sedimentation ponds for treating run-off water from the various pads around the mine site have been sized and direct costs were estimated at $1.3M, based on quantities developed by BBA civil engineering.

Other Site Preparation and Infrastructure

This item, estimated at $2.1M, includes a variety of miscellaneous items such as clearing of various small site areas, the explosives magazine pad, the guardhouse and some fuel storage areas and equipment.

Indirect Costs

Project indirect costs were estimated at $28.7M, based on project scope and construction schedule. These costs are presented in Table 21-8. Owner's costs have been provided by LCIO based on the corporate and support personnel dedicated to the Project during the construction period. Engineering, Procurement and Construction Management (EPCM) have been estimated by BBA based on a defined construction management plan. Temporary construction facilities and their operations have been estimated in detail by BBA based on LCIO's agreement with a third party to provide room and board during the construction period. Other indirect costs were factored based on similar project.

Table 21-8: Indirect Costs

Cost Area	Indirect Costs
Owner's Costs	$2.3M
EPCM Services	$12.2M
Construction Facilities and Utilities	$3.8M
Construction – Operation and Maintenance	$6.1M
Third Party Professional Services	$1.2M
Overhead Expenditures / Monetary Fees Input	$0.5M
Common Distributables	$2.5M
TOTAL	**$28.7M**

Contingency

Contingency provides an allowance for undeveloped engineering detail within the scope of work of the project. It does not account for labour disruptions, weather-related impediments, changes to the scope of the Project, price escalation or currency fluctuations. The value of the contingency, $13.9M, represents 10% of direct and indirect capital costs for project infrastructure.

21.2.3 Railcars and Other Site Mobile Equipment

The project requires the purchase of 480 iron ore railcars. Budget quotations were received from two vendors. The estimated purchase price delivered to site is $42.0M. While the disbursement for the rail car is spread over two years (PP-1 and Yr. 1), the full amount of the purchase is considered as a pre-production capital cost.

Other mobile equipment required for the project includes the list shown in Table 21-9. Auxiliary equipment, valued at $25.9M, includes equipment mainly for maintenance of the haul road and access road to the site. The purchase of an additional haul truck valued at $1.1M has been included in sustaining capital.

Table 21-9: Other Site Mobile Equipment and Rolling Stock

Equipment	Cost
Fuel Tanker Rail Cars (6 units)	$1.1M
150 t, Bi-Train Product Haul Trucks (10)	$10.9M
ROM and Product Wheel Loaders (5)	$12.4M
Plant Auxiliary Equipment	$1.5M
TOTAL	**$25.9M**

21.2.4 Sustaining Capital and Salvage Value

Sustaining capital costs include ongoing capital costs for additions and modifications of a capital nature during the life of the operation. The salvage value represents the residual saleable value of the equipment and infrastructure at the end of the operation. The salvage value of the mining equipment, including mine trucks and shovels, was estimated by BBA based on the projected number of hours of operation and estimated remaining life. Also, an allowance was made for resale of project infrastructure components that encompass the camp, process plant, rail tracks, power generators, truck shop and laboratory. These infrastructures were designed to be modular and mobile.

A salvage value was assigned to the product railcars, fuel tanker railcars, and major plant and site mobile equipment such as loaders. It should be noted that the product haul trucks are not expected to have any salvage value as they will likely be at or close to the end of their useful life. The sustaining capital and salvage value estimates are summarized in Table 21-10.These values have been included in the project economic analysis presented in Chapter 22.

Table 21-10: Estimated Sustaining Capital Costs and Salvage Value

Description	Capital Costs
LOM Sustaining Capital	
Mining equipment	$15.0M
Joyce Lake Water Management	$1.3M
Additional Product Haul Truck	$1.1M
TOTAL SUSTAINING CAPITAL	**$17.4M**
Salvage Value	
Mining equipment	$4.0M
Project infrastructure	$6.7M
Rail cars	$15.8M
Other mobile equipment	$4.6M
TOTAL SALVAGE VALUE	**$31.1M**

21.3 Operating Cost Estimate

Operating costs were estimated at $58.25/DMT of product loaded in ship at the IOC port in Sept-Îles, as indicated in Table 21-11. A more detailed description of each operating cost component is provided in the sections following.

Table 21-11: LOM Operating Cost Summary

Cost Area	LOM Cost (C$)	LOM Average Cost per tonne (C$ / DMT)
Mining	$230.0M	$12.98/t
Low Grade Stockpile Reclaim	$4.4M	$0.25/t
Perimeter Dewatering and Water Management	$5.9M	$0.34/t
Processing and Handling	$39.8M	$2.25/t
Product Hauling	$62.3M	$3.52/t
Load-out and Rail Loop	$19.7M	$1.11/t
Site Administration & Services (Site)	$43.5M	$2.45/t
Site Administration (Room & Board and FIFO Air Tickets)	$30.4M	$1.71/t
Rail Transportation, Port and Ship loading	$577.8M	$32.60/t
Corporate G&A	$18.6M	$1.05/t
TOTAL	**$1,032.4M**	**$58.25/t**

21.3.1 Mining Costs

Mining operating costs have been developed based on the mining plan for the Project. Mining operating costs averaged over the life of the operation were estimated at $12.98/DMT of combined lump and fines products, including the low grade product generated at the end of the mine life. This equates to a cost of $2.71/t mined, including ore, waste and overburden, including material generated during pre-production. A breakdown of mining operating costs is provided in Table 21-12. Mining takes place year round.

Table 21-12: Breakdown of Average LOM Mining Operating Costs

Cost Area	LOM OPEX ($/t mined)
Equipment Maintenance Cost	$0.79
Equipment Fuel	$0.51
Blasting	$0.51
Mine Labour	$0.87
Services and Miscellaneous	$0.03
TOTAL	**$2.71**

Equipment Maintenance Cost

These costs consist mainly of maintenance costs that have been estimated by BBA based on experience, historical data on similar projects, as well as Vendor information. Maintenance costs include the costs of repairs, spare parts, consumables, etc., and are compiled on a maintenance cost per hour of operation basis for each equipment type. It should be noted that equipment maintenance costs exclude the cost of maintenance personnel, fuel and electricity, which are accounted for separately.

Equipment Fuel Cost

Diesel fuel is used to operate mine trucks, shovels, loaders, drills, dozers and other mine equipment. Fuel consumption was estimated for each year of operation based on equipment specifications and equipment utilization. The price of diesel fuel was assumed to be $1.10 per litre delivered to site, based on information obtained from the Supplier and third party service suppliers for fuel delivery to site.

Blasting Cost

Blasting costs for ore and waste rock were estimated based on parameters and powder factors presented in Section 16 of this Report. Blasting unit costs were estimated at $0.42/t for ore and $0.32/t for waste rock, based on an emulsion unit cost of $114 per 100 kg. Blasting costs also include contractor labour costs for mixing, delivering explosives to the blast holes, and loading explosives into the blast holes.

Labour Cost

Labour requirements were estimated to support the mine plan developed in this Study. Mine salaried and hourly personnel positions and headcounts are presented in Section 16.4.9 of this Report. A general list of all-in monthly and hourly labour rates for salaried and hourly personnel was provided by LCIO based on its experience in the region, as well as on its planned strategy to operate the facility. Table 21-13 provides details of positions, personnel counts, and salaries and wages by position. It should be noted that all salaries and wages presented include the entire labour burden (e.g. benefits, insurance, etc.) but exclude FIFO and room and board costs that are included in the G&A.

Table 21-13: Mining Personnel

Salaried Personnel		Peak Count	Annual Salary ($/yr)
Operations	Mine Superintendent	1	$145,000
	Mine Shift Foreman	4	$90,000
	Blaster	2	$75,000
	Blaster Helper	2	$70,000
	Production / Maintenance Clerk	2	$45,000
Maintenance	Maintenance Superintendent	1	$145,000
	Mechanical/Industrial Engineer	1	$120,000
	Mine Maintenance Foreman	4	$90,000
	Mine Maintenance Trainer	2	$45,000
Engineering	Chief Engineer	1	$145,000
	Mine Planning Engineer	2	$120,000
	Mine Surveyor	2	$100,000
Geology	Chief Geologist	1	$145,000
	Geologist	1	$120,000
	Geologist Technician	1	$100,000
Sub-total Salaried Personnel		**27**	-
Hourly Personnel		**Peak Count**	**Hourly Rate ($/hr)**
Operations	Shovel Operators	8	$50.00
	Loader Operators	2	$45.00
	Haul Truck Operators	47	$48.00
	Drill Operators	8	$48.00
	Dozer Operators	12	$45.00
	Grader Operators	4	$43.00
	Auxiliary Equipment	8	$43.00
	General Labour	4	$20.00
	Dewatering	2	$40.00
Maintenance	Field Gen Mechanics	4	$50.00
	Field Welder	2	$50.00
	Field Electrician	2	$50.00
	Shovel Mechanics	3	$50.00
	Shop Electrician	2	$50.00
	Shop Mechanic	8	$50.00
	Mechanic Helper	4	$22.00
	Welder-machinist	2	$50.00
	Tool Crib Attendant	2	$20.00
	Janitor	2	$20.00
Sub-total Hourly Personnel		**126**	-
TOTAL		**153**	**-**

Services and Miscellaneous Cost

This element includes costs for items such as consulting services and production of aggregates for mine road maintenance using waste rock and the process crushing plant during periods of availability.

Low Grade Stockpile Reclaim

Over the life of the open pit mine operation, a low grade stockpile is accumulated in the vicinity of the open pit for processing once the mining operation runs out of high grade ore. This ore needs to be reclaimed by loader and hauled to the processing plant ore stockpile. This operation contributes an estimated $0.25/DMT of total product produced over the life of the mine based on $1.20 per tonne of low grade ore handled. Processing takes place only over eight months of the year.

Perimeter Dewatering and Water Management

Perimeter dewatering is carried out year-round throughout the open pit mining operation, which is planned to be completed by Q1 of the sixth year of operation of the mine. Perimeter dewatering contributes $0.34/DMT to operating costs. The main cost components of this operation consist of labour that is provided by site personnel, fuel for generating electricity for each of seven pumps, and an allowance for pump maintenance. A breakdown of the cost components is provided in Table 21-14.

Table 21-14: Perimeter Dewatering Operating Costs

Cost Item	LOM Average Cost per tonne ($/DMT)
Electricity for Perimeter Dewatering (Generated)	$0.24/t
Pump Maintenance (Allowance)	$0.10/t
TOTAL	**$0.34/t**

21.3.2 Processing and Handling

Processing and ore and product handling costs account for $2.25/DMT and are detailed in Table 21-15. A description of each cost component is further discussed. Processing takes place over eight months of the year.

Table 21-15: Process Operating Costs

Cost Item	LOM Average Cost per tonne ($/DMT)
Labour	$0.88/t
Feed and Product Loader Fuel	$0.28/t
Feed and Product Loader Maintenance and Tires	$0.32/t
Electricity (Generated)	$0.59/t
Plant Maintenance (Allowance - 5% of CAPEX)	$0.05/t
Plant Consumables (crushers and Screens)	$0.09/t
Laboratory Consumables (Incl. Mine samples)	$0.03/t
TOTAL	**$2.25/t**

Labour

The processing facility accounts for a total of 31 employees. Seven salaried personnel work year-round, while the 24 hourly workers are employed on a seasonal basis for eight months of the year. The workers assigned to this area are responsible for loading ROM into the crusher, processing and loading product into the haul trucks.

Table 21-16: Process Plant Labour

Salaried Personnel	Number of Employees	Salary ($/year)
Processing manager	1	$145,000
Process engineer	1	$115,000
Lab manager	1	$115,000
Area foreman	4	$90,000
Sub-total Salaried Personnel	**7**	-
Hourly Personnel	**Number of Employees**	**Wage ($/hr)**
Process plant operator	4	$43.00
Area general labour	4	$18.00
Area mechanics	2	$50.00
Area electricians	2	$48.00
Laboratory attendants	4	$22.00
Loader operators	8	$45.00
Sub-total Hourly Personnel	**24**	-
TOTAL	**31**	**-**

Maintenance personnel for loaders are shared services and included in product hauling labour calculations.

Front End Loader Costs

Two 16-tonne capacity front end loaders are used to feed ROM ore from the stockpile to the crusher plant and to load lump and fines products from the process plant stockpiles into haul trucks. Loader operating costs include labour costs for operators, fuel and parts and maintenance. Diesel fuel consumption was estimated based on material handling logistics, loader cycle times, and the fuel consumption rate provided by the equipment vendor. Maintenance and spare parts costs were also estimated using vendor data.

Electricity

Electricity for the processing plant is generated at the central power plant using diesel fuel. Fuel consumption for power generation is prorated to the consuming area. The process plant operates eight months of the year and fuel consumption is attributed to power generation for the process plant at the appropriate proportion based on a diesel price of $1.10 per litre.

Maintenance and Consumables

Maintenance costs were estimated at 5% of the total capital costs for the mobile plant. Cost of consumables, including crusher liners and concaves and screen deck panels, were provided by the process plant vendor.

Laboratory

The laboratory provides sample preparation and testing for the process plant, as well as for drill cores for the mine. The laboratory operating costs, including electricity and manpower, are included in the general process plant costs presented earlier. The laboratory equipment vendor provided a budget cost on a per sample basis for consumables and equipment maintenance. Laboratory consumable costs were estimated at $3.00 per sample.

21.3.3 Product Hauling Costs

The costs of product hauling, estimated at $3.52/DMT, are presented in Table 21-17. These include the operation and maintenance of a 10 bi-train truck fleet to deliver the lump and fines products from the process plant product stockpiles to the rail loop.

Table 21-17: Product Hauling Operating Costs

Cost Item	LOM Average Product Hauling Cost ($/DMT)
Labour (Truck Drivers and Maintenance)	$1.48/t
Fuel	$1.05/t
Tires	$0.44/t
Small parts & lube	$0.13/t
Major parts (Allowance 10% of value)	$0.41/t
TOTAL	**$3.52/t**

Labour

A total of 46 workers, including the haul truck drivers and maintenance personnel, are required in the product hauling operation. A breakdown of hourly personnel by position is presented in Table 21-18.

Table 21-18: Product Hauling Operating Labour

Hourly Personnel	Number of Employees	Wage ($/hr)
Haul truck operators	40	$47.00
Haul truck and loader maintenance mechanics	6	$50.00
TOTAL	**46**	**-**

Fuel

The annual fuel requirement for the fleet of ten trucks was estimated based on vendor data. Total fuel usage was calculated assuming an average hourly consumption of 50 l/h and cycle time of 138 minutes (round trip).

Tires and Maintenance

Tire wear data and unit costs were provided by vendor. Tire costs were based on 4,000 hour tire life. Maintenance expenses for the haul fleet are presented in the form of an allowance for small parts, lubricants and major parts. The major parts allowance takes into consideration that the haul trucks have a useful life of about 5 to 6 years. An additional unit is also provided to ensure that the fleet lasts the life of the hauling operation, which is expected to last just over seven years.

21.3.4 Product Load-Out and Rail Loop

Load-Out and rail loop operating costs were estimated at $1.11/DMT and are presented in Table 21-19. These costs cover product stockpile management, loading of product into railcars and operating and maintaining the area infrastructure. This area operates eight months of the year.

Table 21-19: Rail Loop and Load-Out Operating Costs

Cost Item	LOM Average Cost per tonne ($/DMT)
Labour (Loader Drivers and Supervision)	$0.44/t
Fuel for Loaders	$0.28/t
Loader maintenance (Incl. Tires)	$0.27/t
Electricity (Generated)	$0.02/t
Expenses and Rail Maintenance (Allowance)	$0.10/t
TOTAL	**$1.11/t**

Labour

Labour costs associated with operations in the load-out and rail loop area are mainly related to loader operators and supervision and are presented in Table 21-20.

Table 21-20: Operating Labour at the Load-Out and Rail Loop

Salaried Personnel	Number of Employees	Salary ($/yr)
Area foreman	2	$90,000
Hourly Personnel	**Number of Employees**	**Salary ($/yr)**
Railcar loading/Stacking loader operators	12	$45.00
TOTAL	**14**	**-**

Front End Loader Costs

Three 21-tonne capacity front end loaders are used to manage the lump and fines product stockpiles and to load railcars. Loader operating costs include labour costs for operators, fuel and parts and maintenance. Diesel fuel consumption was estimated based on material handling logistics and loader cycle times and fuel consumption rate provided by the equipment vendor. Maintenance and spare parts costs were also estimated using vendor data.

Area Infrastructure

There is minimal infrastructure in the load-out and rail loop area and costs are limited to operating a diesel generator for electrical requirements in the trailer office and an allowance for inspecting and maintaining the rails.

21.3.5 Site Administration and Services

Site administration and services are comprised of shared and common services provided to all areas of the project, including the general mine area, access and haul roads and remote areas such as the load out and rail loop area. Site administration and services were estimated at $2.45/DMT. Table 21-21 provides details of these costs. Site administration services are generally considered fixed costs and are provided year round.

Table 21-21: Site Administrative and Operating Costs

Cost Item	LOM Average Cost per tonne ($/DMT)
Labour	$0.72/t
Electricity (Generated)	$1.09/t
Site Maintenance Equipment (Fuel and Maintenance)	$0.13/t
Telecom	$0.32/t
Other (Expense Allowance)	$0.19/t
TOTAL	**$2.45/t**

Labour

A list of personnel assigned to site administration and services, as well as salaries and wages used to develop operating costs, is presented in Table 21-22. Personnel consists of resident general operations management and support, as well as personnel for assuring the maintenance and upkeep of site infrastructure, including road maintenance.

Table 21-22: Site Administration and Service Personnel

Salaried Personnel	Number of Employees	Salary ($/yr)
Resident General Manager	1	$170,000
Human Resources	1	$105,000
Accounting/Payroll	1	$105,000
Health & Safety	1	$105,000
Purchasing	1	$105,000
IT technician	1	$90,000
Environmental engineer	1	$105,000
First aid	2	$90,000
Sub-total salaried personnel	**9**	-
Hourly Personnel	**Number of Employees**	**Wage ($/hr)**
Security guard	4	$18.00
Warehouse attendants	2	$18.00
Fuel distribution and dewatering systems	2	$22.00
Site mechanical maintenance	2	$50.00
Road maintenance – general labour	3	$18.00
Road maintenance – light mobile equipment operator	3	$22.00
Sub-total hourly personnel	**16**	-
TOTAL	**25**	**-**

Electricity

Electricity generated by the central power plant at the mine site is distributed as discussed in Chapter 18. In calculating operating costs, the cost of diesel fuel to generate electricity is distributed proportionally to the process plant and to site infrastructure (workers camp, offices, and garage and warehouse) based on annual consumption. Of the total annual electricity produced by the central power plant, 35% is used by the process plant and 65% is used by the connected site infrastructure. The average annual diesel fuel consumption for the central power plant was estimated at 3.76 million litres to generate 14.1 million kwh of electricity. With a diesel price of $1.10 per litre, the cost of producing electricity is $0.30 per kWh (excluding any labour and maintenance for the power plant).

It should be noted that local generators providing power to areas not connected to the central power plant are accounted for separately and costs are attributed to the appropriate areas.

Site Infrastructure Maintenance

Site infrastructure maintenance costs include the upkeep of equipment used for site and road maintenance, excluding labour, which is accounted for separately.

Telecom

Telecom service costs were estimated based on service provider proposals that were, in turn, based on specific telecom requirements for the site. They are presented as a monthly all-in cost that is considered fixed and applicable year-round.

Other (Expense Allowance)

A general expense allowance was provided for site administration office operations.

21.3.6 FIFO and Room and Board

Fly-in-fly-out airline tickets and room and board (camp catering services) were estimated to average $1.71/DMT over the life of the mining and processing operation. These are presented in Table 21-23 and further details are provided in the following paragraphs.

Table 21-23: FIFO and Room & Board Costs

Cost Item	LOM Average Cost per tonne ($/DMT)
Room and Board	$0.59/t
FIFO (Seasonal 8-months)	$0.26/t
FIFO (12-months)	$0.86/t
TOTAL	**$1.71/t**

In the Feasibility Study, personnel counts were developed for all areas based on activity and requirements. In general, mine personnel varies based on the mine plan while personnel count in other areas stays relatively stable. An analysis was performed of the general labour force requirements and personnel were first classified based on FIFO and local residents. A further classification was made based on personnel working year round and seasonal personnel required only during the 8-month period when processing, product hauling and rail transportation takes place.

In the first six years of operation when mining and high grade ore processing take place, total personnel counts vary as follows:

- between 160 and 180 during the four months when only mining activities are ongoing,
- between 235 and 265 when mining, processing, product hauling and rail transportation take place.

In Years 6 and 7, when mining operations have stopped and reclaiming and processing of the low grade stockpile takes place, personnel is reduced to about 130 during the months when reclaiming and processing take place. A skeleton crew of about 20 people, consisting mainly of the salaried managers, is assumed to be kept in place.

In developing the staffing plan, it was assumed that certain positions (mainly of a non-specialized nature) would be filled from the local communities, thus these positions are not considered in the FIFO or in the camp accommodations.

Based on the total personnel requirements previously explained, a personnel count for camp accommodations and for the number of airline tickets for FIFO was derived. The estimated FIFO and room and board costs presented previously in Table 21-23 were then calculated assuming a camp operating cost of $45.00 per person per day and the cost of a return airline ticket of $1,500.

21.3.7 Rail Transportation, Port and Ship Loading

Once the products are loaded into the railcars at the rail loop, LCIO will subcontract rail transportation from the rail loop approximately 20 km south of Schefferville to the IOC port terminal in Sept-Îles, as well as port handling and ship loading services. LCIO has performed its own analysis based on confidential discussions with the various third party service providers that would be involved. LCIO has estimated a cost of $32.60/DMT for railing and port services This includes a refundable portion of deposit provisions expected to be made as part of a volume based formula.

21.3.8 Corporate G&A

LCIO has provided an estimate for corporate sales and general administration (SG&A) support to the Project provided by its corporate office. This cost covers the operating period of the Project and is estimated to average $1.05/DMT.

22 ECONOMIC ANALYSIS

The economic evaluation of Joyce Lake DSO Project was performed using a discounted cash flow model on both a pre-tax and after tax basis. The Capital and Operating Cost Estimates presented in Section 21 of this Report were based on the mining and processing plan developed in this Study to produce a nominal 2.5 Mt of combined lump and fines products annually over the life of the mine (LOM). The Internal Rate of Return (IRR) on total investment was calculated based on 100% equity financing. The Net Present Value (NPV) was calculated for discounting rates of 0%, 8% and 10%, resulting from the net cash flow generated by the Project. The Project Base Case NPV was calculated based on a discounting rate of 8%. The payback period based on the undiscounted annual cash flow of the Project is also indicated as a financial measure. Furthermore, a sensitivity analysis was also performed for the pre-tax Base Case to assess the impact of a +/-15% variation of the Project initial capital costs and operating costs. Sensitivity to the price of iron ore was analyzed between -30% and +50% of the benchmark projected price.

The Financial Analysis was performed with the following assumptions and basis:

- The Project Execution Schedule considered key project milestones.
- The Financial Analysis was performed for the entire LOM for the Mineral Reserve estimated in this Study. Production is estimated to span over 7 years.
- The financial analysis was based on a benchmark sinter fines price of US$95/DMT CFR Port of China for 62% Fe content. Applicable premiums and penalties were applied as described in Chapter 19.
- Ocean freight from Sept-Îles to Chinese port is assumed to be US$15 per wet tonne shipped over the LOM.
- All of the fines and lump products are sold in the year of production.
- Initial production will focus on processing of high grade ore. Once exhausted, the low grade stockpile generated during the mining of the high grade ore will be processed.
- All cost and sales estimates are in constant Q4-2014 dollars (no escalation or inflation has been taken into account).
- The Financial Analysis includes working capital from two components. The first component includes $14.8M that is required to meet expenses after startup of operations and before revenue becomes available. This is equivalent to approximately 30 days of Year 1 operating expenses. The second component includes the costs associated with carrying inventory in the low-grade stockpile as it is generated.
- A royalty is payable to Champion as outlined in Section 4.4.1 of this report.
- An exchange rate of C$1.00 = US$0.80 was used.

This Financial Analysis was performed by BBA on a pre-tax basis. All values are expressed in Canadian Dollars unless otherwise stated. LCIO provided the applicable annual taxation which BBA incorporated into its cash flow model to perform the after-tax calculation.

Table 22-1 presents the annual revenues as derived from the base price for 62% Fe sinter fines for the high grade products and for 58% Fe for the low grade products after which the applicable premiums and penalties are incorporated, as described in Chapter 19.

Table 22-2 presents the undiscounted cash flow projection for the Project based on the following:

- The aforementioned annual revenues;
- Operating costs;
- Royalties;
- Capital cost disbursements;
- Other costs including rehabilitation and closure costs, and deposit provision payments.

Table 22-1: Joyce Lake DSO Project Revenue

Year	1	2	3	4	5	6	7	8	Total
Fines Production (kt)	1,455	1,620	1,616	1,615	1,615	1,625	1,625	349	**11,521**
Fines Fe Grade (%Fe)	59.50%	58.99%	59.60%	60.41%	61.22%	60.13%	52.34%	52.34%	-
Fines SiO_2 Grade (%SiO_2)	10.26%	12.35%	12.24%	10.80%	10.01%	11.51%	22.27%	22.27%	-
Fines Mn Grade (%Mn)	1.28%	0.81%	0.69%	0.85%	0.66%	0.52%	0.62%	0.62%	-
Fines moisture content (%)	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	-
Lump Production (kt)	783	872	870	870	870	875	875	188	**6,204**
Lump Fe Grade (%Fe)	62.50%	61.97%	62.61%	63.46%	64.31%	63.16%	54.98%	54.98%	-
Lump SiO_2 Grade (%SiO_2)	5.97%	8.09%	7.93%	6.44%	5.58%	7.17%	18.49%	18.49%	-
Lump Mn Grade (%Mn)	1.28%	0.81%	0.69%	0.85%	0.66%	0.52%	0.62%	0.62%	-
Lump moisture content (%)	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	-
Fines Selling Price ($/DMT)									
Fines Base Selling Price CFR China (US$)	$95.00	$95.00	$95.00	$95.00	$95.00	$92.09	$83.00	$83.00	-
Fines Fe Penalty/Premium (US$)	$4.51	$6.02	$4.23	$2.42	$1.17	$3.82	$18.65	$18.65	-
Fines SiO_2 Penalty (US$)	$4.32	$5.89	$5.80	$4.73	$4.13	$4.26	$9.20	$9.20	-
Fines Mn Penalty (US$)	$0.55	$-	$-	$-	$-	$-	$-	$-	-
Fines Selling Price CFR China (US$)	$85.62	$83.09	$84.97	$87.85	$89.70	$84.02	$55.15	$55.15	-
Shipping Sept Iles to China Port (US$ / Wet Mt)	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00	-
Shipping Sept Iles to China Port (US$ / DMT)	$16.14	$16.14	$16.14	$16.14	$16.14	$16.14	$16.14	$16.14	-
Fines Selling Price (US$ FOB Loaded in Ship Sept Iles)	$69.48	$66.95	$68.83	$71.72	$73.56	$67.88	$39.01	$39.01	-
Exchange Rate C$1.00 = US$0.80	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	-
Fines Selling Price (C$ FOB Loaded in Ship Sept Iles)	**$86.85**	**$83.69**	**$86.04**	**$89.65**	**$91.96**	**$84.85**	**$48.77**	**$48.77**	-
Lump Selling Price ($/DMT)									
Lump Selling Price (US$)	$110.00	$110.00	$110.00	$110.00	$110.00	$107.09	$98.00	$98.00	-
Lump Fe Penalty/Premium (US$)	-$0.75	$0.04	-$0.92	-$2.19	-$3.47	-$2.34	$8.07	$8.07	-
Lump SiO_2 Penalty (US$)	$1.10	$2.69	$2.57	$1.46	$0.81	$1.54	$6.37	$6.37	-
Lump Mn Penalty (US$)	$0.55	$-	$-	$-	$-	$-	$-	$-	-
Lump Selling Price CFR China (US$)	$109.10	$107.27	$108.35	$110.73	$112.65	$107.89	$83.56	$83.56	-
Shipping Sept Iles to China Port (US$ /Wet Mt)	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00	-
Shipping Sept Iles to China Port (US$ / DMT)	$15.63	$15.63	$15.63	$15.63	$15.63	$15.63	$15.63	$15.63	-
Net Lump Price (US$ FOB Loaded in Ship Sept Iles)	$93.48	$91.64	$92.72	$95.11	$97.03	$92.26	$67.93	$67.93	-
Exchange Rate C$1.00 = US$0.80	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	-
Net Lump Price (C$ FOB Loaded in Ship Sept Iles)	**$116.85**	**$114.55**	**$115.90**	**$118.89**	**$121.29**	**$115.33**	**$84.92**	**$84.92**	-
Sales Revenue from Fines	$126.4M	$135.6M	$139.1M	$144.8M	$148.6M	$137.9M	$79.2M	$17.0M	$928.5M
Sales Revenue from Lump	$91.5M	$99.9M	$100.9M	$103.4M	$105.5M	$100.9M	$74.3M	$16.0M	$692.4M
Gross Revenue from Sales	**$217.9M**	**$235.5M**	**$240.0M**	**$248.2**	**$254.1M**	**$238.8M**	**$153.5M**	**$33.0M**	**$ 1,621.0M**

Table 22-2: Joyce Lake DSO Project Undiscounted Cash Flow (million C$)

Year		PP-1	1	2	3	4	5	6	7	8	Total
Lump Production (kt)		-	783	872	870	870	870	875	875	188	**6,204**
Fines Production (kt)		-	1,455	1,620	1,616	1,615	1,615	1,625	1,625	349	**11,521**
Lump Selling Price (C$/DMT)		-	**116.85**	**114.55**	**115.90**	**118.89**	**121.29**	**115.33**	**84.92**	**84.92**	-
Fines Selling Price (C$/DMT)		-	**86.85**	**83.69**	**86.04**	**89.65**	**91.96**	**84.85**	**48.77**	**48.77**	-
Gross Revenue from Sales (C$M)		-	**$217.9**	**$235.5**	**$240.0**	**$248.2**	**$254.1**	**$238.8**	**$153.5**	**$33.0**	**$ 1,621.0**
Operating Expenses	LOM average ($/DMT product)	Capitalized PP Costs	1	2	3	4	5	6	7	8	Total
Mining	**$12.98**	$14.3	$34.7	$45.2	$50.8	$51.6	$40.6	$7.0	$0.0	$0.0	**$230.00**
Stockpile Reclaiming (low grade)	**$0.25**		$0.0	$0.0	$0.0	$0.0	$0.0	$0.7	$3.0	$0.6	**$4.37**
Perimeter Dewatering and Water Management	**$0.34**		$0.9	$1.3	$1.3	$1.3	$1.3	$0.0	$0.0	$0.0	**$5.94**
Processing and Handling	**$2.25**		$5.1	$5.6	$5.6	$5.6	$5.6	$5.6	$5.4	$1.3	**$39.81**
Load-out and Rail Loop	**$3.52**		$8.1	$8.7	$8.7	$8.7	$8.7	$8.7	$8.7	$2.2	**$62.31**
Rail Transportation	**$1.11**		$2.5	$2.7	$2.7	$2.7	$2.7	$2.7	$2.7	$0.7	**$19.68**
Site Administration & Services	**$2.45**		$4.7	$6.2	$6.2	$6.2	$6.2	$6.2	$5.4	$2.3	**$43.47**
Site Administration & Services (FIFO, room + board)	**$1.71**	$1.1	$4.3	$5.1	$5.3	$5.3	$5.2	$2.4	$2.0	$0.8	**$30.37**
Rail Transportation, Port Handling and Ship Loading	**$32.60**		$71.4	$79.5	$79.3	$81.3	$82.5	$83.0	$83.0	$17.8	**$577.82**
Corporate G&A	**$1.05**		$1.9	$2.6	$2.6	$2.6	$2.6	$2.6	$2.6	$1.3	**$18.63**
Total Annual Operating Expenses	**-**	**$15.3**	**$133.6**	**$156.8**	**$162.4**	**$165.3**	**$155.3**	**$119.0**	**$112.9**	**$27.0**	**$1,032.4**
C$/DMT Product sold	**$58.25**	**-**	***$59.69***	***$62.92***	***$65.32***	***$66.49***	***$62.50***	***$47.61***	***$45.16***	***$50.37***	***$58.25***
Royalties	LOM average ($/DMT product)		1	2	3	4	5	6	7	8	Total
Total Royalties ($M)	**$1.08**	**-**	**$3.86**	**$1.75**	**$2.99**	**$3.11**	**$3.20**	**$2.89**	**$1.18**	**$0.25**	**$19.23**
Capital Costs		PP-1	1	2	3	4	5	6	7	8	Total CAPEX
		Pre-Production	Commercial Production							Salvage	
Mining (Capitalized Pre-Stripping)		$15.3	-	-	-	-	-	-	-	-	**$15.3**
Mining Equipment (Initial Owner Fleet)		$23.3	-	-	-	-	-	-	-	-$4.0	**$19.3**
Mining Equipment Sustaining			$10.4	$4.5	-	-	-	-	-		**$15.0**
Project Infrastructure – Direct Costs		$110.5	$1.3	-	-	-	-	-	-	-$6.7	**$105.1**
Project Infrastructure – Indirect Costs		$28.7	-	-	-	-	-	-	-	-	**$28.7**
Project Infrastructure – Contingency		$13.9	-	-	-	-	-	-	-	-	**$13.9**
Railcars		$31.5	$10.5	-	-	-	-	-	-	-$15.8	**$26.3**
Other mobile equipment		$25.9	$0.0	$1.1	-	-	-	-	-	-$4.6	**$22.4**
Total Capital Costs		**$249.1**	**$22.3**	**$5.6**	**-**	**-**	**-**	**-**	**-**	**-$31.1**	**$245.9**
Other Pre-Production Payments	LOM Total	PP-1	1	2	3	4	5	6	7	8	Total
Rehabilitation and Closure Costs	**$4.3**	-	-	-	-	-	-	-	-	$4.3	$4.3
Deposits Provision Payments	**$18.5**	-	$4.0	$4.0	$4.0	$6.5	-	-	-	-	$18.5
Total Other Pre-Production Payments	**$22.8**	**-**	**$4.0**	**$4.0**	**$4.0**	**$6.5**	**-**	**-**	**-**	**$4.3**	**$22.8**
Cash Flow (Undiscounted)		Pre-Production	1	2	3	4	5	6	7	8	Total
Total OPEX		-	$133.6	$156.8	$162.4	$165.3	$155.3	$119.0	$112.9	$27.0	$1,032.4
Royalties		-	$3.9	$1.8	$3.0	$3.1	$3.2	$2.9	$1.2	$0.2	$19.2
CAPEX Disbursement		$249.1	$22.3	$5.6	-	-	-	-	-	-$31.1	$245.9
Pre-Production Deposits and Payments		-	$4.0	$4.0	$4.0	$6.5	-	-	-	$4.3	$22.8
Working Capital – Current Production		-	$14.8	-	-	-	-	-	-	-$14.8	-
Working Capital – Cost of Low-grade Stockpile		-	$11.6	$16.7	$7.5	$7.3	$2.3	-$7.3	-$31.3	-$6.9	-
Annual Cash Flow		**-$249.1**	**$27.7**	**$50.6**	**$63.1**	**$66.1**	**$93.2**	**$124.2**	**$70.7**	**$54.1**	**$300.6**
Cumulative Cash Flow ($M)	**-**	**($249.1M)**	**($221.4M)**	**($170.8M)**	**($107.7M)**	**($41.7M)**	**$51.5M**	**$175.7M**	**$246.5M**	**$300.6M**	**-**

Figure 22-1presents the undiscounted cash flows for the Project as derived from the spreadsheet format presented earlier.

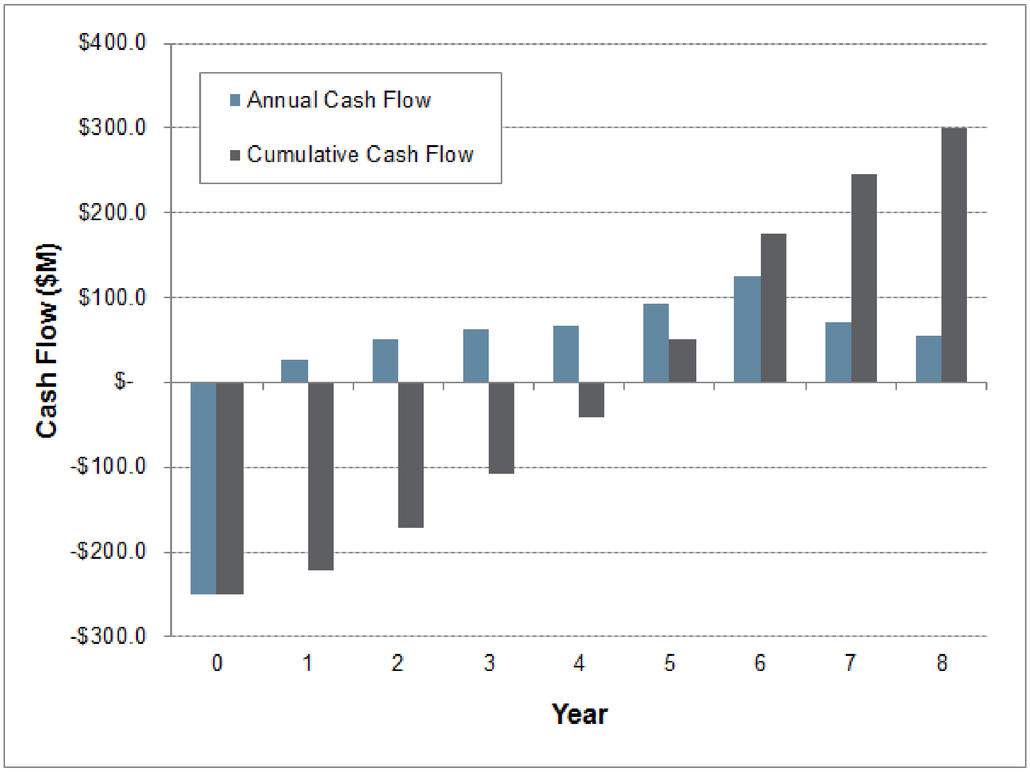


Figure 22-1: Joyce Lake DSO Project Cash Flow

A discount rate is applied to the cash flow to derive the NPV for each discount rate. The payback period is presented for the undiscounted cumulative NPV. The NPV calculation was done at 0%, 8% and 10%. The Base Case NPV was assumed at a discount rate of 8% following discussions with LCIO. Table 22-3 presents the results of the Financial Analysis for the Project, based on the assumptions and cash flow projections presented previously.

Table 22-3: Before Tax Financial Analysis Results

IRR = 18.7%	NPV ($M)	Payback (yrs)
Discount Rate		
0%	$300.6M	4.4
8%	$130.8M	-
10%	$99.9M	-

As can be seen, at a benchmark selling price for sinter fines of US$95/DMT, CFR China port and an exchange rate of C$1.00 = US$0.80, the Project is forecasted to provide a before-tax IRR of 18.7%. At the

Base Case discount rate of 8%, NPV is $130.8M. The payback period is 4.4 years after the start of production. The economic analysis also showed that the project break-even benchmark selling price is US$81.16. The break-even benchmark selling prices is defined as the US$ price for 62% Fe sinter fines, CFR port in China, whereby the undiscounted NPV = $0.

22.1 Taxation

The Project will fall under the tax jurisdiction of the federal income tax, provincial income tax and provincial mining taxes.

A federal income tax rate of 15%, payable to the Federal Government of Canada under the *Income Tax Act* (Canada).

A provincial income tax rate of 14%, payable to the Government of Newfoundland and Labrador under the *Income Tax Act, 2000* (Newfoundland and Labrador).

Under the Revenue Administration Act (Newfoundland and Labrador) the operator of mines will be subject to:

- 15% tax on taxable income.
  - Taxable income is calculated as net income, less the greater of 20% of the net income (if positive) and amounts paid to a person who receives royalties subject to the mineral rights tax.
  - Net income is gross revenue of tax payer less all expenses reasonably incurred in mining operations, processing, and smelting.
  - Operators can claim allowances for depreciation and processing.
    - Processing allowance is the minimum of 8% of the cost of the processing facility and 65% of income before the processing allowance. A credit is available against the 15% tax on taxable income for a year.
    - Credit applies for ten consecutive years beginning in the year in which commercial production is achieved.
    - Cumulative credit amount cannot exceed $20 million.
    - Credit amount for a year is lesser of $2 million and corporate income tax payable under *Income Tax Act, 2000* (Newfoundland and Labrador) for the year.
- 20% tax on amounts taxable.
  - Net income is taxable at 20% under “Tax on Taxable Income”, if positive, minus amounts paid to a person who receives royalties subject to the mineral rights tax.
- 20% mineral rights tax.

Under the *Mineral Act* (Newfoundland and Labrador) the mineral rights tax will be applied where a person receives consideration, including rent and royalties that are contingent upon production of a mine, or computed by reference to the production from a mine, for the grant or assignment of any right issued.

Tax Bracket	Mineral Rights Tax Rate
Net Revenue ≤ $100,000	0%
$100,000 < Net Revenue < $200,000	40% of Net Revenue exceeding $100,000
$200,000 <Net Revenue	20%

After tax project financial performance is presented in Table 22-4.

Table 22-4: After Tax Financial Analysis Results

IRR = 13.7%	NPV ($M)	Payback (yrs)
Discount Rate		
0%	$192.5M	4.9
8%	$61.4M	-
10%	$37.5M	-

As can be seen, on an after tax basis, the Project is forecasted to provide an IRR of 13.7%. At the Base Case discount rate of 8%, NPV is $61.4M. The payback period is 4.9 years after the start of production.

22.2 Sensitivity Analysis

The sensitivity of NPV and IRR was done for the before-tax Base Case discounting of 8% on parameters that are deemed to have the biggest impact on project financial performance as follows.

- Estimated initial capital costs +/-15%;
- Estimated operating costs +/-15%;
- Assumed commodity selling price -30%/+50%;

It should be noted that the capital cost sensitivity was done on total capital costs of $277.0M (which includes initial and sustaining capital, but excludes salvage value). Results are presented in Table 22-5, and are graphically represented in Figure 22-2 and Figure 22-3.

Table 22-5: Sensitivity Analysis Table (Before Tax)

Variation	-30%	-20%	-15%	-10%	-5%	0	+5%	+10%	+15%	+20%	+30%	+40%	+50%
Selling Price													
Base Price for 62% Fe, CFR China (US$/DMT)	$66.50	$76.00		$85.50		$95.00		$104.50		$114.00	$123.50	$133.00	$142.50
IRR	-26.1%	-8.0%		6.2%		18.7%		30.4%		41.5%	52.4%	63.1%	73.7%
NPV (8%)	-$324.7M	-$172.5M		-$20.9M		$130.8M		$282.4M		$434.0M	$585.6M	$737.2M	$888.8M
Payback (yr)	8.0	8.0		5.9		4.4		3.2		2.5	2.0	1.7	1.5
CAPEX													
CAPEX (C$)			$235.46M	$249.31M	$263.16M	$277.01M	$290.86M	$304.71M	$318.56M				
IRR			23.9%	22.0%	20.3%	18.7%	17.3%	15.9%	14.6%				
NPV (8%)			$172.0M	$158.2M	$144.5M	$130.8M	$117.0M	$103.3M	$89.6M				
Payback (yr)			4.0	4.1	4.3	4.4	4.6	4.7	4.9				
OPEX													
OPEX (C$/DMT)			$49.51	$52.42	$55.33	$58.25	$61.16	$64.07	$66.98				
IRR			27.8%	24.8%	21.8%	18.7%	15.6%	12.5%	9.3%				
NPV (8%)			$246.2M	$207.7M	$169.3M	$130.8M	$92.3M	$53.8M	$15.3M				
Payback (yr)			3.4	3.8	4.1	4.4	4.8	5.2	5.6				

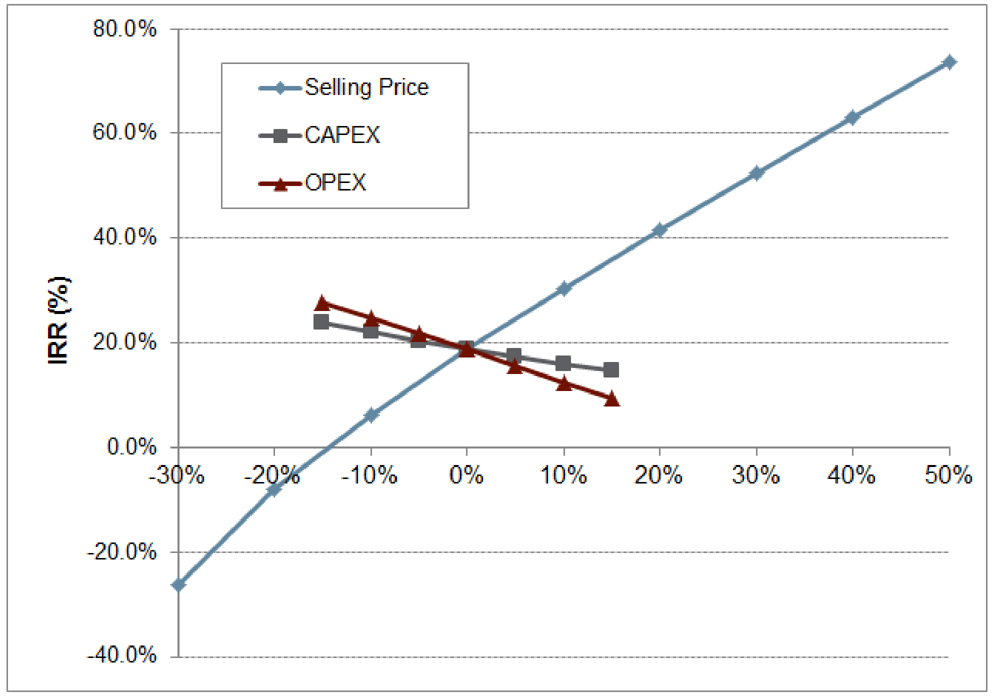


Figure 22-2: Sensitivity Analysis for IRR (Before Tax)

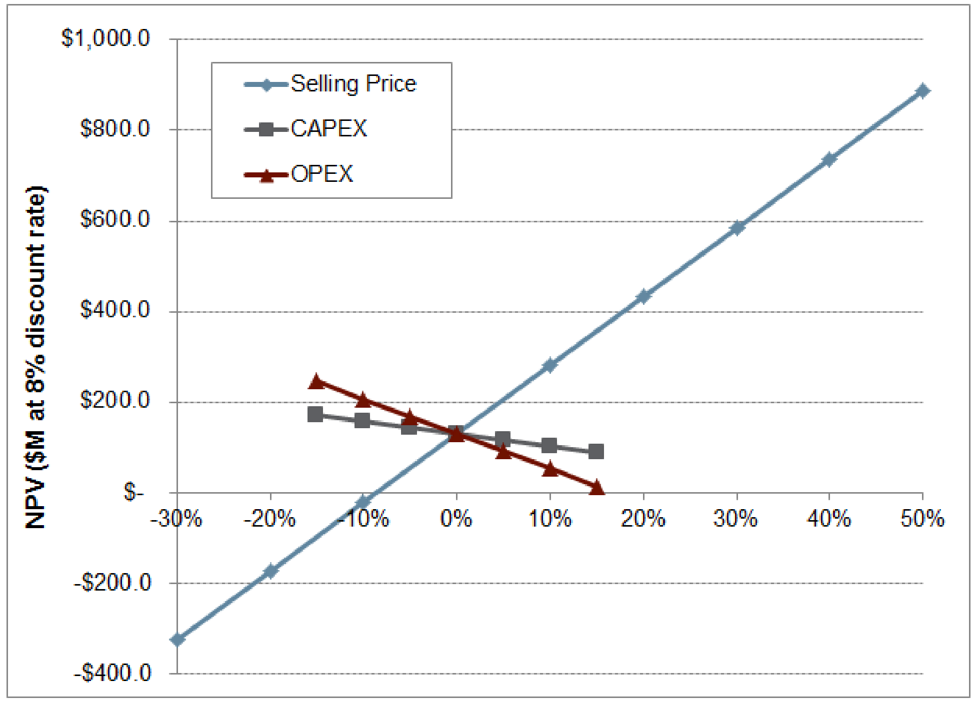


Figure 22-3: Sensitivity Analysis for NPV (Before Tax)

23 ADJACENT PROPERTIES

The Joyce Lake DSO project is located in the western central part of the iron-rich Labrador Trough, containing a large number of iron rich deposits and exploration properties. Only the adjacent DSO properties are described here, which are not adjacent locally but more regionally.

The following companies have adjacent DSO projects currently in exploration and/or under development:

- Labrador Iron Mine Holdings Limited (LIM); and
- Tata Steel Minerals Canada Limited (TSMC), a joint venture between Tata Steel Limited and New Millennium Iron Corp.
- Cap-Ex Iron Ore Ltd.(CEV).
- Beaufield Resources (BFD)
- Champion Iron Limited (CIA)

The following information has been taken from information publicly disclosed by the companies listed. The qualified person for this report has not verified this information. **The information below is not necessarily indicative of the mineralization on the Joyce Lake DSO project and may not be up to date as the situation evolves for the other land owners in the region.**

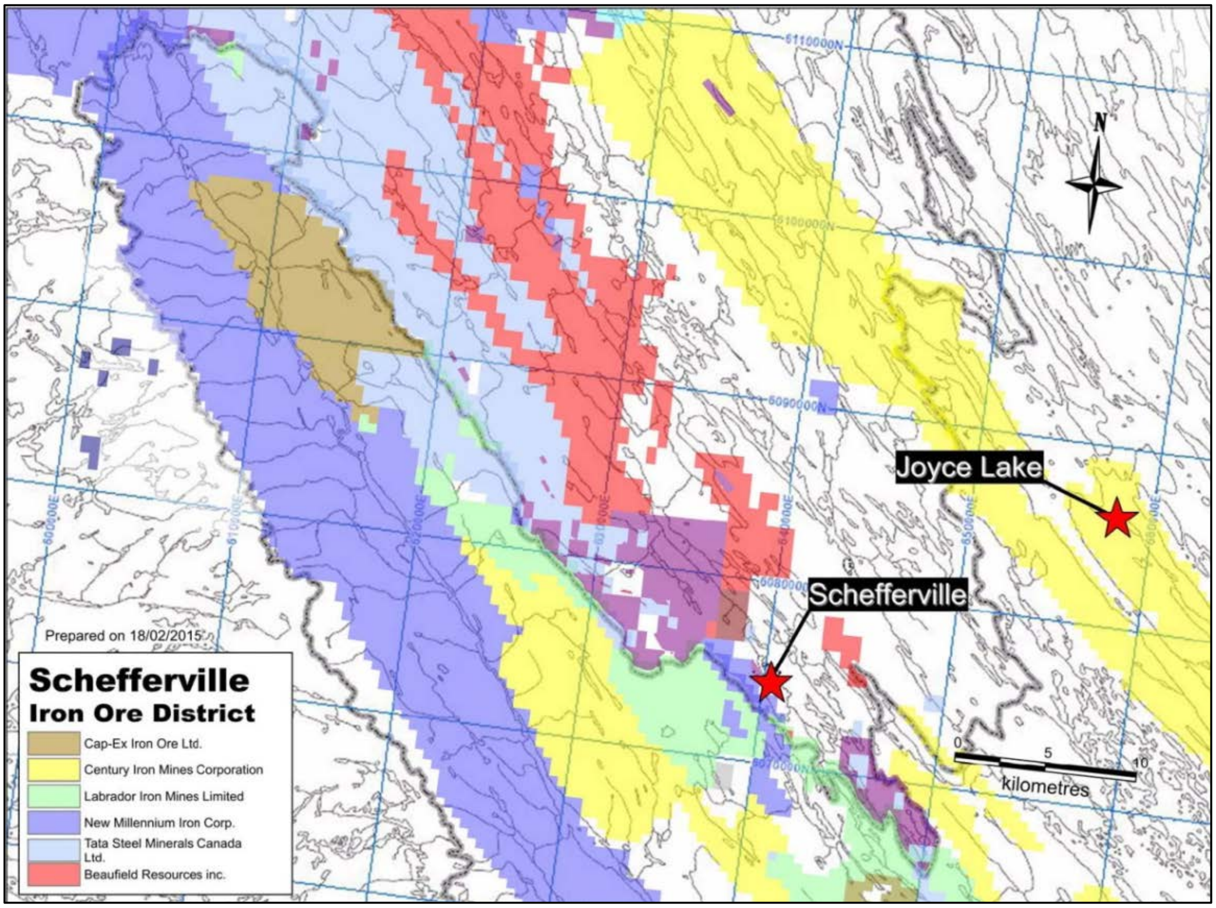


Figure 23-1: Regional Property Map

23.1 Labrador Iron Mine Holdings Limited (LIM)

The following text comes directly from LIM website: Schefferville Area Projects:

"LIM's 20 direct shipping (DSO) properties comprising our Schefferville Projects are located in the western central part of the iron-rich Labrador Trough, one of the most prolific iron ore producing regions in the world. The Schefferville area has a tradition in iron ore production that dates back to the early 1950s. LIM's DSO deposits contain hematite lump and sinter fine ores and are part of the original IOC Schefferville operations, forming part of the 250 million tonnes of historic reserves and resources identified by IOC. Today, the area is home to established infrastructure, which includes hydro power, the town, airstrip and railway service to the Port of Sept-Îles, Quebec

LIM's mine operations involve the extraction of iron ore by developing open pit mines, starting with the James Mine, which commenced initial production in June 2011. Commercial production was achieved in

April 2012 and LIM completed its third year of operations in November 2013. To date, LIM has sold approximately 3.6 million dry tonnes (approximately 3.8 million wet tonnes) in 23 cape-size shipments to the Chinese spot market. LIM has not restarted mine operating activities for the 2014 operating season, due to a combination of the prevailing low prices of iron ore in 2014 to date, an assessment of the economics of the remaining resources of the James Mine and other stage 1 deposits at current ore prices and a strategic shift in corporate focus towards establishing a lower cost operating framework. LIM's Stage 1 deposits and related infrastructure, including the wet processing plant, are being maintained in standby condition for the time being, which will allow for a potential restart of stage 1 production when economic conditions improve (PR July 2, 2014).

At present, LIM has confirmed NI 43-101 compliant measured and indicated minerals resources of 59.5 million tonnes at a grade 56.7% Fe on the James, Redmond, Denault, Knob Lake, Houston and Malcolm deposits (as at March 31, 2013). In addition to these deposits, the remaining 15 deposits have a total combined historical resource estimated to be approximately 108 million tonnes based on work carried out by IOC prior to the closure of its Schefferville operations in 1984. The historical estimate was prepared according to the standards used by IOC and, while still considered relevant, is not compliant with NI 43-101. The Company plans to bring the historical resources on these other deposits into NI 43-101 compliant status sequentially in line with their intended phases of production."

It should be noted that on February 13, 2015, LIM announced that it had voluntarily delisted its shares from the TSX.

23.2 Tata Steel Minerals Canada Limited (TSMC)

The following text comes directly from TSMC website: The DSO Project:

"TSMC is developing a Direct Shipping Ore (DSO) Project in the provinces of Quebec and Newfoundland & Labrador.

The DSO property is comprised of 25 hematite deposits with a resource potential of 122 million tonnes. Detailed exploration and mine planning has been undertaken for 9 deposits to establish 59 million tonnes of reserves. We have altogether NI-43-101 compliant resource for 10 deposits totalling 78 million tonnes (Measured, Indicated and Inferred) including Ferriman 4 deposit.

The project comprises of mining, crushing, washing, screening and drying the run-of-mine ore with a state-of-art facility near Schefferville, Québec to produce 4.2 MTPY of sinter fines and pellet feed. The processing facilities will be housed under a large steel supported fabric structure to enable year round *operations. The plant will meet its power requirements entirely by its own generators. In order to accommodate workers during the construction phase and later during operations, a fully equipped camp is being set up near the plant.*

The finished product will be transported by rail to Sept-Îles, Québec for onward shipment to Tata Steel Europe's steel making facilities."

The following are highlights from TSMC website detailing the progress of their DSO project

September 14, 2013: The First Shipment from Tata Steel Minerals Canada's (TSMC) DSO Project departed from the IOC terminal facility in Sept-Îles, Quebec. The MV Sterling vessel carrying 76,896 tonnes of iron ore sinter fines is destined for Tata Steel's European plants.

June 4, 2014: Construction of the KéRail rail line connecting TSMC's DSO processing facilities to the Tshiuetin Rail Transportation (TRT) main line complete.

November 2, 2014: Rail haulage of TSMC ore commences directly from the DSO rail loop through KéRail for onward journey to ocean-going vessels at the Port of Sept-Îles.

November 24, 2014: Panamax vessel carrying TSMC ore departs Port of Sept-Îles, destined for Tata Steel Europe.

23.3 Cap-Ex Iron Ore (CEV)

The following text comes directly from Cap-Ex website:

"Cap-Ex Iron Ore Ltd. is a Canadian listed company, focused on the development of its Block 103 Iron Ore Property in the Labrador Trough, near the mining town of Schefferville, Quebec. The Block 103 property is strategically located close to an existing railway, which can provide a direct link to a shipping port, and is adjacent to New Millennium Iron Corp-Tata Steel LabMag and KeMag deposits and the New Millennium-Tata oxide deposits to the east.

The 2012 exploration program included 22,300m of drilling in 72 holes and resulted in an initial NI 43-101 inferred resource of 7.2 billion tonnes at 29.2% total iron. Highlights of the PEA were released by the Company on June 27, 2013."

Here are recent highlights from Cap-Ex Iron Ore DSO projects:

October 8th, 2014 : ***Cap-Ex Iron Ore Ltd.*** has signed an agreement (the "Agreement) with Tata Steel Minerals Canada Ltd (TSMC) in respect of roadway access and DSO exploration over the Company's wholly-owned Block 103 property in western Labrador. Under the terms of the Agreement, the Company has agreed to assist TSMC in obtaining surface rights for a roadway through Block 103 to connect adjoining properties of TSMC. TSMC shall be solely responsible for all work, costs and expenses required to build the roadway and for continued use of the roadway, including maintenance.

In return TSMC has agreed to pay the Company $250k cash and conduct an initial $550k DSO exploration program on Block 103. The exploration program, to be determined by TSMC, will include gravity testing and pit testing of geophysical anomalies previously identified by Cap-Ex and TSMC geologists. The program is to be completed by September 30, 2015 during which period Cap-Ex has granted TSMC exclusivity in regards to exploring DSO prospects on Block 103.

At any time prior to September 30, 2015, TSMC has the right to advise Cap-Ex that it wishes to enter into a joint venture agreement regarding the DSO potential of Block 103 in which event both parties agree to negotiate in good faith for a period of 90 days. If at any time TSMC decides it does not to continue with the exploration program, or both parties cannot agree on a joint venture agreement, TSMC will pay an additional $200k cash to Cap-Ex in full satisfaction of its exploration commitment under the Agreement.

Graham Harris, CEO states "to date the Company's focus has been on developing the PEA of the 7.8 Billion tonne Magnetite deposit on Block 103. Over the next 12 months we look forward to working closely with our neighbour, TSMC, to explore the DSO potential of Block 103."

October 28th 2014: Cap-Ex Iron Ore Ltd *has been notified by Tata Steel Minerals Canada Ltd. (TSMC) that the initial phase of a detailed ground gravity and magnetometer survey on the Block 103 Property has commenced. Based on reinterpretations of the 2011 Airborne Gravity and Magnetometer survey (see news release June 15, 2011), geophysical consultant, Jean Hubert, has identified over 20 separate DSO type anomalies for immediate detailed follow-up on the Block 103 property.*

Graham Harris, the CEO of Cap-Ex, comments "We now have over 20 prospective targets giving the potential to identify DSO resources on the Block 103 property. We look forward to working with TSMC to delineate their potential."

Other mineral claims owned by Cap-Ex in the vicinity of Schefferville are not DSO projects and include the Snelgrove mineral claims and Lac Connelly. They are not DSO and will just be briefly mentioned.

23.4 Beaufield Resources (BFD)

The following text comes directly from BFD website:

Beaufield Resources Inc. is a publicly traded Canadian resource exploration company trading on the TSX Venture Exchange under the symbol BFD. The company has diversified properties with exposure to gold, base metals, and iron, all located in eastern Canada. The company has a 100% ownership in the Schefferville property. The property is located about 40 kilometres northwest of the town of Schefferville and the 786 claims cover a total area of 383.7 square km. Highlights from this property are:

- *Central position in the Schefferville Iron district*
- *Preliminary surface exploration returned high grade iron (up to 91.7% Fe_2O_3)*
- *960 line kilometre airborne gravity survey completed on the property*
- *Sokoman Iron formation mapped over several kilometres on the property*
- *Exploration drilling encountered high-grade iron over large widths.*

Geological Setting and Mineralization

The Schefferville project is located on the western margin of the Labrador Trough, a sequence of Proterozoic sedimentary rocks, including iron formation, volcanic rocks and mafic intrusions. Metamorphic grade increases from sub-greenschists assemblages in the west to upper amphibolite to granulite assemblages in the eastern part of the Labrador Trough

Within the Labrador Trough stratigraphy, the Sokoman Formation is an iron formation forming a continuous stratigraphic unit that thickens and thins throughout the Labrador Trough. It is the main exploration target of Beaufield's Schefferville project.

Deposit Types

The iron formations of the Sokoman Formation are classified as taconite or Lake Superior-type. They consist of a banded sedimentary unit composed principally of bands of magnetite and hematite within chert-rich rock, and variable amounts of silicate-carbonate-sulphide lithofacies. Taconite deposits of potentially economic significance generally have iron content in excess of 30 percent (or approximately 40 percent iron oxide). Lake Superior-type iron formations with low iron content locally can be brought to ore-grade through the process of enrichment by leaching and deep weathering processes (DSO-type). This process involves the migration of meteoric and syn-orogenic heated fluids occurring during tectonic events *such as the Hudsonian Orogeny. DSO-type mineralization generally has an iron grade in excess of 50 percent (or approximately 70 percent iron oxide).*

Exploration

Following the acquisition of its first land package in the Schefferville area in 2008, Beaufield began exploring the Schefferville project in 2009 with a detailed airborne magnetic and gamma-ray survey. Beaufield expanded the property in 2010 by staking and continued exploration work with a large airborne magnetic and gravity gradiometer geophysical survey. In total, 34 gravity and magnetic geophysical anomalies were selected to potentially host DSO, taconite, SEDEX, VS or MV deposits. Geophysical anomalies were further prospected by conducting target-scale ground gravity surveys, and soil and grab sampling programs in the summer of 2011.

A total of 1,295 soil samples were taken across the Schefferville project area to map the distribution of metals in the soils with the hypothesis that certain metals in the soil bear direct relationship with potential mineralization of SEDEX, VS or MV deposits. Grab sampling was conducted by Beaufield in 2011 in conjunction with prospecting. Samples were collected from outcrop, sub-crop and historical trenches in areas of interest related to geophysical anomalies or known DSO occurrences adjacent to the project boundary. A total of 1,071 grab samples were collected. Of these, 329 samples (31%) were greater than 45% iron oxide (Fe_2O3) and a total of 27 samples (3%) were greater than 75% Fe_2O_3. Many grab samples sites with iron oxide content greater than 60% occur in the vicinity of gravity and magnetic anomalies.

23.5 Champion Iron Limited (CIA)

The following text comes directly from CIA website:

In July 2012, Champion Iron Limited announced it had entered into an agreement to acquire the Snelgrove Lake Project, a highly prospective Iron Ore project located in Canada's premier iron ore district, the Labrador Trough. The Snelgrove Lake Project is located approximately 55 kilometres southeast from Schefferville, Quebec and approximately 200 kilometres north of Labrador City in the province of Newfoundland & Labrador.

Previous exploration has indicated that the Snelgrove Lake Project has a banded iron taconite formation with a prominent ridge of iron formation that occurs over a strike length of approximately 33 kilometres. The Snelgrove Lake Project is hosted within the Sokoman Formation which is the main ore bearing horizon within the Labrador West district where a number of other companies currently operate. There is no mention of DSO by Champion in this area.

24 OTHER RELEVANT DATA AND INFORMATION

24.1 Project Implementation Schedule and Execution Plan

This section of the Feasibility Study provides a summary and general description of the Project Implementation and Construction Execution Plan (BBA 2015) upon which, the project schedule and the Capital Cost Estimate were developed.

The project schedule and execution plan are dependent on the start date due to the seasonal impact associated with developing a project of this nature in Labrador. As such, the plan is based on start of major construction in March of the project implementation year in order to start commercial production in March of the following year. It is assumed that all studies and other work will have been completed and LCIO will have all permits in hand prior to the construction start date.

The major project milestones are listed in the Table 24-1. The two monthly columns show the time of occurrence in months relative to the start of construction and to the start of production.

Table 24-1: Key Project Milestones

Major Milestones	Month vs Start Construction	Month vs Start of Production
Award EPCM mandate	-8	-20
Award Mobile Crushing/ Screening Plant Order	-7	-19
Award Mining Equipment Order	-7	-19
Environmental Permit Approval	-3	-15
Start Construction	0	-12
Initial Iron Arm Crossing	5	-8
Telecommunication available across site	5	-8
Causeway completed	6	-6
Start pumping Joyce lake	6	-6
Export Infrastructure Completed	9	-3
Power Available at site	9	-3
Truck shop dome completed	9	-3
Permanent camp available (144 rooms)	10	-2
Mechanical Completion (Turn-Over to POV)	10	-2
Start Commercial Production - Mining and Processing	12	0

24.1.1 Schedule Basis

The Project Execution Schedule developed in the feasibility study and described herein covers the period from the start of the EPCM contract award to the start of commercial production. The major assumptions driving key milestones in the preliminary Project Execution Schedule are as follows:

- The feasibility study is completed in Q1-2015.
- It is expected that the environmental impact studies and permit requests will proceed in time to allow the environmental permitting process to be completed and all construction permits awarded before any construction work is scheduled.
- The main EPCM services contract will be awarded in July of the year prior to the year of start of construction.
- The major construction is planned to take place over a period of 10 months starting in the month of March of the project implementation year.
- Over the summer of the year prior to the start of major construction activities, work will be limited to the refurbishment of a 14 km section of existing road leading from the city of Schefferville to the existing exploration camp in order to prepare the road for construction traffic.
- Construction work shifts are based on 10 hours per day and 7 days a week with a rotation of 28 days of works and 14 days of rest on a FIFO basis.
- The construction of the rock causeway will be done as early as possible from the South side of Iron Arm
- The draining of Joyce Lake will take four months starting after the initial crossing of the Iron Arm. This is required because during year 1 of production the bottom of the dry lake needs to be configured for surface water catchment and pumping so as to avoid surface water from draining into the open pit.

24.1.2 EPCM Services

Engineering

To support the construction schedule, EPCM activities will be split in two mandates.

The first will define the requirements and prepare the specifications, drawings, and request for quotations (RFQ) for the rehabilitation of the existing road from Schefferville to the Border of Labrador. This mandate will be awarded about one year prior to the official start of construction to ensure that the mine is accessible when beginning major construction. It is understood that LCIO will have secured all required permits to undertake this work.

The second will cover the balance of the work and will complete the definition of requirements and prepare specifications, drawings and RFQs for the product haul road, causeway, mine garage and other site infrastructure, processing facility, permanent camp, power plant and rail loop infrastructure.

It is planned that the project processing plant will be ordered and delivered early in the schedule in order for it to be used during construction to provide crushed materials for the construction of the road and pads in the mine area. The EPCM mandate will be awarded and mobilized about 8 months prior to construction start.

Procurement

Procurement for the first mandate will be only for the rehabilitation of a section of the road from Schefferville to Labrador.

Procurement activities in the second mandate will be prioritized based on delivery of longer lead items such as the mining fleet, the mobile crushing and screening equipment, the modular operations camp, and the power plant generators. In budgetary quotes received during the FS, the longest lead times near or on the critical path are in the order of 8 months. Some equipment, such as the rail cars, will potentially have longer lead times, but have no significant impact on the critical path of the project. They will however impact LCIO cash disbursement schedule. It is recommended that the EPCM contractor confirm this early in their mandate.

Construction Management

The construction management team will be split in two locations. At first, the major part of the team will be located near the existing LCIO exploration camp while the road and causeway are under construction and relocated in the modular offices on the mine side of the Iron Arm once they are operational.

A smaller portion of the team will be located at the rail loop and will be working from the rail office. Overall, the construction management team will be composed of up to 16 personnel with between 12 to 15 on a two weeks in / one week out rotation.

Figure 24-1shows the construction management manpower curve.

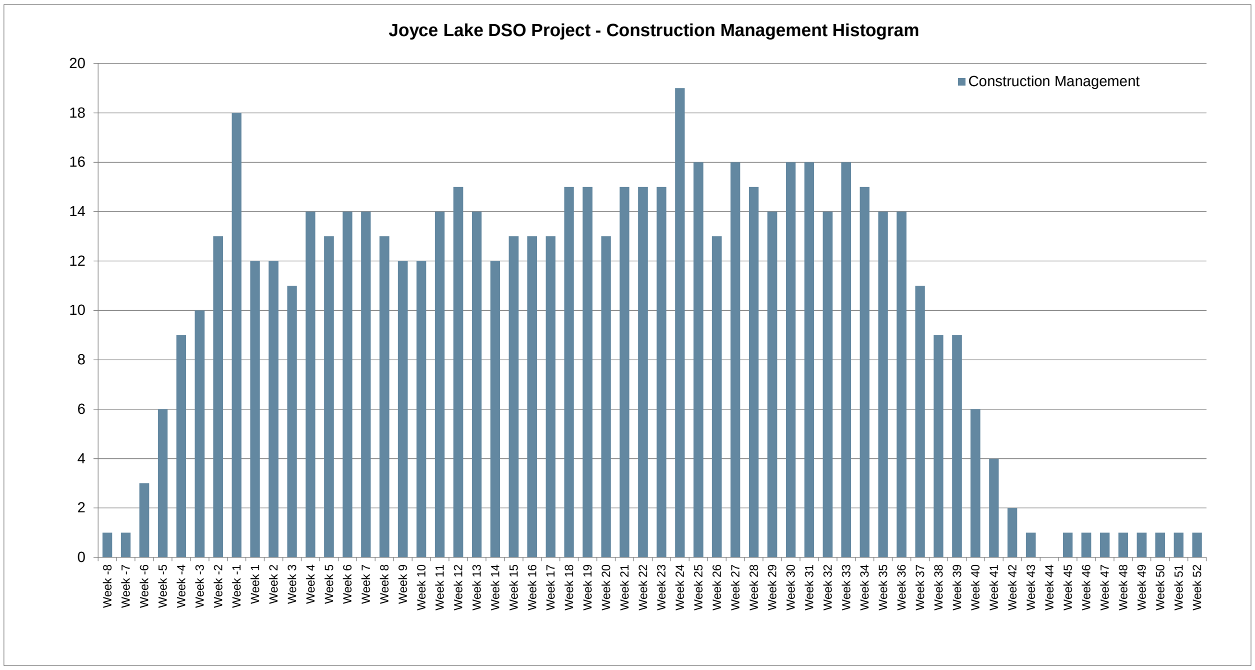


Figure 24-1: Joyce Lake Construction Management Histogram

24.1.3 Construction

The mine site sits across the Iron Arm waterway approximately 28 km from Schefferville. An existing 15 kilometer stretch of road shall be rehabilitated to accommodate the traffic required by the mine construction and operation. To take advantage of the short summer months the existing road shall be rehabilitated over the summer preceding the start of construction. It is assumed that construction permits for this work will be in hand.

It is expected that all required permits including the construction permits shall be issued to allow start of construction in the first week of March of the project implementation year.

The work is split in three major areas, the rail loop, the product haul road and the mine. Work shall start simultaneously at the rail loop, on the product haul road at kilometer 8+000 and on a new section of road leading from the rehabilitated road to the causeway. Mobile crushers destined for future operation shall be requisitioned to supply the backfill material required for construction phase. A number of borrow material deposits have been identified by geotechnical work performed during the feasibility study. Nevertheless the majority of the road and pad construction material shall be retrieved from the rail loop pad, the mine pit and a quarry developed at kilometer 34, when measured from the rail loop area of the product haul road.

Rail Loop

The selected area for the rail loop pad shall produce enough backfill material for the haul road up to kilometer 17 from the rail loop. This backfill material is generated from the rock excavation work required to lower the grade level of the rail loop. This grade level was selected as it accommodates a maximum incline of 1.3% from the existing rail tracks, a requirement specified by railway consultant. A heavy civil contractor shall execute all earth and rock excavation and backfill except for the rail ballast. Material required for the ballast construction will be crushed by the earthwork contractor and piled for use by the rail contractor. All work related to the rails, including the tie-in to the existing rails, shall be accomplish by a specialised rail turnkey contractor. Rail construction will be completed by October.

Product Haul Road and Causeway

The product haul road spans approximately 43 kilometers in total length and crosses four important waterways, including Iron Arm which will be crossed using a rock causeway. A total of five bridges will be erected. One of 50 m, one of 31 m and another of 30 m will be erected along the road between kilometer 1 and 34 (from the rail loop). Two, 8 m long bridges will be installed at each end of the causeway crossing the Iron Arm. Two of the bridges, including the 50 m bridge, located between the rail loop and km 8, must be erected rapidly in order to provide access to the rail loop area from east and west. Near the rail loop area, crews will work on each side of the 50 m bridge crossing where one team will work from the rail loop to lay down the haul road foundation, working west to east while a second team will start at km 8 to will lay down the road foundations from east to west, toward the rail loop. Once the bridges are installed, crushed material from the rock excavation at the rail loop will be used to complete the upper layers of the road. Two rented 20-person fly camps will be located on each side of the 50 m bridge crossing to accommodate the work crews.

At the other end of the product haul road is the causeway, with a length of 1.2 km, it will have two 8-meter bridges that will serve to maintain water circulation and allow passage for leisure boats along Iron Arm. The foundation layer of the causeway is first built to allow access to the mine site. Crossing the causeway marks the start of construction of the mine area. Consequently, the ability to cross the causeway with heavy machinery is a major milestone in the critical path of the project. The schedule foresees four and a half months of work prior to the initial crossing expected Mid-July. A four kilometer section of new road must be completed between the causeway and the existing road rehabilitated the previous summer. It is assumed that the material for this section of new road shall be supplied by a quarry in Kawawachikamach, roughly twelve kilometers away. The material for the sub-foundation of the causeway will be produced at the km 34 quarry.

Mine Area

The mine area civil work will be executed with LCIO's mining team and equipment fleet. Tree and brush clearing where required will be done by a local contractor. This work will begin as soon as the crossing of the Iron Arm is completed.

The mine pit will produce extensive backfill material from both the overburden and the waste rock. This material will be used as raw material for the construction of the mine roads, the mine area pads and the product haul road from km 43 to km 17 (relative distance from rail loop).

In the construction year, the excavated material from the mine shall be used to build the pads for the explosive magazine area, truck shop, crushing plant, permanent camp, the fuel bay and power plant along with mine and service roads. The initial pads shall be built so that they can be expanded should operations require.

Civil works are expected to be completed by mid-October. Taking advantage of the extended day light hours in the region, work on the critical path, such has the causeway, shall be accomplished on two shifts. Construction power where required shall be provided by contractors using temporary generators.

The permanent camp and truck shop will both be supply and install contracts. Work will start as soon as sufficient pad space is prepared and be completed and turned over in December at the latest. In parallel, to the camp and truck shop construction, a third contractor will be responsible for the mechanical and electrical installation of the power plant and fuel storage and dispensing facilities.

Construction Camp

Facilities for room and board for construction workers will be done within the Schefferville municipality. LCIO has rooms available and has an agreement with a third party to provide additional facilities for the construction period. Lodging of workers is assumed to be as follows:

- Schefferville LCIO, 50 rooms available, owned by LCIO;
- Exploration camp, 30 rooms available, owned by LCIO;
- Third Party Construction Camps and Mobile Camp facilities, 195 rooms available;
- Two small 20 room fly camps for the rail loop area rented from a Third Party.
- Schefferville hotels and rooms in private residences to be used as necessary.

This puts the total number of confirmed rooms available during construction at 315.

The peak labor force on site during construction is expected to average approximately 310 once optimized, as demonstrated in Figure 24-2. For a period of approximately two months a few additional rooms will be required and should be secured by LCIO when the construction starts to ensure schedule progress is achieved as planned. During the EPCM phase, it will also be possible to optimize the construction plan to smooth out the personnel peak.

At the end of December, the permanent camp will be completely operational and ready to receive Mining and Operations personnel.

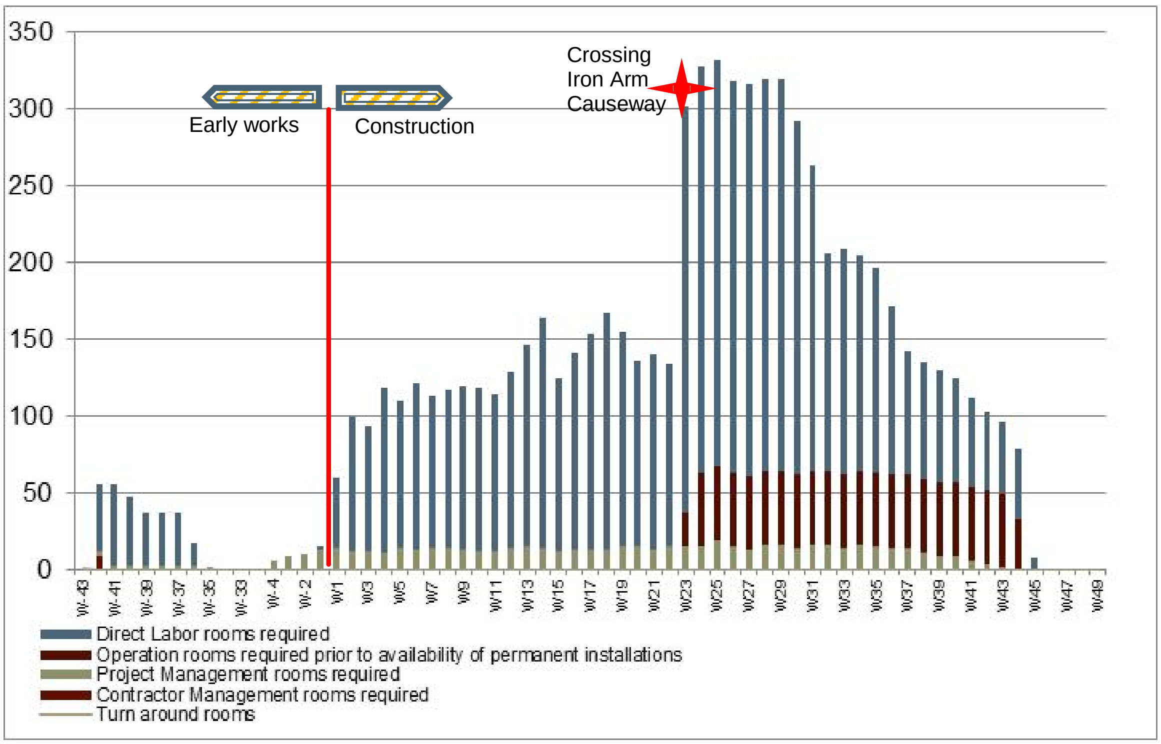


Figure 24-2 : Preliminary Construction Manpower Curve

24.1.4 Pre-Operational Verifications and Commissioning

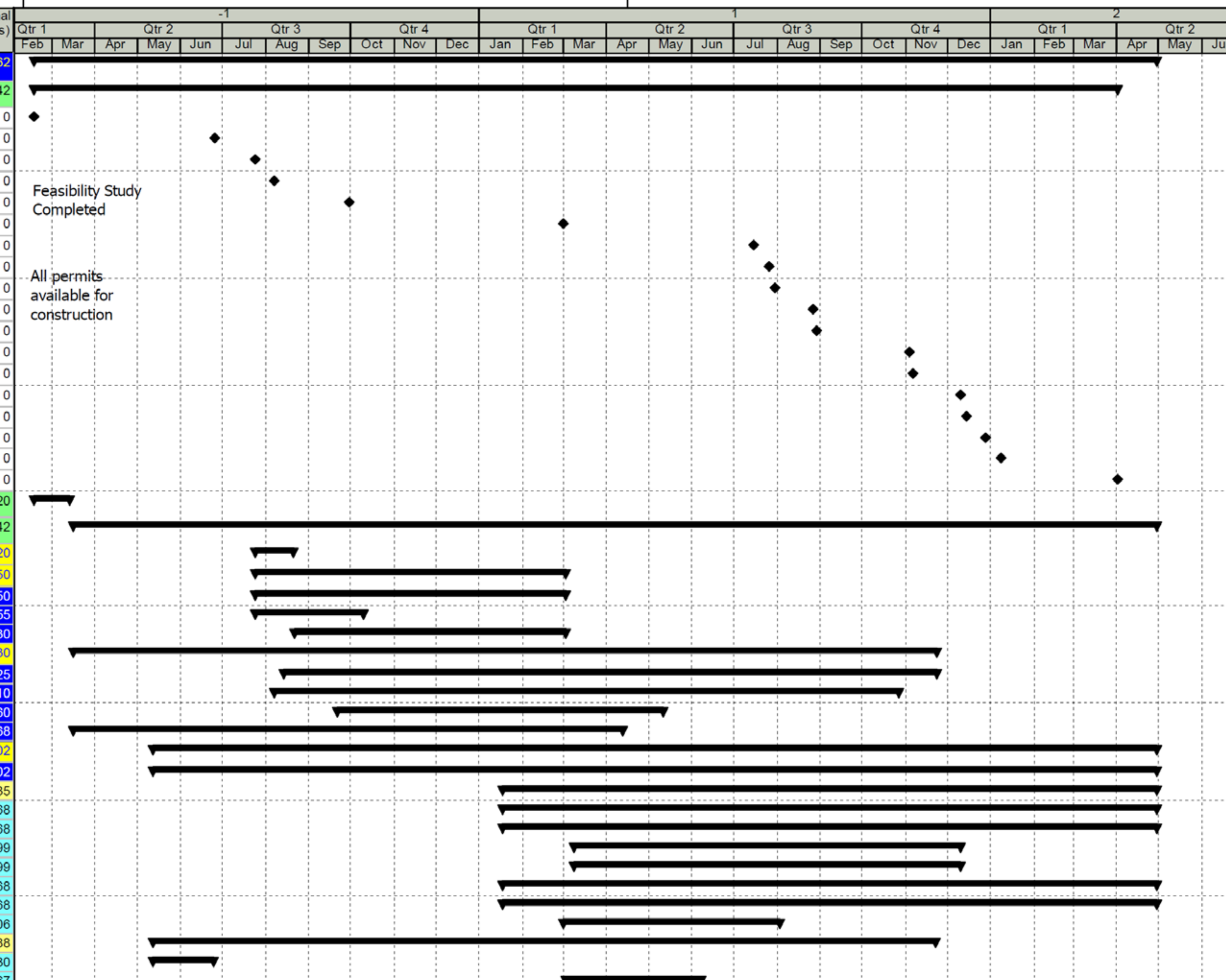
The bulk of the POV activities are concentrated in the process plant, truck shop, camp and power plant areas. It starts during October to complete in December of the year of construction. Production will start at the end of Q1 of the first production year.

24.1.5 Project Execution Schedule

For the Feasibility Study, a Level 3 project execution schedule was developed as part of the construction plan. Figure 24-3 and Figure 24-4 present a simplified Project Execution Schedule that is a summary of the more detailed schedule developed.

FS- Joyce Lake DSO Project

Activity Name	Original (Weeks)
FS- Joyce Lake DSO Project	562
MAJOR MILESTONES	542
Award Preliminary Engineering for Existing Road Upgrade	0
Complete Existing Road Upgrade	0
Award EPCM Mandate	0
Award Mobile Crushing/ Screening Plant Purchase Order	0
Award Mining Mobile Equipment Orders	0
Start Construction (Mobilisation)	0
Initial Iron Arm Crossing for construction Completed	0
Telecommunication available across site	0
Start Open-Pit Pre-Stripping	0
Causeway completed for Operations	0
Start pumping Joyce lake	0
Power Plant Complete	0
Truck shop dome completed	0
Permanent camp available (140 rooms)	0
Haul Road & Rail Loop Completed	0
Mechanical Completion (Turn-Over to POV)	0
Practical completion (Turn-Over to Operation)	0
Start Production Mining & Processing	0
EARLY WORKS	20
EPCM	542
PROJECT MANAGEMENT	20
ENGINEERING	150
Prepare Purchase Bid Documents (PBD)	150
Detail Engineering	55
Prepare Construction Bid Documents (CBD)	130
PROCUREMENT	430
Procurement Packages	325
Turn Key Contracts	310
Construction Contracts	160
Service Agreement	268
CONSTRUCTION	502
2000 - Infrastructure	502
Site Preparation (Construction Camp & Offices)	335
Schefferville LCIO (50 rooms)	468
Exploration Worker's Camp (30 rooms)	468
Construction Worker's Camp- Rail Loop (20 rooms)	199
Construction Worker's Camp- 8+000 (20 rooms)	199
LIM Camp (144 rooms)	468
Schefferville Hotel/ public lodging (rooms available: to be assessed)	468
Mobilization first contractors	106
CIVIL WORKS	388
Rehabilitation existing road to Mine	30
4.3 kM access road to Haulage road	67



Actual Work | Critical Remaining Work | Summary | Remaining Work | Milestone

Page 1 of 2

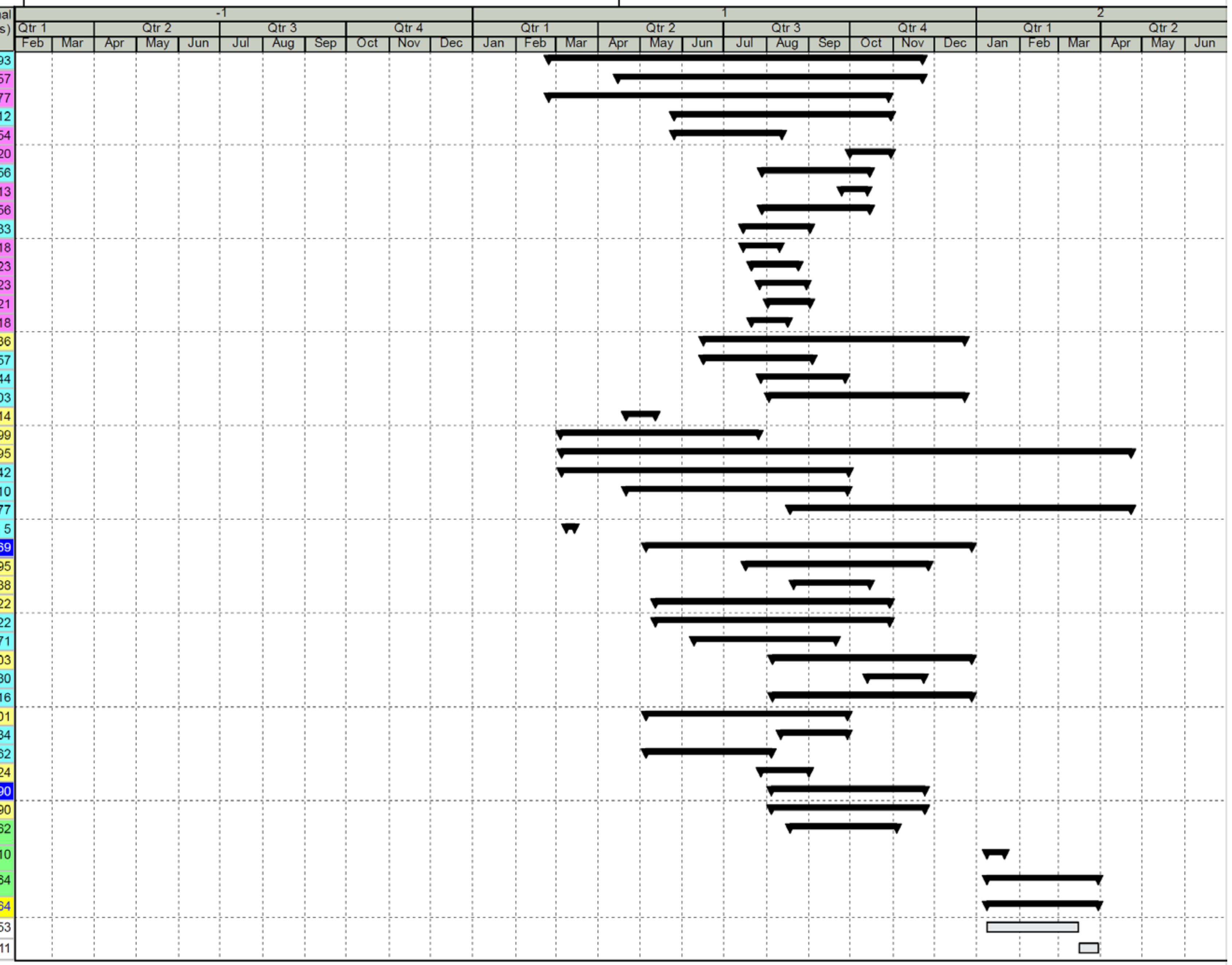
Date	Revision	Checked	Approved
04-Feb-2015	For FS report	C. Catudal	A. Grandillo

Figure 24-3: Summary Project Master Schedule (page 1 of 2)

BBA

FS- Joyce Lake DSO Project

Activity Name	Original (Weeks)
Product Haulage road	193
Rail loop to Mine (North bound)	157
Mine to rail loop (South bound)	177
Mine Haul road	112
Mine road #2 Plant to Waste dump/ Open pit	54
Mine road #1 to Overburden stockpile	20
Service roads	56
Explosive storage area	13
Mine peripheral road	56
Mine Pads (Minimun required for construction)	33
Pad #1: Truck shop	18
Pad #2: Plant	23
Pad#3: Fuel bay/ Power plant	23
Pad#4: Operation Camp	21
3800 - Explosive area pad	18
2500 - Permanent buildings	136
2510 - Main control gate	57
2530 - Plant office	44
Operation Worker's Camp- Mine (140 rooms)	103
2600 - Water treatment & distribution	14
2700 - Telecommunication	99
2900 - Rail Loop	295
Pad	142
2900 - Services	110
2910 - Rail	177
2920 - Office	5
3000 - Mine	169
3100 - Pre-stripping	95
Mine water management	38
3200 - Infrastructure	122
3210 - Power generation	122
3250 - Fuel station	71
3300 - Permanent buildings	103
Laboratory	30
3310 - Truck shop	116
3700 - Mobile equipment	101
3710 - Major equipment	34
3720 - Support equipment	62
3800 - Explosive Storage	24
4000 - Mobile dry plant	90
4100 - Crushing	90
PRE-COMMISSIONING	62
COMMISSIONING	10
PRODUCTION	64
PRODUCTION	64
Ore Stacking	53
Initial Shipping	11



Actual Work — Critical Remaining Work — Summary — Remaining Work — Milestone

Page 2 of 2

Date	Revision	Checked	Approved
04-Feb-2015	For FS report	C. Catudal	A. Grandillo

Figure 24-4: Summary Project Master Schedule (page 2 of 2)

25 INTERPRETATION AND CONCLUSIONS

The Feasibility Study for the Joyce Lake DSO Project is based on the mining and processing of the estimated Mineral Reserves as of March 2, 2015, the effective date of this Report. NI 43-101 Guidelines require that relevant results and interpretations be discussed, as well as risks and uncertainties that could reasonably be expected to affect reliability or confidence in the exploration information, Mineral Resource, Mineral Reserve estimates and projected economic outcomes.

25.1 Mineral Resources

The resource block model for Joyce Lake uses drillhole data that comprises the basis for the definition of 3D mineralized envelopes, with resources limited to the material inside those envelopes. Drillhole data within the mineralized envelopes are then transformed into fixed length composites followed by interpolation of the grade of blocks on a regular grid and filling the mineralized envelopes from the grade of composites in the same envelopes. All the interpolated blocks below the topography form the mineral inventory at that date and they are classified according to proximity to composites and corresponding precision/confidence level. Mineral resource reporting was completed in GENESIS using the conceptual iron envelope. Mineral resources were estimated using variable ellipsoids in conformity with generally accepted CIM Estimation of Mineral Resource and Mineral Reserve Best Practices Guidelines. The current Mineral Resource Statement for the Joyce Lake deposit is presented in Table 25-1.

The current resource estimate for the Joyce Lake deposit, at cut-off grade of 50% Fe, is 24.29 million tonnes of Measured and Indicated mineral resources at an average grade of 58.55% Fe. Inferred resources amount to 0.84 million tonnes. In SGS's opinion, the geological interpretation, sample location, assay intervals, drillhole spacing, QA/QC and grade continuity of the Joyce Lake DSO deposit are adequate for the current resource estimation and classification.

Table 25-1: Summary of Mineral Resource Estimate at Joyce Lake DSO Project (March 2014)

Joyce Lake (DSO) Resources					
55% Fe Cut-off	**Tonnes**	**% Fe**	**% SiO_2**	**% Al_2O_3**	**% Mn**
Measured (M)	12,880,000	61.45	9.02	0.54	0.86
Indicated (I)	3,600,000	61.54	9.38	0.49	0.64
M+I	16,480,000	61.47	9.10	0.53	0.81
Inferred	800,000	62.47	7.73	0.43	0.80
50% Fe Cut-off	**Tonnes**	**% Fe**	**% SiO_2**	**% Al_2O_3**	**% Mn**
Measured (M)	18,650,000	58.67	13.02	0.55	0.81
Indicated (I)	5,640,000	58.14	14.39	0.51	0.54
M+I	24,290,000	58.55	13.34	0.54	0.75
Inferred	840,000	62.00	8.43	0.43	0.78

Within a mineralized envelope, % Fe Cut-Off on individual blocks

Variable Density (equation derived from core measurements), tonnes rounded to nearest 10,000.

25.2 Mineral Reserves

The Joyce Lake open pit mine contains 17.72 Mt of iron ore reserves in the Proven and Probable categories at an average grade of 59.71% Fe, 11.62% SiO_2, 0.55% Al_2O_3 and 0.76% Mn. Total waste material amounts to 70.08 Mt of waste rock (including 2.69 Mt of low grade material that will not be processed) and 2.33 Mt of overburden resulting in an overall open pit strip ratio of 4.09 (tonnes of waste rock and overburden per tonne of ore). Table 15-4 presents the final open pit Mineral Reserves for the Joyce Lake DSO pit.

Table 25-2: Joyce Lake Mineral Reserves at 52% Fe Cut-Off Grade (March 2, 2015)

Mineral Reserves Mineral Category	Tonnage (t)	Grade (%Fe)	Grade (% SiO_2)	Grade (% Al_2O_3)	Grade (%Mn)
High Grade Proven (Above 55% Fe)	11.63 M	61.35	9.16	0.54	0.84
Low Grade Proven (52% - 55% Fe)	2.89 M	53.31	20.70	0.60	0.70
Total Proven (Above 52% Fe)	**14.52 M**	**59.75**	**11.45**	**0.55**	**0.81**
High Grade Probable (Above 55% Fe)	2.45 M	61.50	9.48	0.50	0.61
Low Grade Probable (52% - 55% Fe)	0.75 M	53.09	21.90	0.58	0.30
Total Probable (Above 52% Fe)	**3.20 M**	**59.52**	**12.40**	**0.52**	**0.54**
Total Reserve (Above 52% Fe)	**17.72 M**	**59.71**	**11.62**	**0.55**	**0.76**
Waste Measured (50% - 52% Fe)	1.91 M	50.85	24.49	0.56	0.59
Waste Indicated (50% - 52% Fe)	0.78 M	50.81	25.44	0.56	0.19
Total Segregated Waste (50% - 52% Fe)	**2.69 M**	**50.84**	**24.76**	**0.56**	**0.48**
Overburden	2.33 M	-	-	-	-
Waste Rock (<50% Fe)	67.39 M	-	-	-	-
Total Waste	**72.42 M**				
Total Material	**90.14 M**		**Strip Ratio**		**4.09**

1. The Low Grade Measured and Indicated Resources are all blocks inside the engineered pit design in the Measured and Indicated categories that fall between 50% and 52% Fe. The Low Grade Measured and Indicated Resources are reported for information only and are considered as waste.
2. Proven Reserves are all blocks inside the engineered pit design in the Measured category.
3. Probable Reserves are all blocks inside the engineered pit design in the Indicated category.
4. Open pit Mineral Reserves have been estimated using a cut-off grade of 52% Fe and a process recovery of 100%.
5. Open pit Mineral Reserves have been estimated using a dilution of 1% at 35%Fe and 46.96% SiO_2 and an ore loss of 4%.

25.3 Mining

Mining of the Joyce Lake deposit will generally follow the standard practice of a conventional open pit operation, with drill and blast, load and haul cycles using a drill/shovel/truck mining fleet. The overburden and waste rock material will be delivered to the overburden and waste disposal areas near the pit. The run-of-mine ore will be delivered to the ore stockpile or low grade stockpile ahead of the processing plant. Mining operations are planned to take place year-round.

A three-phase mine plan was developed to support a mining operation targeting a saleable product production rate of 2.5 Mtpa of lump and fines products over the LOM. Mine pre-stripping takes place over a nine-month period and mining operations will take place over an additional five years.

The more prominent risks identified that are related to the mining operation are as follows:

- Risks related to pit dewatering and water management (including perimeter well pumping, Joyce Lake drainage and surface water management and open pit water from surface water and ground water). If the hydrogeology is not adequately understood and higher volumes of water need to be pumped, this could have an impact on capital and operating costs.
- Risks related to ore moisture content (assumed to be 6% but can vary depending on pit water management plan). Excess humidity in the ore can impact processing efficiency, as well as product transportation costs.
- Risks related to pit slope stability. Pit slope design is dependent on rock mechanics and hydrogeology. LVM has identified certain geotechnical complexities that should be further studied. Operation of the open pit mine will require dewatering to ensure that the water table is maintained below the bottom of the pit and more than 25 m from the pit walls. Perimeter dewatering was proposed by BluMetric Environmental to achieve this based on groundwater modeling. If shallower pit slopes are required this could impact the size of the mineral reserve, stripping ratios and overall mining costs.
- Risks related to the estimate of the density of waste rock. If the density is significantly higher than estimated, there will be an impact on mining fleet requirements and cycle times, thus on overall mining operating costs.

25.4 Processing

A trade-off study comparing dry versus wet processing concluded that a dry processing flowsheet was favourable for the Joyce Lake DSO Project. While the PEA testwork was deemed sufficient to complete the FS, some parameters that could not be validated by testwork should be investigated prior to completion of final design during detailed engineering. The risks identified related to processing are as follows:

- Lower than expected lump to sinter fines ratio: The feasibility study economic analysis was based on a ration of lump/fines of 35% / 65%. Considering that the lump product attracts a selling price premium compared to the fines product, any change in the aforementioned ratio can impact revenues and project economics. Blasting practice and crushing plant operations can help in optimizing the lump to fines ratio.

- Excessive fines (minus 100 microns) in sinter fines product: A selling price penalty applies when the sinter fines product contains more than a 10% minus 100 micron particle size fraction. The Feasibility Study assumes that this proportion of fines is not exceeded. Blasting practice and crushing plant operations can help in minimizing minus 100 micron material in the sinter fines product.
- Excessive fines in lump product: A selling price penalty applies when the lump product contains more than a 10% minus 8 mm particle size fraction. The Feasibility Study assumes that this proportion of fines is not exceeded in the lump product. Moisture in the ore can agglomerate fines, which can subsequently report to lump product.

25.5 Project Implementation and Construction

As part of the Feasibility Study, a construction plan and a project implementation schedule was developed. It was shown that it is possible to start construction in the month of March of the project implementation year and be in production in the month of March of the following year. Two important risks identified related to the project construction plan are as follows:

- The Feasibility Study capital cost estimate and project financial performance are greatly dependent on the project construction schedule. Any significant delays within the construction schedule can result in increased capital costs and reduced project financial performance. Furthermore, a delay of start of production can also result. Detailed planning, early in the EPCM process is critical in achieving the proposed schedule.
- Project indirect costs were estimated based on the assumption that LCIO would be able to secure lodging for project construction workers from its own facilities (exploration camp and housing in Schefferville), as well as existing facilities rented from third parties. Should third party rental units not be available, LCIO may have to build temporary facilities, thus adding costs to the project.

25.6 Economic Analysis

A summary of the results of the pre-tax and after-tax project economic analysis based on the capital and operating costs developed in the Feasibility Study is presented are Table 25-3 and Table 25-4.

Table 25-3: Before Tax Financial Analysis Results

IRR = 18.7%	NPV ($M)	Payback (yrs)
Discount Rate		
0%	300.6	4.4
8%	130.8	-
10%	99.9	-

Table 25-4: After-Tax Financial Analysis Results

IRR = 13.7%	NPV ($M)	Payback (yrs)
Discount Rate		
0%	192.5	4.9
8%	61.4	-
10%	37.5	-

On a pre-tax basis, as can be seen, the Project is forecasted to provide an IRR of 18.7% and an NPV of $130.8M at a discount rate of 8%. The payback period is 4.4 years after the start of production. The economic analysis also showed that the project break-even benchmark selling price is US$81.16. The break-even benchmark selling prices is defined as the US$ price for 62% Fe sinter fines, CFR port in China, whereby the undiscounted NPV = $0. As was pointed out in Chapter 19, current iron ore market conditions are such that iron ore prices are well below the project break-even price. As such, it is important to highlight the following risk associated with iron ore market conditions:

- The economic analysis based on the capital and operating costs developed in the Feasibility Study indicates that the Project requires a selling price above current and short term selling price forecasts for economic viability. LCIO has indicated that unless product prices reach an adequate level for the project to be economically justifiable, the project will not proceed. LCIO is confident however that pricing will eventually rebound and has indicated that it will continue with project environmental permitting.

25.7 Conclusions

A number of potential technical and economic risks have been identified in the Feasibility Study and highlighted in this section of the report that can materially affect project execution and project economics. Based on the information available and the degree of development of the Project as of the effective date of this report, BBA is of the opinion that the project is technically robust. Given current market conditions, it can be concluded that the project is only economically viable when the iron ore market improves and higher selling prices are attainable.

26 RECOMMENDATIONS

Considering current low iron ore prices, BBA recommends that full-scale engineering and construction of the Project be delayed until the iron ore market returns to more favourable conditions. The following recommendations are however made with the objective of de-risking the project, as it is currently defined to prepare the project for fast track implementation once LCIO decides to proceed. The recommendations also outline some areas of opportunity for potential improvements to project economics.

- Continue advancing the Environmental Impact Study (EIS) with the objective of obtaining all permits in hand when the decision to proceed with project implementation is made by LCIO.
- Perform additional (confirmatory) metallurgical testwork on bulk samples and / or core samples that is representative of the Joyce Lake deposit based on the most current Mineral Resource estimate and the Feasibility Study mine plan. The objectives of the testwork should be as follows:
  - Confirm the lump to sinter fines ratio assumed in the Feasibility Study.
  - Confirm the lump %Fe upgrading that was estimated during the PEA metallurgical testwork.
  - Develop a better understanding of the effect of moisture in the ROM ore on the proposed process flowsheet and its impact on final product particle size distribution.
  - A budget in the order of $250,000 should be planned for the aforementioned metallurgical testwork.
- Undertake a more detailed geotechnical and hydrogeological study to confirm pit slope and perimeter dewatering parameters and design.
  - A budget of approximately $1.2M is estimated to cover the execution of the six oriented boreholes, the optical and acoustic tele-viewer surveys, the laboratory testing program and the study of the final geotechnical pit slope design.
  - The estimate of perimeter dewatering requirements (number of wells, estimated dewatering rates) for the feasibility study was partially based on the results of testing conducted on small-diameter (50-mm) monitoring wells. Further pumping tests should be conducted with wells of a minimum diameter of 200 mm. A budget of approximately $1.5M should be planned for the recommended hydrogeological study.
- Systematic density measurements on all cores within the ore zone (from triple tube and sonic drilling) should be completed. Even though the core samples from two drill holes were used for the density measurements used in the feasibility study, the bulk of the main ore zones have not been tested. Measurements should include bulk density, dry density and moisture content.
- Perform a trade-off study to evaluate various options for cost reduction such as:

- Evaluate the option to purchase used equipment such as railcars, mobile equipment, generators as well as used camp facilities.
- Evaluate options of using local suppliers as much as possible during the construction period, mostly in haul road, causeway and rail loop construction to potentially reduce capital costs
- Split the overall civil work construction package on several smaller packages to allow smaller companies to bid on the project, potentially reducing the overall capital costs
- Evaluate splitting the EPCM and using in house capacities to reduce the EPCM costs
- Evaluate options of buying or leasing existing infrastructure in the region based on availabilities, to reduce the capital costs
- Evaluate "lease to buy" option to reduce capital costs
- Further evaluate the fuel cost structure and look for ways to reduce the fuel costs per tonne
- Evaluate the option of building the permanent camp within the Schefferville or the Kawawachikamach communities where power and other services would be available and construction costs for the camp facility would be lower. The camp could also be used for lodging construction workers. Building it within the communities can also provide a longer term benefit to the community and can be part of the Impact Benefit Agreement (IBA) with local stakeholders.
- Evaluate the cost benefits of constructing the haul roads with owner operations personnel and rented equipment.

The Feasibility Study for the Project is based on the development of the Joyce Lake deposit as a stand-alone project. Physical constraints of the deposit and the mining operation limit the annual production capacity to about 2.5 Mt of lump and fines product. Given the considerable capital costs required to put in place the project infrastructure, increasing annual production or extending the period of annual production, both of which would be beneficial to project economics. This could be done by exploration and development of other nearby claims under the control of LCIO and/or by acquiring claims from other nearby owners.

27 REFERENCES

BBA Inc. 2014a, "Pit Optimization Methodology and Selection", Technical Memorandum, Report No. 3020002-000000-4M-ERA-0001.

BBA Inc. 2014b, "Dry Versus Wet Processing", Trade-Off Study, Report No. 3020002-000000-49-ERA-0001.

BBA Inc. 2014c, "Iron Arm Crossing", Trade-Off Study, Report No. 3020002-000000-40-ERA-0001.

BBA Inc. 2014d, "Haul Road vs Rail", Trade-Off Study, Report No. 3020002-000000-40-ERA-0002.

BBA Inc. 2015, Construction Management Plan. Report No. 3020002-000000-60-CPL-0001.

Genivar 2013a. Joyce Lake Direct Shipping Iron Ore Project. Fish and Fish Habitat Baseline Study. Report prepared for Labec Century Iron Ore.

Genivar 2013b. Joyce Lake Direct Shipping Iron Ore Project. Avifauna Baseline Study. Report prepared for Labec Century Iron Ore.

Genivar Inc. 2013c. Joyce Lake Direct Shipping Iron Ore Project. Mammal and Herpetofauna Baseline Study. Report prepared for Labec Century Iron Ore.

Genivar Inc. 2013d. Joyce Lake Direct Shipping Iron Ore Project. Vegetation Baseline Study. Report prepared for Labec Century Iron Ore.

Genivar Inc. 2013e. Joyce Lake Direct Shipping Iron Ore Project. Water and Sediment Quality Baseline Study. Report prepared for Labec Century Iron Ore.

LVM 2014a. Joyce Lake and Area DSO Project Geotechnical Engineering Feasibility Study – Open Pit Design. Report prepared for Labec Century Iron Ore, Ref. no.: 025-B-0010504-3-GE-R-0001-00.

LVM 2014b. Joyce Lake and Area DSO Project Geotechnical Feasibility Study – Surrounding Areas. Report prepared for Labec Century Iron Ore, Ref no.: 025-B-0010504-1-GE-R-0001-00.

Stantec Consulting Ltd. 2013. Joyce Lake Direct Shipping Iron Ore Project: Phase 1 Assessment for Acid Rock Drainage and Metal Leaching (ARD/ML). Report prepared for Labec Century Iron Ore.

Stassinu Stantec Limited Partnership. 2013a. Joyce Lake Direct Shipping Iron Ore Project: Baseline Hydrogeology Scoping Study. Report prepared for Labec Century Iron Ore.

Stassinu Stantec Limited Partnership. 2013b. Joyce Lake Direct Shipping Iron Ore Project: Contemporary Aboriginal Use of Lands and Resources for Traditional Purposes – Baseline Study. Report prepared for Labec Century Iron Ore.

Stassinu Stantec Limited Partnership. 2013c. Joyce Lake Direct Shipping Iron Ore Project: Characterization and Preliminary Treatability Testing of Tailings Effluent. Report prepared for Labec Century Iron Ore.

Stassinu Stantec Limited Partnership. 2013d. Sediment Pond Design Joyce Lake Direct Shipping Iron Ore Project. Report prepared for Labec Century Iron Ore.

Stassinu Stantec Limited Partnership. 2014a. Joyce Lake Direct Shipping Iron Ore Project: Surface Water Baseline Study. Prepared for Labec Century Iron Ore.

Stassinu Stantec Limited Partnership. 2014b. Joyce Lake Direct Shipping Iron Ore Project: Historic and Heritage Resources Baseline Study. Prepared for Labec Century Iron Ore.

Stassinu Stantec Limited Partnership.2015. Joyce Lake Direct Shipping Iron Ore Project: Socio-Economic Baseline Study. Economy, Employment and Business. Report prepared for Labec Century Iron Ore.

WESA (BluMetric Environmental) 2015. Joyce Lake and Area DSO Project – Hydrogeological Study. Report prepared for Labec Century Iron Ore.

WSP 2014a. Joyce Lake Direct Shipping Iron Ore Project. Fish and Fish Habitat Baseline Study – Complementary Report. Report prepared for Labec Century Iron Ore.

WSP 2014b. Joyce Lake Direct Shipping Iron Ore Project. Rare Plant Survey. Report prepared for Labec Century Iron Ore.

WSP 2015a. Joyce Lake Direct Shipping Iron Ore Project. Air Quality Modelling. Report prepared for Labec Century Iron Ore Inc.

WSP 2015b. Joyce Lake Direct Shipping Iron Ore Project. Noise Modeling Study. Report prepared for Labec Century Iron Ore Inc.

WSP 2015c. Joyce Lake Direct Shipping Iron Ore Project. Closure and Reclamation Plan. Report prepared for Labec Century Iron Ore.