



NI 43-101 TECHNICAL REPORT UPDATED FEASIBILITY STUDY

of the

KAMISTIATUSSET (KAMI) IRON ORE PROPERTY, LABRADOR

Prepared for:

Alderon Iron Ore Corp.



Effective Date: September 26, 2018

Report Issued Date: October 31, 2018

Prepared by:



In collaboration with:



GOLDER



DATE AND SIGNATURE PAGE

This report is effective as of the 26th day of September, 2018 and was prepared by:

"Original document signed and sealed"

Angelo Grandillo, P. Eng, M. Eng.
BBA Inc.

October 31, 2018

Date

"Original document signed and sealed"

Jeffrey Cassoff, P. Eng.
BBA Inc.

October 31, 2018

Date

"Original document signed and sealed"

James Powell, P. Eng., M. Eng.
Gemtec Ltd.

October 31, 2018

Date

"Original document signed and sealed"

Michael Kociumbas, B.Sc., P. Geo.
Watts, Griffis and McOuat Ltd.

October 31, 2018

Date

"Original document signed and sealed"

Peter Merry, P. Eng.
Golder Associate Ltd.

October 31, 2018

Date



CERTIFICATE OF QUALIFIED PERSON

I, Angelo Grandillo, do hereby certify that:

1. I am an Associate and a Project Manager in the consulting firm:

BBA Inc.
2020 Robert-Bourassa Blvd., Suite 300
Montréal, Québec, Canada H3A 2A5
2. This certificate accompanies the report titled “**Updated Feasibility Study of the Kamistiatussset (Kam) Iron Ore Property, Labrador**” for Alderon Iron Ore Corp., having an effective date of September 26, 2018.
3. I graduated from McGill University of Montréal with a B. Eng. in Metallurgy in 1981, and M. Eng. in 1988.
4. 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).
5. 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.
6. I have personally visited the property on March 22-23, 2011 and on October 13-14, 2011.
7. I am responsible for the coordination, consolidation and review of this NI 43-101 Technical Report. I have also authored and am responsible for Sections: 1 to 5, 13, 17 to 19 and 21 to 27.
8. I am independent of the issuer as described in Section 1.5 of NI 43-101. I have had prior involvement with the Kamistiatussset property as a “Qualified Person” for the 2011 Preliminary Economic Assessment Study, the 2012 Feasibility Study and the March 2017 re-scoped Preliminary Economic Assessment Study and the November 2017 Preliminary Economic Assessment.
9. 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.
10. I have read National Instrument 43-101, Form 43-101F1 and the Technical Report has been prepared in compliance with this Instrument.
11. 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, contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Signed this 31st day of October, 2018

Original signed and sealed

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



CERTIFICATE OF QUALIFIED PERSON

I, Jeffrey Cassoff, do hereby certify that:

1. I am a Senior Mining Engineer in the consulting firm:

BBA Inc.
2020 Robert-Bourassa Blvd., Suite 300
Montréal, Québec, Canada H3A 2A5
2. This certificate accompanies the report titled “**Updated Feasibility Study of the Kamistatusset (Kami) Iron Ore Property, Labrador**” for Alderon Iron Ore Corp., having an effective date of September 26, 2018.
3. I graduated from McGill University of Montréal with a B. Eng. in Mining in 1999.
4. I am in good standing as a member of the Order of Engineers of Québec (#5002252) and Professional Engineers and Geoscientists, Newfoundland and Labrador (#06205).
5. 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.
6. I have personally visited the property on July 26, 2012.
7. I am responsible for Sections 15 and 16 and parts of Sections 1, 21, 25 and 26.
8. I am independent of the issuer as described in Section 1.5 of NI 43-101. I have had prior involvement with the Kamistatusset property as a “qualified person” for the March 2017 Re-Scoped Preliminary Economic Assessment Study and the November 2017 Preliminary Economic Assessment.
9. I have practiced my profession continuously since my graduation in 1999. My relevant experience includes operations and mine planning in mine operations and have worked on many NI 43-101 studies, namely in iron ore.
10. I have read National Instrument 43-101, Form 43-101F1 and the Technical Report has been prepared in compliance with this Instrument.
11. 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, contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Signed this 31st day of October, 2018

Original signed and sealed

Jeffrey Cassoff, P. Eng.

CERTIFICATE OF QUALIFIED PERSON

I, James K. Powell, do hereby certify that:

1. I am a Senior Project Manager in the consulting firm:

GEMTEC Limited
10 Maverick Place
Paradise, NL, Canada A1L 0J1
2. This certificate accompanies the report titled “**Updated Feasibility Study of the Kamistiatusset (Kami) Iron Ore Property, Labrador**” for Alderon Iron Ore Corp., having an effective date of September 26, 2018.
3. I graduated from the University of New Brunswick in Fredericton, NB with a B.Sc. Eng. in Civil Engineering in 1998, and from McGill University of Montréal, Québec with an M. Eng. in Mining Engineering in 2005.
4. I am in good standing as a member of the Professional Engineers and Geoscientists, Newfoundland and Labrador (#03986).
5. 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.
6. I have personally visited the property in March 2011, October 2011 and July 2013.
7. I have also authored and am responsible for Chapter 20 of this NI 43-101 Technical Report.
8. I am independent of the issuer as described in Section 1.5 of NI 43-101. I have had prior involvement with the Kami property as a “Qualified Person” for the 2011 Preliminary Economic Assessment Study and as an employee of Alderon Iron Ore Corp and the Kami Limited Partnership from December 2012 through May 2015. I was also a “Qualified Person” for the Kami 2017 Re-Scoped Preliminary Economic Assessment, and the 2017 Update to the Re-Scoped Preliminary Economic Assessment.
9. I have practiced in civil, environmental, geotechnical, and mining engineering continuously since my graduation in 1998. My relevant experience includes technical and project management in a wide range of industrial and mining projects including mine exploration, development, operations, and closure in gold, copper, nickel, and iron ore.
10. I have read NI 43-101, Form 43-101F1 and the section of the Technical Report for which I am responsible has been prepared in compliance with this Instrument.
11. 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, contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Signed this 31st day of October, 2018

Original signed and sealed

James K. Powell, M. Eng., P. Eng.

CERTIFICATE OF QUALIFIED PERSON

I, Michael W. Kociumbas, do hereby certify that:

1. I reside at 420 Searles Court, Mississauga, Ontario, Canada, L5R 2C6.
2. I am a Senior Associate Geologist with Watts, Griffis and McOuat Limited, a firm of consulting geologists and engineers, which has been authorized to practice professional engineering by Professional Engineers Ontario since 1969, and professional geoscience by the Association of Professional Geoscientists of Ontario.
3. This certificate accompanies the report titled **“Updated Feasibility Study of the Kamistiatussut (Kami) Iron Ore Property, Labrador”** for Alderon Iron Ore Corp., having an effective date of September 26, 2018.
4. I am a graduate from the University of Waterloo, Waterloo, Ontario with an Honours B.Sc. Degree in Applied Earth Sciences, Geology Option (1985), and I have practised my profession continuously since that time.
5. I am a licenced Professional Geoscientist of the Association of Professional Geoscientists of Ontario (Membership #0417) and Professional Engineers and Geoscientists, Newfoundland and Labrador (Membership #06332).
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 am responsible for Sections 6 to 12 and Section 14 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 had prior involvement with the Property that is the subject of this Technical Report, including acting as co-author of numerous Technical Reports on the Property since 2011.
10. My relevant experience includes 30 years of field exploration and project management for gold and base metal projects, including extensive experience with iron deposits both in Canada and internationally. I also have extensive experience with Mineral Resource estimation techniques and preparation of technical reports.
11. I have read NI 43-101, Form 43-101F1 and the technical report and have prepared the technical report in compliance with NI 43-101, Form 43-101F1 and generally accepted Canadian mining industry practice.
12. As of the effective date of this Technical Report, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Signed this 31st day of October, 2018

Original signed and sealed

Michael Kociumbas, P. Geo.

CERTIFICATE OF QUALIFIED PERSON

I, W. Peter H. Merry, P. Eng., do hereby certify that:

1. I am a Principal of Golder Associates Ltd., located at 6925 Century Avenue, Mississauga Ontario, Canada, L5N 7K2.
2. This certificate applies to the technical report titled **“Updated Feasibility Study of Kamistiatusset (Kami) Iron Ore Property, Labrador”** for Alderon Iron Ore Corp. having an effective date of September 26, 2018.
3. I graduated with a Bachelor of Science (Civil Engineering) degree from Queen’s University of Kingston, Ontario in 2002. I am a P. Eng., registered in the Province of Ontario (PEO No. 100101561), the Province of Newfoundland and Labrador (PEGNL No. 04809), the Province of New Brunswick (APEGNB No. L5004), and the Northwest Territories and Nunavut (NAPEG No. L2912).

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

My relevant experience for the purpose of the Technical Report is:

- Principal, Golder Associates Ltd.....2017 – PRESENT
- Associate, Golder Associates Ltd.....2011 – 2017
- Mine Waste / Geotechnical Engineer, Golder Associates Ltd.....2002 – 2011

4. I have visited the Property that is the subject of this Technical Report on June 12-13, 2012.
5. I am responsible for authoring Section 18.4 of this Technical Report with respect to the design of tailings management facility. I also contributed to Section 21 of this Technical Report with respect of the material take-off quantities for dam construction of the tailings management facility and operating costs associated with management of the tailings management facility.
6. I am independent of the Issuer applying all of the tests in Section 1.5 of National Instrument 43-101.
7. My prior involvement with the Project that is the subject of this Technical Report relates to 2012 feasibility study for the Kami property, where I lead the feasibility level design of the tailings management facility on behalf of Golder Associates Ltd.
8. I have read NI 43-101 and Form 43-101F1 and the sections of the Technical Report for which I am responsible have been prepared in compliance with this Instrument.
9. As of the date of this Technical Report, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Effective Date: September 26, 2018

Signed Date: October 31, 2018

Original signed and sealed

W. Peter H. Merry, P.Eng.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS.....	XXI
UNITS OF MEASURE	XXVI
1. SUMMARY.....	1-1
1.1 Introduction	1-1
1.2 Geology and Mineralization	1-2
1.3 Exploration and Drilling.....	1-3
1.4 Sample Preparation and Data Verification	1-5
1.5 Mineral Processing and Metallurgical Testwork	1-5
1.6 Mineral Resources.....	1-5
1.7 Mining Methods	1-8
1.8 Recovery Methods and Processing Plant Design	1-9
1.9 Project Infrastructure	1-11
1.10 Market Studies and Contracts	1-12
1.11 Environment and Stakeholder Engagement	1-12
1.12 Capital Costs	1-15
1.13 Operating Costs	1-16
1.14 Economic Analysis	1-17
1.15 Project Schedule	1-17
1.16 Conclusions and Recommendations	1-18
2. INTRODUCTION.....	2-1
2.1 Scope of Study.....	2-1
2.2 Background and Project History	2-1
2.3 Sources of Information	2-3
2.4 Terms of Reference.....	2-3
2.5 Site Visit	2-3
3. RELIANCE ON OTHER EXPERTS.....	3-1
4. PROPERTY DESCRIPTION AND LOCATION	4-1
4.1 Property Location	4-1
4.2 Property Description and Ownership	4-1
4.3 Property Agreements.....	4-4
4.4 Permitting	4-5

5. ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY	5-1
5.1 Access.....	5-1
5.2 Climate	5-1
5.3 Local Resources and Infrastructure	5-1
5.4 Physiography.....	5-2
6. HISTORY	6-1
7. GEOLOGICAL SETTING AND MINERALIZATION	7-1
7.1 Regional Geology	7-1
7.2 Property Geology	7-4
7.2.1 General.....	7-4
7.2.2 East of Mills Lake	7-7
7.3 Mineralization and Structure	7-7
7.3.1 Weathering.....	7-8
7.3.2 Wabush Basin – Rose Deposits	7-9
7.3.3 Mills Lake Basin – Mills Lake and Mart Lake Deposits.....	7-15
7.3.4 Mineralization by Rock Type and Specific Gravity.....	7-18
8. DEPOSIT TYPE	8-1
9. EXPLORATION	9-1
9.1 General	9-1
9.2 Altius Exploration Programs 2006 – 2009.....	9-1
9.3 Alderon’s Summer 2010 Exploration Program	9-2
9.4 Alderon’s Winter 2011 Exploration Program	9-4
9.5 Alderon’s 2011 - 2012 Exploration Program	9-4
10. DRILLING	10-1
10.1 Historic Drilling	10-1
10.2 Altius 2008 Drilling Program	10-1
10.3 Alderon 2010 Drilling Program.....	10-3
10.4 Alderon 2011 Winter Drilling Program.....	10-7
10.5 Alderon Summer 2011 - 2012 Drilling Program	10-10
10.6 Drillhole Collar Surveying	10-16
10.7 Downhole Attitude Surveying.....	10-17
10.8 Geophysical Downhole Surveying	10-18

10.9	WGM Comments on Altius and Alderon Drilling.....	10-20
11.	SAMPLE PREPARATION, ANALYSIS AND SECURITY	11-1
11.1	Field Sampling and Preparation.....	11-1
11.1.1	2008 Drill Core Handling and Logging	11-1
11.1.2	2008 Sampling Method and Approach.....	11-2
11.1.3	2008 Core Storage	11-2
11.1.4	Alderon 2010-2012 Drill Core Handling and Logging	11-2
11.1.5	Alderon 2010-2012 Sampling Method and Approach.....	11-4
11.1.6	WGM Comments on Sampling for 2008 through 2012 Drilling Programs	11-5
11.2	Laboratory Sample Preparation and Assaying.....	11-6
11.2.1	Altius 2008 Preparation and Assaying	11-6
11.2.2	Alderon 2010-2012 Sample Preparation.....	11-7
11.2.3	Alderon 2010-2012 Sample Assaying.....	11-8
11.3	Sampling and Assaying QA/QC.....	11-9
11.3.1	2008 through 2012 QA/QC	11-9
11.3.2	Supplemental QA/QC.....	11-17
11.4	WGM's Comments on 2008 through 2012 Assaying.....	11-25
12.	DATA VERIFICATION	12-1
13.	MINERAL PROCESSING AND METALLURGICAL TESTWORK	13-1
13.1	Mineralogical Characterization of the Kami Deposit.....	13-1
13.2	Testwork Plan.....	13-3
13.2.1	Historical Testwork.....	13-3
13.2.2	2011 PEA Study Metallurgical Testwork Plan	13-3
13.2.3	2012 Feasibility Study Metallurgical Testwork Plan.....	13-4
13.3	Mineralogical Characterization	13-7
13.3.1	Historical Mineralogical Analysis Results.....	13-7
13.3.2	2011 PEA Study Mineralogical Analysis Results	13-7
13.3.3	2012 Feasibility Study Mineralogical Analysis Results	13-9
13.4	Beneficiation Testwork	13-11
13.4.1	Historical Beneficiation Test Result Summary.....	13-11
13.4.2	2011 PEA Beneficiation Test Result Summary	13-12
13.4.3	2012 Feasibility Study Wilfley Table Testwork Results	13-14
13.4.4	Detailed Engineering Gravity Testwork.....	13-15
13.4.5	2012 Feasibility Magnetic Separation Test Results	13-16

13.4.6	Detailed Engineering Confirmatory Semi-Pilot Beneficiation Testwork	13-19
13.5	Grindability Testwork	13-19
13.5.1	Historical Grindability Tests Results	13-19
13.5.2	2011 PEA Grindability Tests Results	13-20
13.5.3	2012 FS Grindability Results Using the SPI and IGS Methodology	13-20
13.5.4	Final AG Mill Sizing Performed During Detailed Engineering	13-24
13.5.5	Particle Size Distribution Testwork Results	13-24
13.5.6	Other Grindability Test Work Performed during the 2012 FS	13-24
13.6	Solid-Liquid Separation	13-26
13.7	Projected Final Concentrate Specifications	13-27
13.8	Sintering Testwork	13-28
14.	MINERAL RESOURCE ESTIMATE	14-1
14.1	Mineral Resource Estimate Statement	14-1
14.2	General Mineral Resource Estimation Procedures	14-4
14.3	Database	14-5
14.3.1	Drillhole Data	14-5
14.3.2	Data Validation	14-5
14.3.3	Database Management	14-6
14.4	Geological Modelling Procedures	14-7
14.4.1	Cross Section Definition	14-7
14.4.2	Geological Interpretation and 3-D Wireframe Creation	14-7
14.4.3	Topographic Surface Creation	14-9
14.5	Statistical Analysis, Compositing, Capping and Specific Gravity	14-18
14.5.1	Back-Coding of Rock Code Field	14-18
14.5.2	Statistical Analysis and Compositing	14-18
14.5.3	Grade Capping	14-27
14.5.4	Density/Specific Gravity	14-28
14.6	Block Model Parameters, Grade Interpolation and Categorization of Mineral Resources	14-29
14.6.1	General	14-29
14.6.2	Block Model Setup/Parameters	14-29
14.6.3	Grade Interpolation	14-30
14.6.4	Mineral Resource Categorization	14-35
14.7	Block Model Validation	14-41

15. MINERAL RESERVE ESTIMATE	15-1
15.1 Resource Block Model.....	15-1
15.1.1 Model Coordinate System.....	15-1
15.1.2 Model Densities.....	15-2
15.1.3 Model Recoveries	15-3
15.1.4 Model Surfaces	15-4
15.2 Mining Dilution and Ore Loss.....	15-5
15.3 Pit Optimization	15-6
15.4 Cut-off Grade.....	15-9
15.5 Engineered Pit Design.....	15-10
15.5.1 Mineral Reserves	15-13
16. MINING METHOD.....	16-1
16.1 Mining Methodology	16-1
16.1.1 Phase Designs	16-1
16.2 Waste Rock Pile Design	16-3
16.3 Mine Production Schedule.....	16-5
16.4 Mining Equipment.....	16-14
16.4.1 Haul Trucks	16-15
16.4.2 Excavators	16-17
16.4.3 Drilling and Blasting	16-18
16.4.4 Auxiliary Equipment	16-19
16.5 Operations Management	16-19
16.6 Workforce.....	16-20
17. RECOVERY METHODS	17-1
17.1 Process Design Basis.....	17-1
17.2 General Process Description and Plant Design	17-2
17.3 Crushing, Conveying and Storage	17-8
17.4 Grinding and Screening Circuit.....	17-8
17.4.1 Grinding.....	17-8
17.4.2 Screening.....	17-9
17.5 Gravity Concentration Circuit.....	17-9
17.6 Magnetic Separation Circuit.....	17-10
17.7 Tailings Dewatering and Pumping	17-11

17.8	Concentrate Conveying and Load-Out	17-12
17.9	Process Plant Utilities	17-12
17.9.1	Compressed Air	17-12
17.9.2	Fresh Water	17-12
17.9.3	Recycled Process Water	17-13
17.9.4	Steam	17-13
18.	PROJECT INFRASTRUCTURE.....	18-1
18.1	Project Plot Plan	18-1
18.2	General Kami Mine Site Infrastructure	18-4
18.2.1	Site Access Roads	18-4
18.2.2	On-Site Roads	18-4
18.2.3	Mine Services Area	18-4
18.2.4	Kami Mine Site Stockpiles	18-5
18.2.5	Primary Crusher Station	18-5
18.2.6	Crushed Ore Conveyors and Stockpile	18-5
18.2.7	Process Plant	18-5
18.2.8	Concentrate Load-Out and Kami Rail	18-6
18.2.9	Fuel Storage	18-6
18.2.10	Fresh Water Pumphouse	18-6
18.2.11	Steam Boiler House	18-6
18.2.12	Fire Protection	18-6
18.2.13	Temporary Construction Camp	18-7
18.2.14	General	18-7
18.3	Electricity	18-7
18.4	Tailings Management Facility	18-8
18.4.1	Background	18-8
18.4.2	Tailings Management	18-9
18.4.3	Design Basis	18-9
18.4.4	TMF Construction and Operations	18-10
18.4.5	Construction Requirements	18-15
18.5	Railway and Port Infrastructure	18-15
19.	MARKET STUDIES AND CONTRACTS.....	19-1
19.1	Iron Ore Market	19-1
19.1.1	Iron Ore Selling Price Assumptions	19-1

19.1.2	Premium for Fe Grade	19-2
19.1.3	Other Premium/Penalties Applicable to Kami Concentrate	19-2
19.1.4	Basis for Determination of Concentrate Price Used for Economic Analysis.....	19-3
19.2	Off-Take and Agreements	19-4
19.2.1	HBIS Agreement	19-4
19.2.2	Glencore Agreement.....	19-5
19.3	Railway Transportation Negotiation Status	19-5
19.4	Discussions Regarding Access to Port Terminal Facilities at Pointe-Noire	19-7
19.5	Port Agreement	19-8
19.6	Electric Power Supply.....	19-9
19.7	Metso Life Cycle Services Agreement	19-10
19.8	Memorandum of Understanding with Duro Felguera.....	19-11
20.	ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT	20-1
20.1	Environmental Setting	20-1
20.2	Jurisdiction, Applicable Laws and Regulations	20-3
20.2.1	New and Changing Regulations	20-4
20.3	Environmental Studies.....	20-5
20.4	Environmental Permitting.....	20-5
20.5	Tailings Management	20-8
20.5.1	TMF Design and Operation.....	20-8
20.5.2	TMF Rehabilitation	20-8
20.5.3	Design Considerations and Recommendations.....	20-9
20.6	Waste Dumps.....	20-10
20.6.1	Overburden and Waste Rock Management Considerations	20-10
20.6.2	Waste Dump Rehabilitation	20-11
20.7	Site Geotechnical	20-11
20.7.1	Crusher Area	20-12
20.7.2	Tailings Impoundment.....	20-12
20.7.3	Rail Loop	20-12
20.7.4	Process Plant Area	20-13
20.7.5	Access Roads	20-14
20.7.6	Structural Fill	20-14
20.8	Baseline Hydrogeology.....	20-14

20.9	Baseline Hydrology and Water Management.....	20-16
20.9.1	Hydrology and Water Quality	20-17
20.9.2	Water Supply.....	20-18
20.9.3	Water Management.....	20-18
20.10	Rehabilitation and Closure Planning	20-20
20.10.1	Rehabilitation Planning	20-20
20.10.2	Proposed Approach to Rehabilitation and Closure.....	20-21
20.10.3	Progressive Rehabilitation	20-21
20.10.4	Closure Rehabilitation	20-22
20.10.5	Post-Closure and Long Term Monitoring	20-23
20.10.6	Cost Estimate for Closure	20-23
20.10.7	Financial Assurance.....	20-24
20.11	Community Relations	20-24
20.11.1	Indigenous Consultation.....	20-24
20.11.2	Community Consultation	20-27
21.	CAPITAL AND OPERATING COSTS.....	21-1
21.1	Basis of Estimate.....	21-3
21.1.1	Type and Accuracy of Estimate	21-3
21.1.2	Estimation Methodology	21-3
21.1.3	Assumptions.....	21-5
21.1.4	Exclusions	21-7
21.2	Estimated Capital Costs	21-7
21.2.1	Mine Area EPC Costs	21-7
21.2.2	Mineral Processing Plant EPC Costs.....	21-8
21.2.3	Tailings Management Facility (Initial Dyke Construction)	21-8
21.2.4	Site Infrastructure and Utilities EPC Costs	21-8
21.2.5	Other EPC Costs (Indirects, Guaranties, Insurance).....	21-8
21.2.6	Pre-stripping of Waste Rock by Kami	21-8
21.2.7	Pre-operational Capitalized Costs	21-9
21.2.8	Owner's Costs	21-9
21.2.9	Sustaining Capital Costs	21-9
21.2.10	Rehabilitation and Mine Closure Costs.....	21-9
21.3	Estimated Operating Costs.....	21-10
21.3.1	Mining Operating Costs.....	21-10

21.3.2	Processing Operating Costs	21-12
21.3.3	General Site Infrastructure Operating Costs.....	21-13
21.3.4	Sales, General and Administration	21-13
21.3.5	Tailings and Water Management and Environmental.....	21-13
21.3.6	Concentrate Rail Transportation, Handling and Shiploading.....	21-13
22.	ECONOMIC ANALYSIS.....	22-1
22.1	Taxation	22-4
22.2	Sensitivity Analysis	22-6
23.	ADJACENT PROPERTIES.....	23-1
23.1	Iron Ore Company of Canada – Carol Lake.....	23-1
23.2	Tacora – Formerly Wabush Mines (Scully)	23-1
23.3	ArcelorMittal Mines Canada – Mont-Wright	23-2
23.4	Québec Iron Ore – Bloom Lake	23-2
24.	OTHER RELEVANT DATA AND INFORMATION	24-1
24.1	Project Execution Plan	24-1
24.2	Initial Capital Reduction Strategies	24-4
25.	INTERPRETATION AND CONCLUSIONS	25-1
25.1	Geology and Mineral Resources.....	25-1
25.2	Mineral Reserves	25-2
25.3	Metallurgy and Mineral Processing.....	25-3
25.4	Environmental Permitting.....	25-3
25.5	Project Economic Analysis	25-4
25.6	Conclusions.....	25-4
26.	RECOMMENDATIONS.....	26-1
26.1	Environmental and Stakeholder Engagement.....	26-2
27.	REFERENCES.....	27-1

LIST OF TABLES

Table 1-1: Categorized Mineral Resource Estimate for the Kami Iron Ore Project	1-6
Table 1-2: Rose Deposit Mineral Reserves (Effective as of August 12, 2018).....	1-9
Table 1-3: Process Design Basis for Kami Concentrator	1-10
Table 1-4: Total Estimated Capital Costs (M US \$)	1-16
Table 1-5: Total Estimated Average LOM Operating Cost (US \$/t Dry Concentrate)	1-16
Table 1-6: Pre-tax Economic Analysis Results	1-17
Table 1-7: Post-tax Economic Analysis Results	1-17
Table 1-8: Key Project Milestones	1-18
Table 3-1: Technical Report Chapter List of Responsibility	3-2
Table 3-2: List of Contributors to FS	3-4
Table 4-1: Kamistiatuset Property in Labrador.....	4-1
Table 7-1: Regional Stratigraphic Column, Western Labrador Trough	7-4
Table 7-2: Summary of Rock Composition Grouped by Rock Type for Rose Area Drilling	7-21
Table 8-1: Deposit Model for Lake Superior-Type Iron Formation after Eckstrand (1984)	8-2
Table 10-1: Drilling Summary – Altius 2008 Program.....	10-2
Table 10-2: 2010 Drilling Summary by Deposit or Zone	10-3
Table 10-3: Drilling Summary – Alderon 2010 Program	10-5
Table 10-4: Drilling Summary – Alderon 2011 Winter Program.....	10-8
Table 10-5: Summary of Summer Exploration 2011-2012 Drilling	10-10
Table 10-6: Drilling Summary – Summer 2011-2012 Exploration Drillholes	10-11
Table 10-7: Drilling Summary – Overburden Pit-Slope Design Program	10-14
Table 10-8: Drilling Summary – Feasibility Level Site-Wide Geotechnical Program	10-15
Table 11-1: Sampling and Analysis Summary, Altius 2008 Drill Program	11-6
Table 11-2: Sampling and Analysis Summary, Alderon 2011 Winter Drill Program.....	11-7
Table 11-3: Sampling and Analysis Summary, Alderon Summer 2011-2012 Drilling Program	11-8
Table 11-4: Certified Standard Reference Materials Used for the In-Field QA/QC Programs - Altius 2008 and Alderon 2010	11-10
Table 11-5: Summary Results for SGS Lakefield Lab Standards for Head Analysis Fe ₂ O ₃ 2008 – 2012 Programs	11-15
Table 11-6: Summary Results for SGS Lakefield Lab Standards for Head Analysis MagFe Summer 2011– 2012 Program	11-16
Table 11-7: Summary Results for SGS Lakefield Lab Standards for Head Analysis FeO 2008–2012 Programs	11-17
Table 12-1: Summary of WGM Independent Second Half Core Sampling	12-2

Table 12-2: Comparison of Analytical Results - WGM Independent Sample Assays versus 2008 and 2010 Original Sample Assays	12-3
Table 13-1: Grinding Test Plan Summary.....	13-5
Table 13-2: Summary of Gravity Beneficiation Test Plan	13-6
Table 13-3: Summary of Magnetic Beneficiation Test Plan.....	13-6
Table 13-4: Rose Central Modal Table	13-8
Table 13-5: Rose North Modal Table.....	13-10
Table 13-6: 2011 PEA Metallurgical Performance Parameters Derived from Gravity Testwork	13-13
Table 13-7: 2011 PEA Mag Plant Metallurgical Performance Parameters.....	13-13
Table 13-8: 2011 PEA Final Concentrate	13-13
Table 13-9: Gravity Variability Test Results Normalized to 4.3% SiO ₂	13-14
Table 13-10: Comparison of Mn Gravity Concentrate Grade Estimation	13-15
Table 13-11: Grades and Recoveries after LIMS and DT Cobbing of Gravity Tailings.....	13-16
Table 13-12: Fe and SiO ₂ Grades and Magnetite and Weight Recoveries by Size	13-17
Table 13-13: Second Stage LIMS Cleaning Size-by-Size Assays.....	13-18
Table 13-14: Summary of SPI Test Results.....	13-21
Table 13-15: Specific Energy by Mineralization Estimated with IGS	13-23
Table 13-16: Calculated Throughput by Mineralization Limited at 3,145 t/h	13-23
Table 13-17: SPI Comparison to Other Tests.....	13-25
Table 13-18: Projected Kami Concentrate Analysis (%).....	13-27
Table 13-19: Projected Kami Concentrate PSD Analysis.....	13-27
Table 14-1: Categorized Mineral Resource Estimate for Rose Central and Rose North (Cut-Off of 15% TFe) (Effective Date as at December 17, 2012).....	14-2
Table 14-2: Categorized Mineral Resource Estimate for Mills Lake (Cut-Off of 15% TFe) (Effective Date as at December 17, 2012).....	14-2
Table 14-3: Basic Statistics of 3 m Composites.....	14-19
Table 14-4: Block Model Coding of Kami Project Deposits	14-31
Table 14-5: ID ² Interpolation Parameters, First Search Ellipsoid (2/3 Sill Range).....	14-32
Table 14-6: ID ² Interpolation Parameters, Second Search Ellipsoid (Sill Range)	14-33
Table 14-7: ID ² Interpolation Parameters, Third Search Ellipsoid	14-34
Table 14-8: Categorized Mineral Resources by %TFe_H Cut-Off for Mills Lake (Effective Date as at December 17, 2012).....	14-40
Table 14-9: Categorized Mineral Resources by %TFe_H Cut-Off for Rose Central and Rose North (Effective Date as at December 17, 2012)	14-40

Table 14-10: Comparison of Average Grade of Assays and Composites with Total Block Model Average Grades for Rose Central.....	14-42
Table 14-11: Comparison of Average Grade of Assays and Composites with Total Block Model Average Grades for Rose North	14-42
Table 14-12: Comparison of Average Grade of Assays and Composites with Total Block Model Average Grades for Mills Lake.....	14-42
Table 15-1: Rose Block Model Items	15-2
Table 15-2: Variety of Waste Rock Densities	15-3
Table 15-3: Fe Recovery by Ore Type.....	15-3
Table 15-4: Pit Optimization Parameters (in Canadian Dollars)	15-6
Table 15-5: Cut-off Grade Sensitivity	15-9
Table 15-6: Engineered Pit Design Parameters	15-11
Table 15-7: Rose Deposit Mineral Reserves (Effective as of August 12, 2018).....	15-14
Table 15-8: Rose Deposit Mineral Reserves by Rock Type	15-14
Table 16-1: Mineral Reserves by Phase	16-2
Table 16-2: Stockpile Design Parameters	16-4
Table 16-3: Mill Targeted Throughput Design per Rock Type.....	16-5
Table 16-4: Mine Production Schedule	16-7
Table 16-5: Mill Feed by Rock Type (Mt).....	16-8
Table 16-6: Mine Equipment Fleet.....	16-14
Table 16-7: Truck Hours (h/y)	16-15
Table 16-8: Truck Cycle Time	16-16
Table 16-9: Truck Productivities (Year 5)	16-16
Table 16-10: Drilling and Blasting Parameters	16-19
Table 16-11: Mine Workforce Requirements (Year 12)	16-21
Table 17-1: Process Design Basis for Kami Concentrator	17-1
Table 18-1: Estimated Kami Power Requirements Electrical Consumption	18-8
Table 19-1: Spot and 3-Year Trailing Average	19-2
Table 19-2: Kami Impurity Premium/Penalty	19-3
Table 20-1: Key Permits, Approvals or Authorizations Currently in Place for Kami Property	20-6
Table 20-2: Potential Provincial Permits, Approvals and Authorizations	20-7
Table 20-3: Potential Federal Permits, Approval and Authorizations	20-8
Table 20-4: Potential Permits, Approval and Authorizations – Municipal	20-8
Table 20-5: Water Balance Results Under the 30-Year Climate Normal (Year 1982 to 2011) Conditions	20-17

Table 20-6: Monthly Maximum, Minimum and Mean Daily Flows at the Outlet of Long Lake.....	20-17
Table 20-7: Preliminary Stakeholder List	20-28
Table 21-1: Estimated Capital Costs (M US \$)	21-1
Table 21-2: Total Estimated Average LOM Operating Cost (US \$/t Dry Concentrate)	21-2
Table 21-3: Project WBS.....	21-4
Table 21-4: Breakdown of the Mining Costs	21-10
Table 21-5: Kami Processing Operating Cost Estimate	21-12
Table 22-1: Kami Project Table of Undiscounted, Pre-Tax, Cash Flow (M\$ US).....	22-3
Table 22-2: Economic Analysis Results (Pre-Tax)	22-4
Table 22-3: Post Tax Economic Analysis Results	22-6
Table 22-4: Sensitivity Analysis Table (Pre-Tax)	22-6
Table 24-1: Key Project Milestones	24-1
Table 25-1: Categorized Mineral Resource Estimate for Kami Iron Ore Project (Cut-Off of 15% TFe) ..	25-1
Table 25-2: Rose Deposit Mineral Reserves (Effective as of August 12, 2018).....	25-2
Table 25-3: Pre-tax Economic Analysis Results	25-4
Table 25-4: Post-tax Economic Analysis Results	25-4

LIST OF FIGURES

Figure 4-1: Land Status Map.....	4-2
Figure 7-1: Regional Geology	7-3
Figure 7-2: Property Geology.....	7-6
Figure 7-3: Ground Magnetic Survey with 2008-2012 Drillhole Locations	7-12
Figure 7-4: Rose Lake Area - Cross Section 20+00E.....	7-13
Figure 7-5: Mills Lake Area - Cross Section 36+00E.....	7-17
Figure 7-6: Bulk Density for 0.1 m Samples Intervals vs. %TFe on Routine Samples.....	7-24
Figure 7-7: SG by Gas Comparison Pycnometer on Pulps vs. %TFe on Routine Assay Samples	7-25
Figure 7-8: DGI Probe Densities for all 2012-2008 Drillholes of Rose Lake	7-26
Figure 7-9: DGI Probe Densities for Mills Lake Samples	7-26
Figure 11-1: TFe _H Results for the Field-Inserted Certified Reference Standards for all Drilling Programs 2008 through 2012	11-11
Figure 11-2: MagFe _{Sat} Results for the Field-Inserted Certified Reference Standards for all Drilling Programs 2008 through 2012.....	11-11
Figure 11-3: Results for Duplicate ¼ Split Drill Core Samples - %TFe _H 2008 through 2012 Programs.....	11-12

Figure 11-4: Results for Duplicate ¼ Split Drill Core Samples – %magFe Satmagan_H 2008 through 2012 Programs	11-13
Figure 11-5: Results for Duplicate ¼ Split Drill Core Samples - %FeO_H 2008 through 2012 Programs	11-13
Figure 11-6: Results for Duplicate ¼ Split Drill Core Samples - %DTWR 2008 through 2012 Programs.....	11-14
Figure 11-7: magFe from Davis Tube versus magFe from Satmagan	11-18
Figure 11-8: %TFe_H at Inspectorate vs. SGS Lakefield	11-19
Figure 11-9: %FeO_H by HF-H ₂ SO ₄ Digestion at Inspectorate vs. SGS Lakefield	11-20
Figure 11-10: %magFeSat at Inspectorate vs. SGS Lakefield	11-20
Figure 11-11: %MnO_H at Inspectorate vs. SGS Lakefield	11-21
Figure 11-12: %SiO ₂ _H at Inspectorate vs. SGS Lakefield	11-21
Figure 11-13: %TFe on Heads at AcmeLabs versus SGS Lakefield.....	11-23
Figure 11-14: %magFe on Heads by Satmagan at AcmeLabs versus SGS Lakefield.....	11-23
Figure 11-15: %FeO on Heads at AcmeLabs versus SGS Lakefield	11-24
Figure 11-16: %MnO on Heads at AcmeLabs versus SGS Lakefield	11-24
Figure 12-1: %TFe_H for WGM Independent Sample vs. Alderon or Altius Original Sample.....	12-5
Figure 12-2: %magFe_H (Satmagan) for WGM Independent Sample vs. Alderon or Altius Original Sample	12-6
Figure 12-3: %FeO_H for WGM Independent Sample vs. Alderon or Altius Original Sample	12-6
Figure 12-4: %SiO ₂ _H for WGM Independent Sample vs. Alderon or Altius Original Sample.....	12-7
Figure 12-5: %Mn_H for WGM Independent Sample vs. Alderon or Altius Original Sample	12-7
Figure 13-1: Fe-Oxide Liberation Curves for RC-1, RC-2 and RC-3	13-9
Figure 13-2: Fe-Oxide Liberation Curves for RN-1, RN-2 and RN-3	13-11
Figure 13-3: Very Fine Magnetite Locked in Gangue Mineral	13-17
Figure 13-4: Throughput Sensitivity on Material Specific Energy	13-22
Figure 14-1: Rose North and Rose Central 3-D Geological Model (Looking SW).....	14-10
Figure 14-2: Rose North and Rose Central 3-D Geological Model (Looking NW)	14-10
Figure 14-3: Mills Lake 3-D Geological Model (Looking NW).....	14-11
Figure 14-4: Rose Deposit Cross Section 20+00E Showing %TFe Block Grade Model.....	14-12
Figure 14-5: Rose Deposit Cross Section 20+00E Showing Mineral Resource Categorization	14-13
Figure 14-6: Rose Deposit Cross Section 10+00E Showing %TFe Block Grade Model.....	14-14
Figure 14-7: Rose Deposit Cross Section 10+00E Showing Mineral Resource Categorization	14-15
Figure 14-8: Mills Lake Deposit Cross Section 36+00E Showing %TFe Block Grade Model.....	14-16
Figure 14-9: Mills Lake Deposit Cross Section 36+00E Showing Mineral Resource Categorization....	14-17

Figure 14-10: Normal Histogram, %TFeHead – Rose Central 3 m Composites (RC-1, RC-2 and RC-3 Domains)	14-20
Figure 14-11: Normal Histogram, %hmFeHead – Rose Central 3 m Composites (RC-1, RC-2 and RC-3 Domains)	14-21
Figure 14-12: Normal Histogram, %magFeHead – Rose Central 3 m Composites (RC-1, RC-2 and RC-3 Domains)	14-22
Figure 14-13: Normal Histogram, %TFeHead – Rose North 3 m Composites (NR-1, NR-2, NR-3 and Limonite Domains).....	14-23
Figure 14-14: Normal Histogram, %hmFeHead – Rose North 3 m Composites (NR-1, NR-2, NR-3 and Limonite Domains).....	14-24
Figure 14-15: Normal Histogram, %magFeHead – Rose North 3 m Composites (NR-1, NR-2, NR-3 and Limonite Domains).....	14-25
Figure 14-16: Normal Histogram, %TFeHead, %hmFeHead, %magFeHead – Mills Lake 3 m Composites (Hematite Zone).....	14-26
Figure 14-17: Normal Histogram, %TFeHead, %hmFeHead, %magFeHead – Mills Lake 3 m Composites (Magnetite Zone)	14-27
Figure 14-18: Rose Deposit, Level Plan 450 m - %TFe Block Model and Geological Outlines	14-38
Figure 14-19: Rose Deposit, Level Plan 450 m showing Mineral Resource Categorization	14-39
Figure 15-1: Isopach Mapping of Overburden Thicknesses	15-4
Figure 15-2: Mining Dilution	15-5
Figure 15-3: Surface Constraints for Pit Optimization	15-7
Figure 15-4: Pit Optimization Results	15-8
Figure 15-5: Pit Optimization Results (Section N1860 m)	15-9
Figure 15-6: Slopes Sectors for Pit Optimization	15-10
Figure 15-7: Engineered Pit Design Plan View.....	15-12
Figure 15-8: Engineered Pit Design Section View N1560 m	15-12
Figure 15-9: Engineered Pit Design Plan View z=450 m	15-13
Figure 16-1: Phase Design (Plan View).....	16-2
Figure 16-2: Phase Design (Typical Section)	16-3
Figure 16-3: Stockpile Layout	16-4
Figure 16-4: Total Material Movement	16-9
Figure 16-5: Mill Feed	16-9
Figure 16-6: Mill Feed by Region	16-10
Figure 16-7: Material Mined Phase.....	16-10
Figure 16-8: End of Pre-production.....	16-11

Figure 16-9: End of Year 5.....	16-11
Figure 16-10: End of Year 10.....	16-12
Figure 16-11: End of Year 15.....	16-12
Figure 16-12: End of Year 20.....	16-13
Figure 16-13: Truck Requirements and Productivities.....	16-17
Figure 17-1: Process Flow Diagram Crushing, Stockpiling and Reclaiming	17-4
Figure 17-2: Process Flow Diagram Grinding, Screening and Gravity Concentration	17-5
Figure 17-3: Process Flow Diagram Magnetic Separation Plant.....	17-6
Figure 17-4: Process Flow Diagram General Process Water Balance.....	17-7
Figure 18-1: General Site Plan for the Kami Project.....	18-2
Figure 18-2: General Site Layout for the Kami Project.....	18-3
Figure 18-3 Schematic of the TMF Design	18-13
Figure 18-4 Tailings Deposition Plan Stages.....	18-14
Figure 19-1 Al ₂ O ₃ , Spot Premium Trend.....	19-3
Figure 22-1: Sensitivity Analysis Graph for NPV	22-7
Figure 22-2: Sensitivity Analysis Graph for IRR.....	22-8
Figure 24-1: Preliminary Construction Manpower Curve	24-3

LIST OF ABBREVIATIONS

Two Dimensional	2-D
Three Dimensional.....	3-D
Atlantic Canada Opportunities Agency	ACOA
Autogenous.....	AG
Alderon Iron Ore Corp.....	Alderon
Allnorth Land Surveyors.....	Allnorth
Altius Minerals Corporation	Altius
ArcelorMittal Mines of Canada	AMMC
Association of Professional Engineers and Geoscientists of British Columbia.....	APEGBC
Acid Rock Drainage / Metal Leaching	ARD/ML
Above Sea Level.....	ASL
All-Terrain Vehicle.....	ATV
British Columbia.....	BC
Breton, Banville and Associates.....	BBA
Bell Geospace Inc.....	BGI
Bond Work Index	BWI
Community Advisory Panel	CAP
Capital Expenditure.....	CAPEX
Companies' Creditors Arrangement Act	CCAA
Canadian Dam Association	CDA
Canadian Environmental Assessment Agency	CEA
Canadian Environmental Assessment Act.....	CEAA
Comminution Economic Evaluation Tool	CEET
Chemin de Fer Arnaud.....	CFA
Cost and Freight China	CFR-China
Converting Magnetic Susceptibility.....	CGS
Council of the Canadian Institute of Mining Metallurgy and Petroleum	CIM
Crown-Indigenous Relations and Northern Affairs Canada	CIRNAC
Cliffs Natural Resources Inc.....	Cliffs
Cut-Off Grade	COG
Comma Separated Value	CSV
Canadian Transportation Agency.....	CTA
Crusher Work Index	CWI
Department of Advanced Education and Skills.....	DAES
Diamond Drillhole.....	DDH
Digital Elevation Model.....	DEM
Duro Felguera	DF
Fisheries and Oceans Canada.....	DFO
DGI Geosciences Inc.	DGI
Differential Global Positioning System	DGPS

Department of Health and Community Services.....	DHCS
Department of Innovation, Business and Rural Development.....	DIBRD
Diameter	dia
Dry Metric Ton	DMT
Department of Natural Resources	DNR
Department of Environment and Conservation.....	DOEC
Department of Finances.....	DOF
Department of Justice	DOJ
Department of Municipal Affairs	DOMA
Direct Reduced Iron	DRI
Direct Shipping Ore.....	DSO
Davis Tube.....	DT
Department of Tourism, Culture and Recreation	DTCR
Davis Tube Tails	DTT
Department of Transportation and Works.....	DTW
Drop Weight Test.....	DWT
Environmental Assessment.....	EA
Environment Canada	EC
Environmental Effects Monitoring.....	EEM
Effective Grinding Length	EGL
Environmental Impact Assessment	EIA
Environmental Impact Statement	EIS
Engineering, Procurement and Construction.....	EPC
Engineering, Procurement and Construction Management	EPCM
Evapotranspiration	ET
Federal Authority.....	FA
Freight on Board	FOB
Feasibility Study.....	FS
Footwall	FW
General Arrangement.....	GA
Guidelines for Canadian Drinking Water Quality	GCDWQ
Gemcom Software International Inc.	Gemcom™
Gravity Gradient Instruments	GGI
Geographic Information System	GIS
Geoscientists in Training.....	GIT
Global Positioning System	GPS
Geological Survey of Canada.....	GSC
Government Service Centre.....	GSC
Harmful Alteration, Disruption or Destruction	HADD
HBIS Group Co., Ltd	HBIS
High Density Polyethylene	HDPE
Hematite	Hem

Heavy Fuel Oil	HFO
Hematite Iron Formation	HIF
Heavy Liquid Separation	HLS
Hematite-Silicate Iron Formation	HSIF
Hematite Iron	hmFe
Impact and Benefits Agreement	IBA
Inverse Distance	ID
Intensity-Duration-Frequency	IDF
Intergovernmental and Aboriginal Affairs	IGAA
Integrated Geometallurgical Simulator	IGS
Iron Formation	IF
Iron Ore Company of Canada	IOC
Iron Ore Index	IODEX
Internal Rate of Return	IRR
Job Efficiency Factor	JEF
Kamistiatuset	Kami
Length	L
Landdrill International Ltd.	Landdrill
Lerchs-Grossman	LG
Light Detection and Ranging	LIDAR
Low Intensity Magnetic Separation	LIMS
Labrador Mining and Exploration Co. Ltd	LM&E
Loss on Ignition	LOI
Life of Mine	LOM
Magnetite	Mag
Magnetite Iron	magFe
Metals Bulletin Iron Ore Index	MBIOI
Work Index of Coarse Particle	M _{ia}
Work Index of the Fine Particle	M _{ib}
Mira Geoscience	Mira
Membrane Bioreactor	MBR
Metal Leaching	ML
Memorandum of Understanding	MOU
Major Project Management Office	MPMO
Metal Mining Effluent Regulation	MMER
MineSight Schedule Optimizer	MSSO
Total Magnetic Fe	MTFe
Material Take-Off	MTO
Non-acid generating	NAG
Nunatukavut Community Council	NCC
Non-Governmental Organization	NGO
Newfoundland and Labrador	NL

Newfoundland and Labrador Department of Municipal Affairs and Environment	NLDMAE
Newfoundland and Labrador Department of Natural Resources	NLDNR
Newfoundland and Labrador Organization of Women Entrepreneurs.....	NLOWE
Nearest Neighbour	NN
Net Operating Hours	NOH
Net Present Value	NPV
Natural Resources Canada	NRCAN
Overburden	OB
Ordre des Géologues du Québec	OGQ
Oxide Iron Formation	OIF
Operating Expenditure	OPEX
Optical Televiewer	OTV
Potentially Acid-Generating.....	PAG
Parrott Survey Limited.....	Parrott
Preliminary Economic Assessment	PEA
Professional Engineers and Geoscientists of Newfoundland and Labrador.....	PEGNL
Process Flowsheet.....	PFS
Pre-Operational Verifications	POV
Project Execution Plan	PEP
Particle Size Distribution	PSD
Quality Assurance	QA
Quality Control	QC
Quantitative Evaluation of Minerals by Scanning Electron Microscopy.....	QEMSCAN
Québec Iron Ore	QIO
Québec, North Shore & Labrador.....	QNS&L
Qualified Person	QP
Rotary Blast Hole Drills	RBHD
Rose Central.....	RC
Revenue Factor	RF
Rose North.....	RN, NR
Relative to Sea Level	RSL
Run-of-Mine	ROM
Rock Quality Designation	RQD
Rod Work Index	RWI
Semi Autogenous.....	SAG
Satmagan	Sat
Silicate-Carbonate Iron Formation.....	SCIF
Specific Gravity	SG
Sales, General, and Administrative Expenses.....	SG&A
SGS Minerals Services	SGS
Silicate Iron Formation	SIF
Single Line Diagram.....	SLD

SAG Mill Comminution	SMC
Societe Ferroviaire et Portuaire de Pointe Noire	SFPPN
Societe Plan Nord	SPN
Spontaneous Potential	SP
SAG Power Index	SPI
Singlepoint Resistivity	SPR
Stripping Ratios	SR
Stantec Consulting Ltd.	Stantec
Total Dissolved Solids	TDS
Total Iron Content	TFe
Triangulated Irregular Network	TIN
Tailings Management Facility	TMF
Total Suspended Solids	TSS
Toronto Stock Exchange	TSX
Valued Ecosystem Component	VEC
Power required to grind the ore with an AG Mill	W_a
Power required to grind the ore from 750 μ m (22M) to the final product size	W_b
Work Breakdown Structure	WBS
Watts, Griffis and McOuat	WGM
Whole Rock	WR
Weight Recovery	WREC
Total Operating Grinding Energy	W_T
Weight	W_t
Wilfley Table	WT
X-Ray Diffraction	XRD
X-Ray Fluorescence	XRF

UNITS OF MEASURE

Foot	', ft
Inches	", in
Dollar	\$
Dollar per tonne	\$/t
Degree	°
Micrograms per litre	µg/L
Micron	µm
Ampere	A
Centimetre	cm
Canadian Dollars	CND
Feet per minute	fpm
Gram	Gram
Gram per cubic centimetre	g/cc, g/cm ³
Gallons per minute	GPM
Giga watt hour	GWh
Hectare	ha
Horsepower	hp
Kilogram	kg
Kilometre	km
Square kilometre	km ²
Kilotonne	kt
Kilovolt	kV
Kilowatt	kW
Kilowatt-hours per tonne	kWh/t
Percent	%
Pounds per hour	lb/h
Litre	L
Metre	m
Million	M
Million tonnes per year	M t/y
Cubic metre per hour	m ³ /h
Metres Above Sea Level	masl
Metres Below Ground	mbg
Milligrams per litre	mg/L
Mile	mi
Millimetre	mm
Million tonnes	Mt
Million tonnes per annum	Mtpa
Metric tonnes per hour	mt/h
Mega Volt Ampere	MVA

Mega Watt	MW
Standard cubic feet per minute	scfm
Tonnes.....	t
Tonnes per hour.....	t/h
Tonnes per cubic metre	t/m ³
Tonnes per year.....	t/y
Metric tons	tonnes or t
Short tons	tons

1. SUMMARY

1.1 Introduction

The Property is located south of the towns of Wabush and Labrador City in Newfoundland and Labrador and east of Fermont, Québec. The Property perimeter is approximately 6 km southwest from the Wabush Mines mining lease. The Property consists of two contiguous licenses and a mining lease forming one block and spans an area that extends approximately 12 km east-west and 13 km north-south in NTS map areas 23B/14 and 15, and centred at approximately 52°49'N latitude and 66°59'W longitude. The Property is comprised of 283 claim units covering 7,075 hectares.

Alderon Iron Ore Corp. ("Alderon") acquired a 100% interest in the Kamistiatuset Iron Ore Property (the "Property" or "Kami") on December 8, 2010 from Altius Minerals Corporation ("Altius"). The purchase is subject to a 3% gross sales royalty. Subsequently, Alderon signed a subscription agreement dated April 13, 2012 and amended August 13, 2012, with HBIS Group Co., Ltd. ("HBIS"), formerly known as Hebei Iron and Steel Group Co. Ltd. Under the terms of this Agreement, HBIS agreed to make a strategic investment into both Alderon and the Property, thus allowing HBIS to hold 19.9% of the outstanding common shares of Alderon and a 25% interest in a newly formed limited partnership that was established to own the Property. The parties also agreed upon the terms of all other material agreements governing the relationship between HBIS and Alderon, and HBIS's agreement to purchase iron ore concentrate produced at the Property.

The following Technical Report summarizes the results of an updated Feasibility Study ("FS") that was undertaken for the development of the Kamistiatuset ("Kami") Iron Ore Property in Western Labrador. The present FS incorporates the most recent project design features developed during the previous detailed engineering phase of the Project but also includes the following key elements:

- An updated Proven and Probable Mineral Reserve estimate;
- An updated mine plan based on the stated mineral reserves as well as providing sufficient waste rock quantities to meet construction requirements;
- A redesigned tailings management facility ("TMF") and tailings deposition plan;
- A tailings dewatering and slurry pumping strategy aligned with the requirements set forth by the new tailings deposition plan;
- Updated capital and operating costs.

This Report was prepared at the request of Mr. Tayfun Eldem, President and Chief Executive Officer of the Corporation.

In December 2012, Alderon completed a Feasibility Study on the Kami Project (the "Project") and issued a NI 43-101 Report summarizing the results. Subsequently, Alderon proceeded with detailed engineering and some procurement activities. All activities on the Project were progressively suspended when iron ore market conditions deteriorated. From late 2014 to late 2016, the iron ore market was in a depressed state resulting from the oversupply of iron ore products and the slowdown in Chinese steel mill demand. This had a significant impact on the companies operating and developing projects in Canada's Labrador Trough ("Trough"). Since then, significant improvements in the market conditions have taken place. This has prompted increased activity in the Trough, namely:

- The successful restart of operations at the Bloom Lake mine and concentrator by Québec Iron Ore;
- The acquisition by Tacora of the Wabush Scully mine and its intention to re-start operations.

As market conditions improved, Alderon has explored various options and opportunities to reduce initial project capital costs and optimize project economics under current conditions. As such, Alderon is presently proceeding with updating its FS, incorporating project re-scope parameters described earlier, in an effort to relaunch the Kami Project.

1.2 Geology and Mineralization

The Property is situated in the highly metamorphosed and deformed metasedimentary sequence of the Grenville Province, Gagnon Terrane of the Labrador Trough. The Trough is comprised of a sequence of Proterozoic sedimentary rocks, including iron formation, volcanic rocks and mafic intrusions. Trough rocks in the Grenville Province are highly metamorphosed and complexly folded. The high-grade metamorphism of the Grenville Province is responsible for recrystallization of both iron oxides and silica in primary iron formation, producing coarse-grained sugary quartz, magnetite and specular hematite schist or gneiss (meta-taconites) that are of improved quality for concentration and processing. The Property is underlain by folded sequences of the Ferriman Group (previously Knob Lake Group) or Gagnon Group containing Wabush / Sokoman Formation iron formation, and underlying and overlying units. The stratigraphic sequence varies in different parts of the Property.

The iron formation on the Property is of the Lake Superior-type consisting of banded sedimentary rocks composed principally of bands of iron oxides, magnetite and hematite within quartz (chert)-rich rock with variable amounts of silicate, carbonate and sulphide lithofacies.

The oxide iron formation ("OIF") consists mainly of semi-massive bands or layers, and disseminations of magnetite and/or specular hematite (specularite) in recrystallized chert and interlayered with bands (beds) of chert with iron carbonates and iron silicates. Where silicate or carbonate becomes more prevalent than magnetite and/or hematite, the rock is then silicate iron formation ("SIF"), or where carbonate is also prevalent, mineralization is silicate-carbonate iron formation ("SCIF"). SIF consists mainly of amphibole and chert, often associated with carbonate and contains magnetite or specularite in minor amounts. The OIF assemblage on the Property is mostly magnetite-rich but includes hematite-rich units as well as lean oxide iron formation and SIF and SCIF variants. Some sub-members contain increased amounts of hematite (specularite) associated with manganese silicates and carbonates. Hematite appears to be more prominent in Rose North mineralization than at either Rose Central or Mills Lake.

In the Mills Lake area, the iron formation consists of a gently east dipping tabular main zone with several parallel ancillary zones. The iron formation in the Rose and Mart Lakes area consists of a series of corrugated gently plunging, northeast-southwest oriented, sub-parallel upright to slightly overturned anticlines and synclines. Thickness of oxide and silicate/carbonate iron formation varies widely but is indicated to be up to about 300 m on fold limbs in the Rose Central deposit.

1.3 Exploration and Drilling

All recent exploration and drilling on the Property were completed either by Altius or Alderon. Altius commenced reconnaissance mapping and rock sampling during the summer of 2006. In 2007, their exploration program also included a high-resolution helicopter airborne magnetic survey and line cutting. The results of the 2007 program were positive and the airborne magnetic survey effectively highlighted the extent of the iron formation. Following the 2007 program, Altius acquired additional property.

The 2008 exploration program conducted by Altius consisted of rock sampling, line cutting, a ground gravity and magnetic survey, a high-resolution satellite imagery survey, an integrated 3-D geological and geophysical inversion model and 6,046 m of diamond drilling in 25 holes (including two abandoned holes that were re-drilled). The drilling program was designed to test three known iron ore occurrences that were targeted through geological mapping and geophysics, namely, Mills Lake, Mart Lake and Rose Lake. Drilling confirmed the presence of iron oxide-rich iron formation and was successful in extending the occurrences along strike and at depth.

Alderon commenced the 2010 drill program on the Property on June 1st. It was focused on the Rose Central and Mills Lake deposits; however, a few drillholes were targeted on the Rose North and South West Rose zones. An aggregate of 26,145 m in 82 holes were collared but only 72 holes were drilled to the desired depths. An airborne gravity and magnetic survey covering all of the Property in Newfoundland and Labrador was completed by Bell Geospace Inc.

The drill program on the Rose Central deposit comprised of 56 drillholes aggregating 20,411 m. Drilling was completed along grid lines 200 m apart, filling in between and extending Altius' 2008 drilling pattern. The distance between holes varied. The holes covered an approximate northeast-southwest strike length of 1.5 km and tested mineralization to a depth of approximately 500 m. Four drillholes were drilled to test the Rose North zone and several Rose Central drillholes also tested the Rose North zone at depth to allow for a preliminary assessment. Ten holes aggregating 1,423 m were targeted on the South-West Rose zone. On the Mills Lake deposit, 16 holes were drilled aggregating 4,311 m over a north-south strike length of 1.2 km on cross sections 200 m apart. The gently dipping Mills Lake iron formation was tested to a depth of approximately 300 m. In the winter of 2011, Alderon's drilling program consisted of 29 holes totaling 4,625 m on the Rose North deposit, with one hole drilled on Rose Central for metallurgical sample collection.

The summer 2011-2012 program started in June 2011 and continued through to the end of April 2012. The holes were drilled throughout the Rose Lake area and a number of holes were also completed on the Mills Lake deposit. Exploration drilling aggregated to 100 exploration drillholes totaling 29,668 m. An additional 46 geotechnical holes under Stantec's management, including several abandoned drillholes, were drilled for pit slope design and general site planning purposes. Four additional holes of the KXN-series were drilled from the north end of Mills Lake north towards the northern boundary of the Kami Property for condemnation purposes.

The purpose of the 2012 drilling program was to advance the Project to feasibility stage by upgrading the classification of Mineral Resources, and to provide more information for mine planning and metallurgical testwork. Watts, Griffis and McOuat ("WGM") understands that no additional geological work, including drilling and/or exploration sample assaying have been completed since late 2012 to the date of this Report.

1.4 Sample Preparation and Data Verification

WGM validated the core logging and sampling procedures used by Alderon as part of an independent verification program and concluded that the drill core handling, logging and sampling protocols meet conventional industry standards and conformed to generally accepted best practices. WGM is confident that the protocols in place by Alderon are appropriate for the collection of data suitable for the completion of a Mineral Resource estimate prepared in accordance with NI 43-101.

It is WGM's opinion that the database dated September 2012 is valid and acceptable for use in Mineral Resource estimation studies. Subsequent to the 2012 Mineral Resource estimate being completed, the Project database has been updated to account for additional check assays, specific gravity analyses and other minor revisions. The changes to the database are not considered to be material and are not reflected in this Feasibility Study.

1.5 Mineral Processing and Metallurgical Testwork

This updated FS is largely based on the historical metallurgical testwork performed during the 2011 PEA and the 2012 FS as well as some subsequent confirmatory testwork and modelling performed during the course of the detailed engineering. Results from this testwork were used to determine process performance parameters such as material throughput, Fe and weight recoveries, final concentrate grade (including key elements such as Fe, SiO₂, Mn) and particle size. The key process performance parameters were then used as the basis for establishing the mine plan, sizing of equipment and ultimately to estimate the Project capital and operating costs, which in turn were used for performing the Economic Analysis of the Project for the updated FS. The testwork performed consisted of the following:

- Ore mineralogical analysis for the six Rose deposit ore types;
- Grinding and ore grindability assessment test program;
- Gravity beneficiation performance assessment test program;
- Magnetic separation test program;
- Solid/Liquid separation testwork.

1.6 Mineral Resources

Following confirmation and infill drilling campaigns in 2011 and 2012, Alderon prepared updated Mineral Resource estimates for the Rose deposit and Mills Lake, Kami Iron Ore Project. WGM was retained by Alderon to audit this in-house estimate. The estimates for Rose Central and Rose North are reported above zero (0.0 m) elevation level (about 575 m from surface).

Subsequent to the 2012 Mineral Resource estimate being completed, the Project database had some minor updates and revisions that are not deemed to be material. No additional geological interpretation or drilling has been conducted; therefore, WGM considers the 2012 Mineral Resource estimate to be current and valid. A summary of the Mineral Resource estimate prepared in accordance with NI 43-101 is provided in Table 1-1.

**Table 1-1: Categorized Mineral Resource Estimate for the Kami Iron Ore Project
(Cut-Off of 15% TFe, Effective Date as at December 17, 2012)**

Zone	Category	Tonne (Million)	Density	TFe%	magFe%	hmFe%	Mn%
Rose Central	Measured	249.9	3.46	29.4	17.6	8.1	1.60
	Indicated	<u>294.5</u>	<u>3.44</u>	<u>28.5</u>	<u>17.7</u>	<u>5.9</u>	<u>1.28</u>
	Total M&I	544.4	3.45	28.9	17.7	6.9	1.43
	Inferred	160.7	3.45	28.9	16.9	7.1	1.44
Rose North	Measured	236.3	3.48	30.3	13.0	14.7	0.87
	Indicated	<u>312.5</u>	<u>3.49</u>	<u>30.5</u>	<u>11.8</u>	<u>17.1</u>	<u>0.96</u>
	Total M&I	548.8	3.49	30.4	12.3	16.1	0.92
	Inferred	287.1	3.42	29.8	12.5	15.5	0.76
Mills Lake	Measured	50.7	3.58	30.5	21.5	7.0	0.97
	Indicated	<u>130.6</u>	<u>3.55</u>	<u>29.5</u>	<u>20.9</u>	<u>3.9</u>	<u>0.80</u>
	Total M&I	181.3	3.56	29.8	21.1	4.8	0.85
	Inferred	74.8	3.55	29.3	20.3	2.7	0.67

Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability. Due to the uncertainty that may be attached to Inferred Mineral Resources, it cannot be assumed that all or any part of an Inferred Mineral Resource will be upgraded to an Indicated or Measured Mineral Resource as a result of continued exploration.

The Mineral Resource estimate for the Kami Project was completed in Gemcom™ using block sizes of 15 m x 15 m x 14 m for Rose Central and Rose North, and 5 m x 20 m x 5 m for Mills Lake, and is based on results from 209 diamond drillholes (“DDH”) at Rose Central and Rose North (170 holes) and Mills Lake (39 holes) zones totaling 62,247 m. These holes were drilled within the iron mineralization for approximately 2,000 m of strike length and a range of 200 m to 400 m of width for Rose Central and Rose North. The holes were drilled on section lines that were spaced 100 m apart for both deposits in the main area of mineralization. For the geological modelling, 3-D bounding boxes defining the maximum extents of the Rose and Mills Lake deposit areas were created. The boxes extended approximately 200 m along strike from the outermost drillholes in each area. Mineralized boundaries extended up to a maximum of about 400 m on the ends of the zones and at depth where there was no/little drillhole information, but only if the interpretation was supported by drillhole intersections on adjacent cross sections or by solid geological inference.

For the Mills Lake deposit, three separate zones were interpreted and wireframed based on drillhole data on vertical sections: a basal magnetite zone; a hematitic interlayer within the magnetite zone; and an upper magnetite zone. Rose North and Rose Central zones were each divided into three metallurgical/mineralogical domains; NR-1, NR-2 and NR-3, and RC-1, RC-2 and RC-3, respectively. The zoning of the Rose deposit was based on recent metallurgical/mineralogical testing of the mineralization plus logging and results in the assay database. Alteration products in the form of limonite and goethite are dominant features in the Rose North deposit and a 3-D solid was created incorporating this alteration (the “Limonite Zone”). This wireframe was used to overprint the other wireframes in the geological model and re-code the blocks to differentiate them for categorization purposes for the Mineral Resource estimate.

In order to carry out the Mineral Resource grade interpolation, a set of equal length composites of 3 m was generated from the raw drillhole intervals. The statistical distribution of the %TFe samples showed good normal distributions in all zones and it was determined that capping was not required for the Rose Central, Rose North and Mills Lake deposits.

For the current Mineral Resource estimates, a best fit correlation line based on DGI Geosciences Inc. (“DGI”) data to obtain the density of each block in the model was used: $\%TFe \times 0.0223 + 2.8103$. Using this variable density model, a 30% TFe gives a specific gravity (“SG”) of approximately 3.48. Alteration products such as limonite/goethite and secondary manganese hydroxides have developed from the oxide iron and manganese minerals; however, the extent of these secondary iron hydroxides is currently not well understood, particularly at depth. This leads to some uncertainty regarding the determination of density for the Mineral Resource tonnage estimate, particularly in the Limonite Zone. To overcome this uncertainty in grade and density of the altered mineralization in Rose North, all densities within this zone were assigned a SG of 3.0.

Alderon used an ID² interpolation method for each of the domains using the 3 m composites and a three-step search ellipsoid approach was used based on results of variography of %TFeHead grade. These three ranges were established for the interpolated domains in all the deposits and were also used as a guide to Mineral Resource categorization, along with the generation of a Distance Model (distance from actual data point in the drillhole to the block centroid). This three-step approach was used in order to inform all the blocks in the block model with grade, however, the classification of the Mineral Resources was also based on drillhole density (or drilling pattern), geological knowledge and zone interpretation. Other elements interpolated into the grade block model were %Mn, %SiO₂, %magFe and %hmFe (calculated).

Since the drilling density was lower in the deeper parts of the deposits, the drillhole spacing was taken into consideration when classifying the Mineral Resources and these areas were given a lower confidence category. Even though the wireframe continued to maximum depth of -106 m (approximately 700 m vertically below surface and extending 100 m past the deepest drilling), at this time, no Mineral Resources were defined/considered below 0 m elevation for Rose North and Rose Central. The Mills Lake wireframes extended to 180 m elevation or about 400 m below surface. The Distance Model was used for the final categorization of the Mineral Resources; blocks within the 3-D wireframes that had a distance of 100 m or less were classified as Measured, 100 m to 150 m as Indicated, and greater than 150 m as Inferred. Inferred Mineral Resources are interpolated out to a maximum of about 400 m for Rose Central and 300 m for Rose North and Mills Lake on the ends/edges and at depth.

There were some exceptions to the general resource categorization methods, where a combination of the Distance Model and the search ellipsoid pass were intentionally not used for category definition, especially in the Rose North and Rose Central zones. The main case was that all altered mineralization in Rose North logged as limonitic and falling within the defined Limonite Zone was tagged as Inferred.

1.7 Mining Methods

Using the 2012 mineral resource estimate and geological block model, a pit optimization analysis was conducted to determine the cut-off grade and to what extent the deposit can be mined profitably. This was done using the MS-Economic Planner module of MineSight. The optimizer uses the 3-D Lerchs-Grossman algorithm to determine the economic pit limits based on input of mining and processing costs, revenue per block and operational parameters such as the Fe recovery, pit slopes and other imposed constraints. Since this Study is at an FS level, NI 43-101 guidelines do not allow Inferred Mineral Resources to be used in the pit optimization analysis and mine plan.

The Mineral Reserves for the Rose deposit that are inclusive of mining dilution and ore loss and are above a cut-off grade of 15% Total Fe are presented in Table 1-2.

Table 1-2: Rose Deposit Mineral Reserves (Effective as of August 12, 2018)

Material	Tonnage (Mt)	TFe (%)	WREC (%)	MagFe (%)	Mag (%)	Mn (%)
Proven	392.7	29.0	34.7	15.0	20.8	1.20
Probable	124.5	28.2	32.0	11.1	15.3	1.07
Total Proven and Probable	517.2	28.8	34.1	14.1	19.4	1.17
Overburden	92.3					
Waste Rock	522.5					
Total Stripping	644.8					
Stripping Ratio	1.25					

The mine plan, based on continuous processing operations over 365 days per year, 7 days per week and 24 hours per day, was developed to support mining operations for the Kami Project. The mine life was estimated at about 23 years. Annual ore requirements were determined based on processing plant production capacity and are in the order of 23.0 Mtpa. Mining phases, including initial overburden and waste pre-stripping requirements and an annual mining schedule were developed. The mining method selected for the Project is based on conventional drill, blast, load and haul. 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. Capital and operating costs were estimated based on the mine plan.

1.8 Recovery Methods and Processing Plant Design

The metallurgical testwork for the Rose deposit allowed for the validation, optimization and more detailed development of the process and plant design. Much of this design was performed by Alderon at a detailed engineering level. General arrangement drawings and a 3-D model, equipment sizing, lists, and a process design criteria were used for generating quantities for materials such as concrete and structural steel. In turn, this information was used in the development of the Project capital and operating cost estimates. Table 1-3 shows the process design basis for the Project. Annual and hourly nominal and design production rates, as well as the operating and metallurgical performance parameters, were used to determine these rates.

Table 1-3: Process Design Basis for Kami Concentrator

	Nominal Operating Parameters (Dry basis)		
	Average LOM	Nominal Hourly Throughput	Design Value
Throughput (fresh feed)	23.003 Mtpa	2,886 t/h	3,310 t/h
Concentrate production	7.844 Mtpa	984 t/h	1,122 t/h
Tailings generated	15.159 Mtpa	1,902 t/h	2,188 t/h
Concentrate Wt Rec %	34.1%		
Concentrate Fe Rec %	77.4%		
Plant utilization %	91.0%		
Head grade %Fe (with mining dilution)	28.8%		
Concentrate grade %Fe	65.2%		
Concentrate grade %SiO ₂	4.30%		

General process and plant design criteria for the Kami processing plant for this FS are generally based on the criteria, design, general arrangements and equipment sizing developed by Kami LP during detailed engineering and on the following considerations.

- ROM material crushing takes place in a single gyratory crusher located in the vicinity of the Rose deposit;
- The Kami process plant is located on the Kami Property, to the east of Waldorf Crossing;
- Crushed material is conveyed using an overland conveyor that discharges onto an uncovered stockpile located ahead of the Kami concentrator;
- Crushed material from the stockpile is reclaimed onto a belt conveyor feeding the AG mill;
- AG mill discharge is screened using a two-stage screening circuit. Oversize from the scalping and classification screens is recirculated back to the AG mill;
- Slurry from the grinding and screening circuit is first subjected to gravity concentration using a three-stage spiral circuit that produces a tailings stream and a final gravity concentrate, which is dewatered using horizontal pan filters and steam injection when required;
- Tailings from the gravity circuit are subjected to a cobbing process using low intensity magnetic separation ("LIMS"). The cobber concentrate is further reground in a ball mill and processed in a magnetic separation circuit. This circuit produces a tailings stream and a final magnetic concentrate, which is dewatered using drum filters and steam injection;

- Filtered concentrate from the gravity circuit and from the magnetic circuit are combined on a belt conveyor, which directs the product to the train load-out silo system;
- Tailings from all sources are combined and treated through hydrocyclones where they are dewatered, and coarse and fine fractions are separated. Cyclone underflow (coarse tailings) are pumped to the TMF and used for progressive dam construction. Hydrocyclone overflow is directed to a thickener where it is dewatered and subsequently pumped to the TMF and deposited based on the tailings deposition plan;
- The general location of the crusher, stockpile, concentrator, load-out, tailings disposal area and other infrastructure are shown on the general site plans in Chapter 18 of this Report.

1.9 Project Infrastructure

Infrastructure design for this FS is based on the following:

- The general site plot plan for the Kami Project is based on the plan and layout developed during detailed engineering, which used the latest available geotechnical data, including design consideration from the Kami LP Environmental Impact Study (“EIS”);
- Mining of the Rose pit and adjacent crushing plant are located at the Kami mine area considering the open pit footprint developed in this Study;
- The overburden waste dump is located to the north of the Rose pit and the waste rock dump is located to the east of Mills Lake;
- Crushed ore is conveyed from the crusher to the crushed ore stockpile, which is located ahead of the concentrator, to the west of the Waldorf Crossing;
- The concentrator and ancillary infrastructure is located to the east of Waldorf Crossing;
- Tailings are disposed of in an area to the south of the concentrator;
- The concentrate load-out and rail loop are located to the east of the Kami concentrator with a connecting railway to the QNS&L main rail line;
- The main access road to the Property follows the new railway, passing to the east of the Tacora rail loop and through the Town of Wabush, to ultimately connect to Highway 500;
- Rail transportation of concentrate is from the Kami rail loop to the common port terminal facilities in Sept-Iles, Québec (Pointe Noire, owned and operated by a third party);
- Ship loading services are provided by Port of Sept-Iles;
- Electric power as well as the main electric substation will be provided by NLH.

In this FS it is assumed that labour requirements for mining and processing operations will be sourced from Labrador West residents.

1.10 Market Studies and Contracts

As part of this Feasibility Study, it is required that a commodity selling price be assumed in order to perform the Project Economic Analysis. The Kami LP has not undertaken a market study and must therefore resort to other means to reasonably assume the selling price of iron ore concentrate.

Iron ore product prices have been traditionally tracked using benchmarks. The IODEX and MBIOI 62% Fe, CFR China Port indices are commonly used as the benchmarks for basing off-take agreements.

When the Kami LP signed its off-take agreements with HBIS and Glencore, the benchmark indices were based on a 62% Fe product. Adjustments in the form of a premium or penalty were agreed to, based on higher or lower Fe content. Since the signature of these agreements, benchmarks for higher Fe content products have been more widely used along with premiums/penalties for other elements such as SiO₂, Al₂O₃ and P, which have an important impact on downstream operations such as sintering, ironmaking and steelmaking. This is a prominent shift to recognize value in quality of iron ore products.

For this FS, Kami LP has updated the market price analysis for iron ore conducted for the November 2017 PEA. A comparison of the spot price and the 3-year trailing average between the Platts 62% Fe and 65% Fe indices was performed. Consideration was also given to premiums/penalties associated with other secondary elements. This analysis allowed for a reasonable assumption of the selling price for the Kami concentrate to be used in the Economic Analysis for this updated FS.

1.11 Environment and Stakeholder Engagement

Various environmental studies, permitting, and stakeholder engagement activities for the defined Project area have been undertaken by Kami LP prior to halting project development in 2014.

The Kami Property is generally a greenfield site consisting of small lakes and rivers located within semi-forested, barren and wetland areas. The proposed Kami open pit mine area has been previously explored and, as a result, some vegetation and ground disturbance is evident.

The Kami Project is subject to the *Newfoundland and Labrador Environmental Protection Act* and associated Environmental Assessment Regulations, as well as the *Canadian Environmental Assessment Act*. An Environmental Assessment (“EA”) Committee was appointed, consisting of provincial and federal government agency representatives, and it was determined that Kami LP would submit an EIS to address the requirements of both jurisdictions. Kami LP submitted the

EIS in September 2012, and the Project was subsequently released from the EA process by the NL Department of Environment and Conservation (now the Department of Municipal Affairs and Environment) on January 10, 2014 and by the Canadian Environmental Assessment Agency on February 18, 2014. As part of the release, there were provincial and federal conditions to which Kami LP has to adhere.

Substantial environmental baseline studies have been completed at the Kami Property to date. Environmental permits have been obtained by Kami LP for the Project, including the EA releases, and several critical permits, again including the EA releases, have been maintained. Further environmental studies, consultation, and permitting will be required to advance this Project.

The latest TMF proposes to maintain the cellular design included in the EA process, while moving to upstream dam raises for a portion of the dam construction. As the proposed TMF design maintains the commitments to dust mitigation, water management and revegetation that were made during the EA process, it is not anticipated that the proposed TMF design will require further EA or new or additional permits not previously obtained or considered. Further consultation with the provincial and federal regulators is recommended to confirm this.

Overburden and waste rock dump locations and designs were developed during detailed engineering and remain unchanged for the current Study; however, these designs have not been aligned with the revised mine plan presented in this Study. Both waste dumps were originally designed for larger volumes of material than anticipated, accounting for potential variations in the deposited densities and potential increased tonnages of material. Water/effluent run-off from the waste dumps will be routed to sedimentation ponds to ensure adequate treatment to meet required regulatory water quality requirements prior to release to the environment.

A Rehabilitation and Closure Plan, as required under the *Newfoundland and Labrador Mining Act*, had been developed for the Kami Project. An updated plan will be submitted to the NL Department of Natural Resources (“DNR”) describing measures planned to restore the Property as close as reasonably possible to its former use or condition, or to an alternate use or condition that is considered appropriate and acceptable by DNR. The Plan will outline measures to be taken for progressive rehabilitation, closure rehabilitation and post-closure monitoring and treatment.

Kami LP is committed to operate within a sustainable development framework. A key principle of sustainable development is to consult with stakeholders who may have an interest in or be affected by the Project in order to build and maintain positive, long-term and mutually beneficial relationships. Kami LP has adopted a ‘Life of Project’ approach to public consultation and developed a framework in Kami LP’s Project Consultation Plan. The principles guiding this Plan are set out in Kami LP’s Communities Relations Policy and are summarized as follows:

- Engage stakeholders through meaningful, transparent and respectful communication and consultation;
- Value, acknowledge and give consideration to the cultural diversity, unique traditions, and the needs and aspirations of local people, communities and other stakeholders;
- Develop relationships with local community leaders and provide timely responses to their communications;
- Understand, acknowledge and respond to the concerns of local people, communities and other stakeholders; and
- Provide Project information and updates on a regular basis.

The following key regulatory and public stakeholder agreements are currently in place, based on the previously defined Kami Project:

- A Benefits Agreement with the Province of Newfoundland and Labrador;
- A Development Agreement with the Town of Labrador City;
- A Stewardship Agreement with the Town of Labrador City;
- A Grant-in-lieu of Municipal Taxes Agreement (the “Wabush Agreement”) with the Town of Wabush (“Wabush”); and
- Agreements completed with 23 of 41 cabin owners for cabin properties in or near the Project area.

Kami LP has and will continue to conduct a wide range of public consultation initiatives to ensure that stakeholders are informed of the progress of the Project and afforded an opportunity to express any concerns. Information will be disseminated through digital and print media, including Kami LP’s website, e-mail, newspaper advertisements and newsletters, and public information sessions. Consultation will take place through major engagement activities including, but not limited to: participation on multi-stakeholder committees, stakeholder consultation events, consultation with educational and training institutions, information briefings with regulators, and media relations.

Kami LP recognizes the importance of building relationships based on mutual trust and respect with indigenous governments and organizations having rights or interests that may be affected by the Project. Kami LP developed an Indigenous Relations Policy, which is based on respect for rights of indigenous peoples and their unique history, diverse culture, values and beliefs, as well as recognition of the need to pursue meaningful engagement with indigenous governments and organizations and the importance of collaboration with indigenous governments and organizations to identify and respond to issues and concerns.

The Indigenous Relations Policy is implemented through Kami LP's Indigenous Engagement Strategy and Action Plan, which outlines a range of engagement activities, actions and initiatives to assist Kami LP in identifying, understanding and addressing any potential effects of the Project on indigenous governments and organizations and their current use of land and resources for traditional purposes.

Kami LP has identified the Innu Nation (representing the Innu of Labrador), NunatuKavut Community Council, Innu Nation of Uashat mak Mani-Utenam, Innu Nation of Matimekush-Lac John, and the Naskapi Nation of Kawawachikamach as the indigenous governments and organizations that may be affected by the Kami Project. Kami LP's engagement efforts with these groups commenced prior to the original Project EA registration and are ongoing. Major engagement initiatives include information sharing initiatives, community engagement initiatives, traditional land and resource use studies, and avoidance or mitigation initiatives.

To date, Kami LP has entered into agreements with the NunatuKavut Community Council and Innu Nation of Labrador. Additionally, Kami LP has engaged the Innu Nation of Uashat mak Mani-Utenam, Innu Nation of Matimekush-Lac John, and Naskapi Nation of Kawawachikamach. Based on the re-activation of the Project, Kami LP will consult with indigenous governments and organizations to advise on the planned changes and receive feedback as the planning process progresses.

It is Kami LP's objective to continue to pursue positive and constructive relationships with all relevant community and government groups; therefore, Kami will conduct engagement activities throughout the life of the Project including closure and decommissioning.

1.12 Capital Costs

The Kami Iron Ore Project scope covered in this Feasibility Study is based on the construction of a facility having a nominal annual production capacity of 7.84 Mt of concentrate. The capital cost estimate for the construction of the mine, mineral processing plant and site infrastructure was developed by Duro Felguera ("DF") and reviewed by BBA based on an Engineering, Procurement and Construction ("EPC") project execution mode. Table 1-4 presents a summary of total estimated capital cost for the Project, including Indirect Costs and Contingency.

Table 1-4: Total Estimated Capital Costs (M US \$)

Estimated Capital Costs (M\$ US)	
Mine (including Contracted Pre-Stripping)	\$72.20
Mineral Processing Areas	\$302.81
TMF (Initial Dyke Construction)	\$23.66
Site Infrastructure and Utilities	\$309.90
General (Indirects, Other EPC Related Costs)	\$192.17
TOTAL EPC COSTS (including Indirects and Contingency)	\$900.74
Pre-Stripping Waste Rock Mining By Kami	\$23.79
Capitalized Portion of Mining Equipment Lease	\$26.90
Owner's Costs	\$30.98
TOTAL	\$982.41

1.13 Operating Costs

The Project operating costs, in US dollars per tonne of dry concentrate produced, averaged over the life of mine ("LOM"), have been estimated and summarized in Table 1-5.

Table 1-5: Total Estimated Average LOM Operating Cost (US \$/t Dry Concentrate)

Estimated Average LOM Operating Costs (US \$/t Dry Concentrate)	
Mining	\$11.25
Mineral Processing	\$5.72
General Site	\$0.50
General Administration	\$2.26
Environmental and Tailings Management	\$0.37
Rail Transportation and Port Services	\$10.62
TOTAL	\$30.72

1.14 Economic Analysis

The Economic Analysis for the Kami Iron Ore Project was performed on a pre-tax and post-tax basis using a discounted cash flow model base. The results are presented in Table 1-6 and Table 1-7.

Table 1-6: Pre-tax Economic Analysis Results

IRR =24.6% Payback = 4.0 years	NPV (M\$)
Discount Rate	
0%	\$5 616 M
5%	\$2 626 M
8%	\$1 698 M
10%	\$1 270 M

Table 1-7: Post-tax Economic Analysis Results

IRR =18.2% Payback = 4.9 years	NPV (M\$)
Discount Rate	
0%	\$3,298M
5%	\$1,445M
8%	\$866M
10%	\$598M

1.15 Project Schedule

A high level project execution plan and schedule were developed by DF as part of its 2015 EPC proposal to Kami LP. Following this Feasibility Study, the Kami LP plans to quickly undertake project financing activities. Once this is achieved, it will be followed by a resumption of project execution activities, including detailed engineering, procurement and permitting followed by construction activities. The Project Schedule key milestones is presented in Table 1-8 and covers the period of pre-construction activities as well as summarizes the key milestones found in DF's project schedule from start of construction to project handover to operations.

Table 1-8: Key Project Milestones

Major Milestones	Month
Assemble Owner's Team	M -11
Award of EPC Contract and Resume Detailed Engineering	M -7
Permit to Start Construction Available	M0
Start Construction	M0
First Concrete	M8
First Structural Steel at Concentrator	M12
Construction Completed	M26
POV Completed	M27
Commissioning Completed and Full Handover to Operations	M29

1.16 Conclusions and Recommendations

The FS for the Kami Project demonstrates that Project economics remain robust. The most compelling argument for proceeding with the Project remains the fact that the superior concentrate quality produced by the Kami Project attracts significant price premiums compared to the standard 62% Fe iron ore products. This is expected to continue as Chinese steelmakers seek to improve their operating performance, reduce costs and reduce greenhouse gas emissions.

The Project has already been relatively well defined during the detailed engineering phase completed in 2014 where most of the technical risks were addressed. The following risks do, however, remain:

- Electric power availability – NLH may not have the required power available when the Project proceeds to construction and production. With the planned restart of the Scully mine, the new power transmission line from Churchill Falls will most likely be required.
- Port terminal access and services – SFPPN may not have the facilities ready to provide port terminal services to the Kami Project. Also, final commercial terms may have an impact on initial capital disbursement requirements and/or on operating costs.
- Assessment / Permits / Approvals – Changing regulations and requirements over time (substantial federal and provincial regulatory review ongoing) may impact capital and operating costs as well as the execution schedule.
- Environmental Assessments, Releases – The NL EA Release is valid only by annual extension until January 2020. By this date, the Kami LP must start construction or risk the requirement for a new assessment. There is no legislated deadline for the start of construction with respect to the Federal EA Release.

- Carbon Tax – The announced carbon tax may affect operating costs as well as capital costs with respect to potential need to purchase state of the art equipment for carbon minimization or reduction.

During the course of this FS, opportunities that may enhance project economics have also been identified. They are outlined as follows:

- The possibility of using waste rock from nearby historical piles for the construction of the TMF should be analyzed. This would allow for a more optimized mine plan as only waste rock for ore liberation would be excavated and would be available for use in construction.
- The orientation of the AG mill in the layout should be reviewed, as having the mill at 90° to the feed conveyor (instead of in straight line) can potentially reduce the size of the building and allow for improved operability and maintainability by providing more efficient use of the floor space around the mill.
- The design parameters for sizing the magnetic recovery plant developed in detailed engineering should be reviewed to make sure it is aligned with the new mine plan and the testwork results.

Based on the results of this Feasibility Study, BBA is of the opinion that the Project is technically and financially sufficiently robust to warrant proceeding with the resumption of detailed engineering and proceeding with the Project on an EPC or an EPCM mode, whichever aligns best with Kami LP's project development strategy. Although the Project was previously developed in detailed engineering, BBA recommends the following:

- Ahead of detailed engineering, value engineering should be performed to optimize the layout in the areas of tailings dewatering and pumping, as the coarse and fine tailings are required to be pumped separately. In conjunction with this, the progressive implementation (as outlined within sustaining capital) of the tailings pumping system should be developed in more detail to align with the tailings deposition plan.
- Regarding pumping of coarse and fine tailings separately, value engineering for optimization of pump selection, number of pumping stages and pipe diameter should be performed.
- The opportunities in Section 25.6 of this Report should be considered and acted upon.
- Kami LP needs to engage in discussions early with NLH in order to ensure that the required infrastructure is constructed and ready to deliver power to the Project on a timely basis.
- Kami LP needs to engage in discussions early with SFPPN in order to put in place a commercial agreement and to ensure that the required infrastructure is constructed and ready to receive concentrate for shipping on a timely basis.

- Kami LP should decide on the Project execution strategy it wants to adopt (EPC or EPCM or other) and engage its service provider early enough to ensure a smooth transition from feasibility study to detailed engineering.
- The hydrological data collected and analyzed with respect to the design of water management features and infrastructure around the site is based on field and historical data prior to 2014, and in some cases earlier. It is recommended that the hydrological normals and averages should be assessed along with the current standards associated with climate change data to determine if the water management features and infrastructure are adequately designed.

Concerning the development of the TMF to more detailed design, Golder made a number of recommendations in its feasibility study report (Golder 2018), which are summarized as follows:

- Update the meteorological data for the site;
- Develop a site-specific seismic hazard potential and de-aggregation analyses;
- Conduct laboratory tests on coarse and fine tailings samples aimed at evaluating the potential for earthquake-induced tailings liquefaction;
- Evaluate sources of TMF construction materials and ensure compliance with requirements;
- Complete thermal modelling for the TMF to evaluate water freezing patterns based on freeze/thaw cycles as water tied up in ice can reduce storage capacity and potentially affect dam stability;
- Evaluate alternatives to reduce potential dusting during operations;
- Develop a detailed construction sequencing plan to fully understand the scope and risk of upstream stacking and the impacts of a limited construction season during non-freezing periods.

Kami LP has developed a conditions/commitments registry based on the EA releases and permits obtained and these conditions/commitments should be used as a planning and design tool to advance the updated Project.

Kami LP should continue efforts to maintain existing long-lead key permits obtained for the Kami Property. Kami LP should also consult with regulators and stakeholders regarding the status and any potential changes to the Project.

A substantial hydrogeological assessment is required to fulfill the commitment to NRCAN prior to commencement of mining. This assessment may take several seasons of study and should be planned for early works as the Project advances.

For the Waste Rock Dumps at the Kami Property:

- The ARD/ML Adaptive Management Plan partially developed during detailed engineering should be advanced and used in the planning and design of the Rose South Dump;
- The Rose South Dump design should be optimized based on the significant reduction in the waste rock produced from the open pit and the existence of a rare plant species near the southern end of the dump.

Federal and provincial regulations pertaining to environmental assessment, fish and fish habitat, and other environmental regulatory aspects have changed since the Kami Project was assessed and some permitting completed. Regulations are continuing to change and substantial changes are expected at the federal level within 2017/18. Kami LP will need to monitor and understand these changes and determine how they can affect the Project going forward.

Kami LP should continue to engage all stakeholders, as required, to provide updates on Project planning and schedule, and to ensure existing agreements, permits and relationships are maintained.

2. INTRODUCTION

2.1 Scope of Study

The following Technical Report (the “Report”) presents an update to the Feasibility Study (“FS”) for the development of the Kamistiatusset (“Kami”) Iron Ore Property in Western Labrador. In November 2017, Alderon Iron Ore Corp. (“Alderon” or the “Corporation”) published the positive results of a Preliminary Economic Assessment (PEA), based on a re-scoped project. In keeping with the main recommendation made in the aforementioned PEA, in April 2018, Alderon retained the services of BBA Inc. (“BBA”) to lead the present FS. This Report, summarizing the results of the FS, was prepared at the request of Mr. Tayfun Eldem, President and Chief Executive Officer of the Corporation. Alderon is a Canadian publicly traded company listed on the TSE under the symbol IRON. Alderon is a British Columbia incorporated company with its registered office located at:

1240–1140 West Pender Street
Vancouver, BC
Canada, V6E 4G1
Tel: (604) 681-8030

This Technical Report titled “Updated Feasibility Study of the Kamistiatusset (Kami) Iron Ore Property, Labrador”, concerning the development of the Kami Property Rose deposit (consisting of the Rose Central and the Rose North deposits, as referred to throughout this Report), was prepared by Qualified Persons (“QP”) 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 September 26, 2018.

2.2 Background and Project History

In December 2012, Alderon completed a Feasibility Study on the Kami Project and issued its NI 43-101 Report summarizing the results. Subsequently, Alderon proceeded with detailed engineering and some procurement activities. All activities on the Project were progressively suspended when iron ore market conditions deteriorated.

From late 2014 to late 2016, the iron ore market was in a depressed state resulting from the oversupply of iron ore products and the slowdown in Chinese steel mill demand. This had a significant impact on the companies operating and developing projects in Canada’s Labrador

Trough. Since then, some significant improvements in market conditions have taken place. This has prompted increased activity in the Trough, namely:

- The successful restart of operations at the Bloom Lake mine and concentrator by Québec Iron Ore;
- The acquisition by Tacora of the Wabush Scully mine and its intention to re-start operations.

As market conditions improved, Alderon has explored various options and opportunities to reduce initial project capital costs and optimize project economics under current conditions. As such, Alderon is presently proceeding with updating its FS, incorporating project re-scope parameters described in its November 2017 PEA as well as new design features developed during the course of this FS, mainly in the areas of the Tailings Management Facility (“TMF”), the tailings deposition plan and tailings dewatering.

The following list describes some key events leading to the current Study:

- December 2012 – Alderon issued its NI 43-101 Report summarizing the results of its Feasibility Study on the Kami Project;
- May 2013 – Alderon announced the award of the EPCM contract for advancing the Project;
- August 2013 – Alderon announces placement of order for new grinding mills;
- January 2014 – Alderon announces Provincial Release from Environmental Assessment;
- January 2014 – Alderon announces positive Environmental Assessment decision from Federal Government;
- February 2014 – Alderon announces conclusion of power agreement with Nalcor;
- December 2014 – Alderon announces cash preservation program resulting from severe downturn in the iron ore marketplace;
- December 2015 – Alderon received a ‘lump-sum’ EPC proposal from Duro Felguera (DF) for executing the construction of the Kami Project,
- March 2017 – Alderon issued its NI 43-101 Report summarizing the results of its PEA on the Kami Project based on constructing the concentrator on the Scully property and disposing of the process tailings within the open pit of the Scully mine;
- July 2017 – Tacora Resources acquired Wabush Mines Scully facilities thus making it no longer available to the Kami Project.
- November 2017 – Alderon issued its NI 43-101 Report summarizing the results of its updated PEA on the Kami Project based on reverting the Project back to the Kami site following the acquisition of the Scully property by Tacora.

This present updated FS replaces the previous November 2017 PEA Study NI 43-101 report as the Current Report for the Kami Project.

2.3 Sources of Information

The present FS has been based primarily and developed on the following sources of information:

- The November 2017 PEA;
- Information provided that was developed during the course of detailed engineering by Kami LP's EPCM Contractor;
- The 2015 Duro Felguera ("DF") 'lump sum' EPC proposal, which outlines DF's scope of supply and services as well as exclusions to its mandate, based on the detailed engineering performed by Kami LP's prior EPCM Contractor;
- The Mineral Resource block model provided by Alderon and audited by WGM in 2012.

2.4 Terms of Reference

Unless otherwise stated:

- All units of measurement in the Report are in the metric system;
- 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;
- All costs, revenues and commodity prices are expressed in terms of US dollars with exchange rate of \$1.00 CND = \$0.77 US.

2.5 Site Visit

- A general site visit was conducted on March 22 and 23, 2011, by Mr. Angelo Grandillo of BBA, followed by a subsequent site visit on October 13 and 14 of 2011 to minimally inspect available core samples as well as conduct a helicopter fly-over of the site. Mr. Grandillo also visited the SGS laboratory facility in Lakefield, Ontario and observed one of the Project testwork taking place while touring the facility;
- Mr. James Powell of Gemtec was previously employed by Stantec and Alderon and has visited the site on a number of occasions;
- Mr. Michael Kociumbas of WGM has not completed a personal inspection of the property. Mr. Kociumbas received the details of the personal inspection conducted by his colleagues at WGM and BBA and determined that a personal inspection was not necessary;
- Mr. Jeffrey Cassoff of BBA did a helicopter fly-over of the property on July 26, 2012.
- Mr. Peter Merry has visited the Property that is the subject of this Technical Report on June 12-13, 2012.

3. RELIANCE ON OTHER EXPERTS

Neither BBA nor WGM have verified the legal titles of the Property nor any underlying agreement(s) that may exist concerning the licenses or other agreement(s) between third parties, but have relied on Alderon to have conducted the proper legal due diligence.

Alderon has provided Chapter 4 and sections of Chapter 19 of this Report, which describe the ownership structure resulting from the strategic partnership agreements with HBIS Group Co., Ltd. as well as off-take agreements and other agreements. As such, BBA has relied on Alderon and its legal counsel to provide all information material to this updated FS pertaining to such agreements and engagements. BBA believes that Alderon has provided all information stemming from these agreements and has reasonably incorporated the impact of the information provided into the Economic Analysis presented in Chapter 22 of this Report.

For this updated FS, BBA has performed the Economic Analysis of the Project on a pre-tax basis and has relied on Alderon and its tax consultants to provide an estimate of annual taxes due to perform the post-tax Economic Analysis, as outlined in Chapter 22 of this Report.

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 had the responsibility for assuring that this Technical Report meets the guidelines and standards stipulated. Certain sections of this Report however, were contributed by WGM, Gemtec and Golder. Table 3-1 outlines responsibility for the various sections of the Report.

Table 3-1: Technical Report Chapter List of Responsibility

Chapter Number	Chapter Title	Responsibility	Comments and Exceptions
1	SUMMARY	BBA	Contributions by WGM, Gemtec and Golder
2	INTRODUCTION	BBA	
3	RELIANCE ON OTHER EXPERTS	BBA	
4	PROPERTY DESCRIPTION AND LOCATION	BBA	Alderon provided information on property description and ownership
5	ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY	BBA	
6	HISTORY	WGM	
7	GEOLOGICAL SETTING AND MINERALIZATION	WGM	
8	DEPOSIT TYPE	WGM	
9	EXPLORATION	WGM	
10	DRILLING	WGM	
11	SAMPLE PREPARATION, ASSAYING AND SECURITY	WGM	
12	DATA VERIFICATION	WGM	
13	MINERAL PROCESSING AND METALLURGICAL TESTING	BBA	
14	MINERAL RESOURCE ESTIMATE	WGM	
15	MINERAL RESERVE ESTIMATE	BBA	
16	MINING METHODS	BBA	
17	RECOVERY METHODS	BBA	
18	PROJECT INFRASTRUCTURE	BBA	Section on TMF design by Golder
19	MARKET STUDIES AND CONTRACTS	BBA	Information on contracts and agreements provided by Alderon
20	ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT	Gemtec	Community relations provided by Alderon
21	CAPITAL AND OPERATING COSTS	BBA	Site closure costs by Gemtec TMF costs by Golder

Chapter Number	Chapter Title	Responsibility	Comments and Exceptions
22	ECONOMIC ANALYSIS	BBA	
23	ADJACENT PROPERTIES	BBA	
24	OTHER RELEVANT DATA AND INFORMATION	BBA	
25	INTERPRETATION AND CONCLUSIONS	BBA	Contributions by WGM, Gemtec
26	RECOMMENDATIONS	BBA	Contributions by WGM, Gemtec and Golder
27	REFERENCES	BBA	

The following Qualified Persons (“QP”) have contributed to the writing of this Report and have provided QP certificates included in this Report indicating the chapters of this Report that they have authored:

- Angelo Grandillo BBA
- Jeffrey Cassoff BBA
- James Powell Gemtec
- Peter Merry Golder
- Michael Kociumbas WGM

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.

Table 3-2: List of Contributors to FS

Component	Person	Company
Geology	Richard Risto, P. Geo.	WGM
Capital Cost Estimate and Project Execution Plan	Alejandro Lopez Ferrer Vicente Barrientos Rimada	Duro Felguera

4. PROPERTY DESCRIPTION AND LOCATION

4.1 Property Location

The Property is located south of the towns of Wabush and Labrador City in Newfoundland and Labrador and east of Fermont, Québec. The Property perimeter is approximately 6 km southwest from the Wabush Mines mining lease. The Property consists of two contiguous licenses and a mining lease forming one block and spans an area that extends approximately 12 km east-west and 13 km north-south in NTS map areas 23B/14 and 15, and centred at approximately 52°49'N latitude and 66°59'W longitude.

4.2 Property Description and Ownership

The Property is located in the Province of Newfoundland and Labrador (“NL”). Québec claims previously held by Alderon have been renounced. All mining and processing operations will take place within NL provincial boundaries. According to the claim system registry of the Government of Newfoundland and Labrador, the Property is registered to Kami General Partner Limited (“Kami GP”). Kami GP is the incorporated general partner of The Kami Mine Limited Partnership (“Kami LP”) and Kami GP holds the Property for the benefit of the Kami LP. Kami LP is owned 75% by Alderon Iron Ore Corp. and 25% by HBIS International Holding (Canada) Co., Ltd. a subsidiary of HBIS Group Co. Ltd. The Property includes two map-staked licences, namely 015980M and 017926M, totaling 283 claim units covering 7,075 hectares. Kami GP previously held license 17948M; however, a decision was made to surrender this license due to no economic ore body existing under it. Surface rights on these lands are held by the provincial government. Table 4-1 provides details of Kami LP’s current mineral land holdings in Labrador. The Property land holdings are shown on Figure 4-1.

Table 4-1: Kamistiatuisset Property in Labrador

Licence	Claims	Area (ha)	NTS Areas	Issuance Date	Renewal Date
015980M	191	4,775	23B14 23B15	Dec 29, 2004	Dec 29, 2019
017926M	92	2,300	23B15	Aug 30, 2010	Aug 30, 2020
Total	283	7,075			

ADV KAM / ADV_12b_License_Map.cdr
Last revision date: Tuesday 15 November, 2016

Watts, Griffis and McOuat

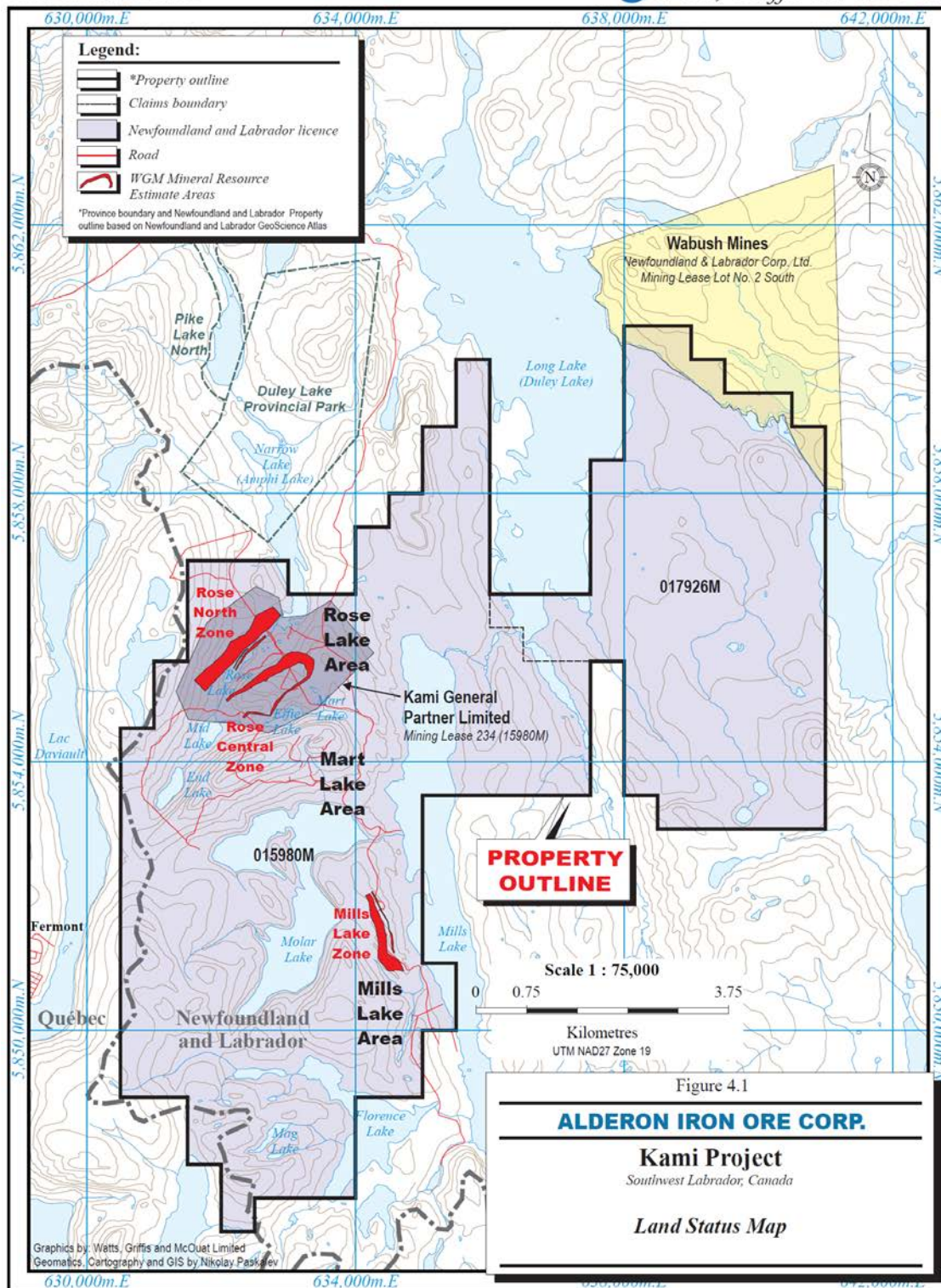


Figure 4-1: Land Status Map

The Property has not been legally surveyed but the claims and licences in Labrador were map-staked and are defined by UTM coordinates, therefore the Property location is considered to be accurate.

In 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 and the mineral exploration licence is renewed every five years.

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. Licence 015980M is now in its 13th year. The licence was renewed December 29, 2014 with a fee payment of \$9,550.00. Total expenditures on the 191 claims to date accepted by the Department of Mines and Energy total \$43,337,178.94. Licence 015980M will remain in good standing until December 29, 2023, at which time a total of \$67,300.47 of acceptable work expenditures are required. In addition, renewal fees for Licence 015980M will be due on December 29, 2019, and every five years following. Licence 017926M is now in its sixth year. Total expenditures on the 92 claims to date accepted by the Department of Mines and Energy total \$12,263,255.94. Licence 017926M will remain in good standing until August 30, 2024, at which time a total of \$82,800.00 of acceptable work expenditures are required. In addition, renewal fees for Licence 017926M will be due on August 30, 2020, and every five years following. All aforementioned amounts expressed in Canadian Dollars.

On February 17, 2014, Mining Lease #234 (15980M) and Surface Lease #142 were issued by the Newfoundland and Labrador Department of Natural Resources. The Mining Lease for mineral development and the Surface Lease cover the entire footprint of the mine and related infrastructure. The Mining Lease gives the Kami LP the exclusive rights to develop the mineral resource underlying the Kami Project. The Surface Lease provides the Kami LP with the surface rights covering the area of the Mining Lease and areas for siting the required infrastructure incidental to the development of the mine.

Mining Lease #234(15980M) was issued for a period of 25 years and requires an annual rental payment of \$42,389.24. Mining Lease #234(15980M) covers 403.707 hectares. Surface Lease #142 was issued for a period of 25 years and requires an annual rental payment of \$126,650.97. Surface Lease #142 covers 4,235.809 hectares. All aforementioned amounts expressed in Canadian Dollars.

Project design may require that certain aspects of the infrastructure be located outside of Kami LP's mineral property limits and assumes that Kami LP will be able to acquire surface rights for any such areas.

4.3 Property Agreements

On November 2, 2009, 0860132 B.C. Ltd. ("**Privco**", a company wholly owned by Mr. Mark Morabito) entered into an option agreement (the "**Altius Option Agreement**") pursuant to which Privco, or an approved assignee of Privco, had the exclusive right and option (the "**Option**") to acquire a 100% title and interest in the Property, subject to the terms and conditions of the Altius Option Agreement. In order to exercise the Option, Privco was required to (i) assign its interest in the Altius Option Agreement to a company acceptable to Altius, acting reasonably, that has its shares listed on the Toronto Stock Exchange or the TSX Venture Exchange ("**Pubco**"); (ii) fund exploration expenditures on the Property of at least \$1,000,000 in the first year, and cumulative expenditures in the first two years of at least \$5 million; and (iii) issue to Altius, after the satisfaction of certain financing conditions, shares of Pubco such that upon issuance, Altius would own 50% of Pubco's issued capital, on a fully diluted basis. In order to exercise the Option, Pubco was required to have initially raised not less than \$5,000,000 in capital. All aforementioned amounts expressed in Canadian Dollars.

Altius retained a 100% interest in the Property until such time as Privco satisfied all of the conditions to exercise the Option. Privco had until November 2, 2011, to satisfy such conditions and exercise the Option. Upon exercise, Altius was required to transfer its 100% interest in the Property to Pubco and retained 3% gross sales royalty, in addition to the equity stake in Pubco described above.

Subsequently, Alderon was identified as "Pubco", and Privco satisfied the first condition of the Altius Option Agreement on December 15, 2009, when it entered into a share exchange agreement (the "**Share Exchange Agreement**") whereby Alderon would acquire all of the issued and outstanding shares of Privco from Mr. Morabito, in consideration of issuing 5,000,000 shares of Alderon to Mr. Morabito. Also on December 15, 2009, Alderon, Privco and Altius entered into an assignment agreement pursuant to which Alderon assumed the rights and obligations of Privco and Pubco under the Altius Option Agreement.

On January 15, 2010, Altius, Privco and Alderon amended the terms of the Altius Option Agreement to provide that upon the completion of a private placement by Alderon in February 2010, all financing conditions set forth in the Altius Option Agreement would have been satisfied. The amendment also clarified the calculation and number of Alderon common shares to be issued to Altius and to achieve the ownership of 50% (fully diluted) of the issued and outstanding common shares of Alderon as of the specified date.

On March 3, 2010, Alderon completed the acquisition of Privco pursuant to the terms of the Share Exchange Agreement and acquired all of the outstanding common shares of Privco. In consideration, Alderon issued 5,000,000 common shares from treasury to Mr. Morabito.

On December 8, 2010, Alderon announced in a press release that Alderon had earned a 100% interest in the Property. In order to complete the exercise of the Option, Alderon issued an aggregate of 32,285,006 common shares from its treasury to Altius. Altius retains a 3% gross sales royalty relating to any potential future mining operations.

Alderon signed a subscription agreement (the "**Subscription Agreement**") dated April 13, 2012, as amended August 13, 2012, with HBIS Group Co., Ltd. ("**HBIS**"), formerly known as Hebei Iron & Steel Group Co., Ltd. Under the terms of the Subscription Agreement, HBIS agreed to make a strategic investment into both Alderon and the Property in an aggregate amount of \$182.2 million, in exchange for 19.9% of the outstanding common shares of Alderon (the "**Private Placement**") and a 25% interest in a newly formed limited partnership that was established to own the Property. The parties also agreed upon the terms of all other material agreements governing the relationship between HBIS and Alderon and HBIS's agreement to purchase iron ore concentrate produced at the Property (the "**Definitive Agreements**").

On September 4, 2012, Alderon closed the Private Placement with HBIS. HBIS acquired 25,858,889 common shares at a price of Canadian \$2.41 per common share for gross proceeds to Alderon of approximately Canadian \$62.3 million, representing 19.9% of the issued and outstanding common shares. Alderon and HBIS also executed the remaining Definitive Agreements, including the Investor Rights Agreement dated August 31, 2012, the Off-Take Agreement dated August 31, 2012, and the agreements required to form and operate the limited partnership that will own the Property after the satisfaction of certain conditions. The limited partnership has been formed (Kami LP) and on March 15, 2013, Alderon transferred the Property to the Kami GP, which holds the Property for the benefit of the Kami LP. The aforementioned off-take agreement is discussed in more detail in Chapter 19 of this Report.

A wholly-owned subsidiary of Alderon is the manager of the Property and is entitled to a fixed annual management fee during the construction period of the Project. Once the Property has reached commercial production, the manager will receive a management fee on a per-tonne of iron ore concentrate basis.

Subsequent to the 2012 Feasibility Study, the Kami LP entered into several third party agreements concerning title to or an interest in the Property. These agreements are outlined in Chapters 4 and 19 of this Report.

4.4 Permitting

The Property has been released from both the Provincial and Federal environmental assessment processes. Prior to Project initiation, the Property will require a number of approvals, permits and authorizations. In addition, throughout construction and operation, compliance with various standards contained in federal and provincial legislation, regulations and guidelines will be required. Chapter 20 of this Report outlines the permits, approvals and authorizations that will be required prior to Project initiation.

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

5.1 Access

The Property is accessible from Labrador City/Wabush, Newfoundland via 4x4 vehicle roads. All-Terrain Vehicle ("ATV") trails enable access to the remainder of the Property. Wabush is serviced daily by commercial airline from Sept-Îles, Montréal and Québec City and also by flights from Goose Bay, Deer Lake and St. John's.

5.2 Climate

The climate in the region is typical of north-central Québec/Western Labrador (sub-Arctic climate). Winters are harsh, lasting about six to seven months with heavy snow from December through April. Summers are generally cool and wet; however, extended daylight enhances the summer workday period. Early and late winter conditions are acceptable for ground geophysical surveys and drilling operations. The prevailing winds are from the west and have an average of 14 km per hour, based on 30 years of records at the Wabush Airport.

5.3 Local Resources and Infrastructure

The Kami Property is adjacent to the two towns of Labrador City, 2011 population 7,367 and Wabush, population 1,861. Together these two towns are known as Labrador West. Labrador City and Wabush were founded in the 1960s to accommodate the employees of the Iron Ore Company of Canada and Wabush Mines. A qualified work force is located within the general area due to the operating mines and long history of exploration in this region.

Although relatively low cost power from a major hydroelectric development at Churchill Falls to the east is currently transmitted into the region for the existing mines operations, the current availability of additional electric power on the existing infrastructure in the region is limited. This will continue to be the case with the proposed restart of operations at Scully by Tacora. Please refer to Chapter 18 of this Report for further details regarding electrical power.

The Kami site is also located in proximity to other key services and infrastructure. The current PEA is based on Kami LP building a new rail loop at the Kami site and a connecting railway to access existing rail infrastructure owned and operated by Québec, North Shore and Labrador ("QNS&L") for transportation of product to port. Fresh water sources on the site are plentiful, although the plan is to maximize recycling and minimize dependence on fresh water. A preliminary site plan for the Project is presented in Chapter 18 of this Report.

5.4 Physiography

The Property is characterized by gentle rolling hills and valleys that trend northeast-southwest to the north of Molar Lake and trend north-south to the west of Molar Lake, reflecting the structure of the underlying geology. Elevations range from 590 m to 700 m.

The Property area drains east or north into Long Lake. A part of the Property drains north into the Duley Lake Provincial Park before draining into Long Lake.

In the central property area, forest fires have helped to expose outcrops; yet the remainder of the Property has poor outcrop exposure. The cover predominantly consists of various coniferous and deciduous trees with alder growth over burnt areas.

6. HISTORY

The earliest geological reconnaissance in the southern extension of the Labrador Trough within the Grenville Province was in 1914, by prospectors in their search for gold. Several parties visited the area between 1914 and 1933, but it was not until 1937 that the first geological map and report was published by Gill et al., 1937 (Rivers, 1980). The metamorphosed iron formation in the vicinity of Wabush Lake was first recognized by Dr. J.E. Gill in 1933. A few years later, the Labrador Mining and Exploration Co. Ltd. ("LM&E") evaluated the iron formation, but decided it was too lean for immediate consideration (Gross et al., 1972).

In 1949, interest in the Carol Lake area by LM&E was renewed and geological mapping was carried out in the Long Lake (also known as Duley Lake) - Wabush Lake area by H.E. Neal for the Iron Ore Company of Canada ("IOC"). The work was done on a scale of 1"=1/2 mi. and covered an area approximately 8 km wide by 40 km long from Mills Lake northward to the middle of Wabush Lake. This work formed part of the systematic mapping and prospecting carried on by LM&E on their concession.

Concentrations of magnetite and specularite were found in many places west of Long Lake and Wabush Lake during the course of Neal's geological mapping. Broad exposures of this enrichment, up to 1.2 km long, assayed from 35% to 54% Fe and 17% to 45% SiO₂. Ten (10) enriched zones of major dimensions were located and six (6) of these were roughly mapped on a scale of 1"=200 ft. Seventy-four samples were sent to Burnt Creek for analysis. Two (2) bulk samples, each about 68 kg, were taken for ore dressing tests. One (1) was sent to the Hibbing Research Laboratory and the other was sent to the Bureau of Mines, Ottawa. The material was considered to be of economic significance as the metallurgical testing indicated that it could be concentrated.

Geological mapping on a scale of 1"=1/2 mi. was carried out by H.E. Neal in the Wabush Lake - Shabogamo Lake area in 1950. Neal (1951) also reported numerous occurrences of pyrolusite and psilomelane and botryoidal goethite being frequently associated with the manganese within the iron formation and quartzite.

Mills No. 1 was one of the iron deposits discovered in 1950 and was sampled and described at that time. A narrow irregular band of pyrolusite was reported to extend 457 m within a friable magnetite-hematite iron formation located 914 m southwest of the prominent point on the west side of Mills Lake (Neal, 1951).

In 1951, nearly all of the concession held by LM&E within the Labrador Trough was flown with an airborne magnetometer. This survey showed the known deposits to be more extensive than apparent, from surface mapping and suggested further ore zones in drift-covered areas (Hird, 1960).

In 1953, a program of geological mapping in the Mills Lake - Dispute Lake area was conducted by R.A. Crouse of IOC. Crouse (1954) considered the possibility of beneficiating ores within the iron formation and all high magnetic anomalies and bands of magnetite-specularite iron formation were mapped in considerable detail. Occurrences of friable magnetite-specularite gneiss containing enough iron oxides to be considered as beneficiating ore were found in several places west of Long Lake and northwest of Canning Lake. Representative samples assayed 18.55% to 43.23% Fe and 26.66% to 71.78% SiO₂ (Crouse, 1954). Seven zones of this material were located in the area. Three of these (one of which was Mills No. 1 deposit) were mapped on a scale of 1"=200 ft. On two of these occurrences, dip needle lines were surveyed at 122 m (400 ft) intervals. Forty-two samples were sent to the Burnt Creek Laboratory for analysis. Three samples were sent to Hibbing, Minnesota for magnetic testing (Crouse, 1954). Crouse (1954) reported that at Mills No. 1, the ore was traced for a distance of 488 m along strike, with the minimum width being 107 m.

In 1957, an area of 86.2 km² to the west of Long Lake was remapped on a scale of 1"= 1,000 ft and test drilled by IOC to determine areas for beneficiating ore. Dip needle surveying served as a guide in determining the locations of iron formation in drift-covered areas. According to Hird (1960), 272 holes, for a total of 7,985 m (26,200 ft.) were drilled during the 1957 program (approximately 66 holes are located on the Property). Mathieson (1957) reported that there were no new deposits found as a result of the drilling, however, definite limits were established for the iron formation found during previous geological mapping. Three zones of "ore" were outlined, which included Mills No. 1 and an area of 19.1 km² was blocked out as the total area to be retained (Mathieson, 1957). According to Mathieson (1957), the Mills No. 1 zone was outlined by six drillholes and found to have a maximum length of 3,048 m (10,000 ft) and a maximum width of 610 m (2,000 ft). Mathieson (1957) describes mineralization to be composed of specularite with varying amounts of magnetite, grading on average 32.1% Fe. A search by Altius for the logs and/or core from the 1957 LM&E drilling program has not been successful. From local sources, it is known that all holes drilled in this area were of small diameter and very shallow (~30 m).

In early 1959, a decision was made by IOC to proceed with a project designed to open up and produce from the ore bodies lying to the west of Wabush Lake and a major program of construction, development drilling and ore testing was started in the Wabush area (Macdonald, 1960). Also that year, geological mapping (1"=1,000 ft.) and magnetic profiling were conducted by R. Nincheri of LM&E in the Long Lake - Mills Lake areas. Zones of potential beneficiating ores were located to the southwest of Mills Lake (Nincheri, 1959).

In 1972, an extensive airborne electromagnetic survey covered 2,150 km² of territory, and entailed a 2,736 km line of flying in the Labrador City area. The area covered, extended from the southern extremity of Kissing Lake to north of Sawbill Lake, and from approximately the

Québec-Labrador border on the west to the major drainage system, through Long Lake, Wabush Lake and Shabogamo Lake on the east. The survey was done by Sander Geophysics Ltd. (for LM&E) using a helicopter equipped with an NPM-4 magnetometer, a fluxgate magnetometer, a modified Sander EM-3 electromagnetic system employing a single coil receiver, and a VLF unit (Stubbins, 1973). Also in 1972 to 1973, an airborne magnetic survey was conducted over the area by Survair Ltd., Geoterrex Ltd., and Lockwood Survey Corporation Ltd., for the Geological Survey of Canada (GSC, 1975).

In 1977, geological mapping was initiated by T. Rivers of the Newfoundland Department of Mines and Energy within the Grenville Province, covering the Wabush-Labrador City area. This work was part of the program of 1:50,000 scale mapping and reassessment of the ratio of mineral potential of the Labrador Trough by the Newfoundland Department of Mines and Energy. Mapping was continued by Rivers in Western Labrador from 1978 to 1980. As part of an experimental geochemical exploration program in Labrador by LM&E in 1978, many of the lakes in the Labrador City area were sampled, both for lake bottom sediments and lake water. Lake sediment samples were sent to Barringer Research Ltd., Toronto, Ontario, for a multi-element analysis. Water samples were tested at Labrador City for acidity, before being acidified for shipment. Some samples were also shipped to Barringer for analysis and some were analyzed in the IOC Laboratory in Sept-Îles. A sample portion was also sent to the Leach Brothers Laboratory in Hibbing Minnesota for additional analysis. On Block No. 24 (part of the Property), only one site was sampled. The sediment assay results indicated the sample was statistically "anomalous" in phosphorous. None of the water samples were defined as anomalous. It was concluded that the samples, as a group, are widely scattered, and it is difficult to draw any firm conclusion from the results. He added that a further study might indicate that it is worthwhile to take additional samples.

In 1979, a ground magnetometer survey was conducted on Block No. 24 (part of the Property). A total of four (4) lines having a combined length of 3,500 m were surveyed on this block (Price, 1979). The standard interval between successive magnetometer readings was 20 m. Occasionally, over magnetically "quiet" terrain, this interval was increased. Whenever an abrupt change in magnetic intensity was encountered, intermediate stations were surveyed. According to Price (1979), the magnetometer profiles and observations of rare outcrops confirm that oxide facies iron formation occurs on Block No. 24 (in the Mills No. 1 area of the Property). Also in 1979, one diamond drillhole was drilled by LM&E near the north end of Elfie Lake on the Property. The hole (No. 57-1) was drilled vertically to a depth of 28 m (Grant, 1979) and did not encounter the iron oxide facies of interest. In 1983, LM&E collared a 51 m deep (168 ft) DDH 137 m north of Elfie Lake (DDH No. 57-83-1). The drillhole encountered metamorphosed iron formation from 17 m to a depth of 51 m. Of this, only 2 m was oxide facies. Core recovery was very poor (20%) (Avison et al., 1984).

In 1981 and 1982, an aerial photography and topographic mapping program was completed by IOC to re-photograph the mining areas as part of its program to convert to the metric system. Two scales of aerial photography (1:10,000 and 1:20,000) were flown, and new topographic maps (1:2,000 scale) were made from these photos. The photography was extended to cover all the lease and licence blocks in the Labrador City area (Smith et al. 1981; Kelly and Stubbins, 1983).

During the summers of 1977 and 1978, a lake sediment and water reconnaissance survey was undertaken over about one-half (134,000 km²) of Labrador by the GSC, in conjunction with the Newfoundland Department of Mines and Energy. The survey was designed to provide the exploration industry with data on bedrock composition, and to identify metalliferous areas as large scale prospecting targets (McConnell, 1984). Sampling continued in 1982 in southwestern Labrador. Water and sediments from lakes over an approximate area of 50,000 km² were sampled at an average density of one sample per 13 km². Lake sediment samples were analyzed for U, Cu, Pb, Zn, Co, Ni, Ag, Mo, Mn, Fe, F, As, Hg and L.O.I. In addition, U, F and pH were determined on the water samples (Davenport and Butler, 1983).

During 1985, field work by C. McLachlan of LM&E was concentrated on the northern part of Block No. 24. A pace and compass grid was established near Molar Lake. Cross lines were added at 152 m (500 ft) intervals. The grid was used to tie in the sample sites and a systematic radiometric survey was thus performed. There were four soil samples and six rock samples (one analyzed) collected (Simpson et al., 1985). A possible source of dolomite as an additive for the IOC pellet plant was examined near Molar Lake. Simpson concluded from visual examination that the dolomite was high in silica.

In 2001, IOC staked a considerable portion of the iron formation in the Labrador City area, with the Kamistatusset area being in the southern extent of the company's focus. Extensive geophysical testing was conducted over the area using airborne methods. The Kamistatusset area and the area north of the Property were recommended as a high priority target by SRK Consulting Ltd., as part of the 2001 IOC Work Report (GSNL open file LAB1369). However, no work was reported for the area.

In 2004, Altius staked twenty (20) claims comprising licence 10501M (predecessor to licence 15980M). In the spring of 2006, Altius staked another thirty-eight (38) claims to the north, comprising licence 11927M. Licence 10501M and licence 15980M were subsequently replaced by licence 15980M, which was acquired by Alderon from Altius as described in Chapter 4 of this Report. Details of Altius' exploration on the Property are set out in Chapter 9 of this Report.

7. GEOLOGICAL SETTING AND MINERALIZATION

7.1 Regional Geology

The Property is situated in the highly metamorphosed and deformed metasedimentary sequence of the Grenville Province, Gagnon Terrane of the Labrador Trough ("Trough"), adjacent to and underlain by Archean basement gneiss (Figure 7-1). The Trough, otherwise known as the Labrador-Québec Fold Belt, extends for more than 1,200 km along the eastern margin of the Superior Craton from Ungava Bay to Lake Pletipi, Québec (Neal, 2001). The belt is about 100 km wide in its central part and narrows considerably to the north and south. The Trough itself is a component of the Circum-Superior Belt (Ernst, 2004) that surrounds the Archean Superior Craton, which includes the iron deposits of Minnesota and Michigan. Iron formation deposits occur throughout the Labrador Trough over much of its length.

The Trough is comprised of a sequence of Proterozoic sedimentary rocks including iron formation, volcanic rocks and mafic intrusions. The southern part of the Trough is crossed by the Grenville Front representing a metamorphic fold-thrust belt in which Archean basement and Early Proterozoic platformal cover were thrust north-westwards across the southern portion of the southern margin of the North American Craton during the 1,000 Ma Grenvillian orogeny (Brown, Rivers, and Callon, 1992). Trough rocks in the Grenville Province are highly metamorphosed and complexly folded. Iron deposits in the Gagnon Terrane, (the Grenville part of the Trough); include those on the Property and Lac Jeannine, Fire Lake, Mont-Wright, Mont-Reed, and Bloom Lake in the Manicouagan-Fermont area, and the Luce, Humphrey and Scully deposits in the Wabush-Labrador City area. The metamorphism ranges from greenschist through upper amphibolite into granulite metamorphic facies from the margins to the orogenic centre of the Grenville Province. The high-grade metamorphism of the Grenville Province is responsible for recrystallization of both iron oxides and silica in primary iron formation, producing coarse-grained sugary quartz, magnetite, and specular hematite schist or gneiss (meta-taconites) that are of improved quality for concentration and processing.

North of the Grenville Front, the Trough rocks in the Churchill Province have been only subject to greenschist or sub-greenschist grade metamorphism and the principal iron formation unit is known as the Sokoman Formation. The Sokoman Formation is underlain by the Wishart Formation (quartzite) and the Attikamagen Group including the Denault Formation (dolomite) and the Dolly/Fleming Formations (shale). In the Grenville part of the Trough where the Property is located, these same Proterozoic units can be identified, but are more metamorphosed and deformed. In the Grenville portion of the Trough, the Sokoman rocks are known as the Wabush Formation, the Wishart as the Carol Formation (Wabush area) or Wapuskatoo Formation (Gagnon area), the Denault as the Duley Formation and the Fleming as the Katsao Formation (Neal, 2000; Corriveau, L., Perreault, S., and Davidson, A., 2007). The recent synthesis by

Clark and Wares (2005) develops modern lithotectonic and metallogenic models of the Trough north of the Grenville Front. In practice, both sets of nomenclature for the rock formations are often used. Alderon and Altius have used the Menihek, Sokoman, Wishart, Denault, and Attikamagen nomenclature throughout their reports to name rock units on the Property. WGM has elected to retain this nomenclature but often gives reference to the other nomenclature. The regional stratigraphy is summarized in Table 7-1.

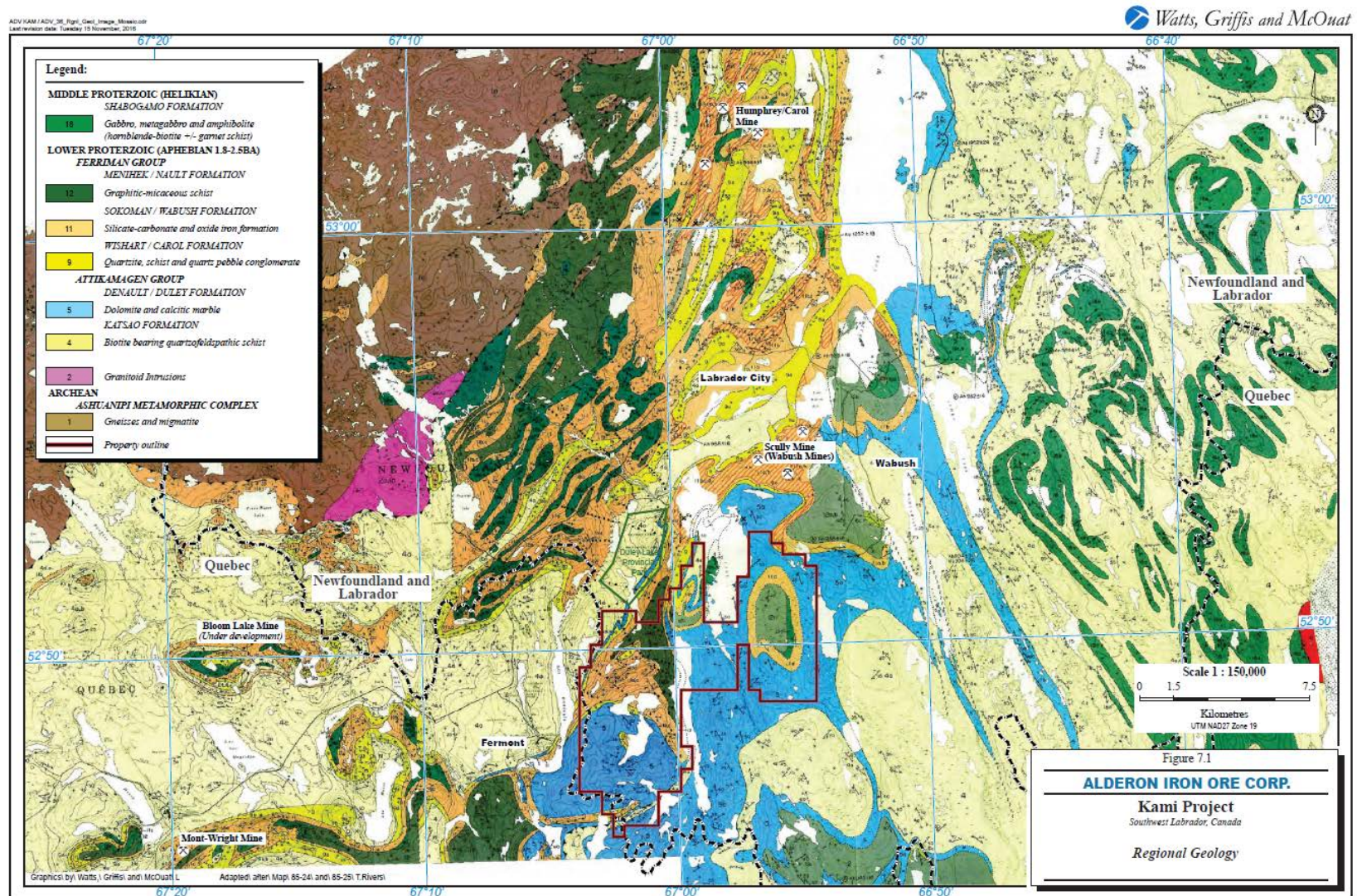


Figure 7-1: Regional Geology

Table 7-1: Regional Stratigraphic Column, Western Labrador Trough

Description	
Middle Proterozoic – Helikian	
Shabogamo Mafic Intrusives -Gabbro, Diabase	
Monzonite-granodiorite	
Intrusive Contact	
Paleoproterozoic – Aphebian	
Ferriman Group	
Nault Formation (Menihek Formation)	Graphitic, chloritic and micaceous schist
Wabush Formation (Sokoman Formation iron formation)	Quartz, magnetite-specularite-silicate-carbonate iron formation
Carol Formation (Wishart Formation)	Quartzite, quartz-muscovite-garnet schist
Unconformity? – locally transitional contact?	
Attikamagen Group	
Duley Formation (Denault Formation)	Meta-dolomite and calcite marble
Katsao Formation (Fleming/Dolly Formations)	Quartz-biotite-feldspar schist and gneiss
Unconformity	
Archean	
Ashuanipi Complex	Granitic and Granodioritic gneiss and mafic intrusives
Note: The names in brackets provide reference to the equivalent units in the Churchill Province part of the Trough.	

7.2 Property Geology

7.2.1 General

The most comprehensive mapping of this area was done by T. Rivers as part of his Labrador Trough mapping program of the mid-1980s. Several maps of the area were produced, with the most applicable to this area being Maps 85-25 and 85-24 (1:100,000) covering National Topographic System Sheet 23B/14. Figure 7-2 is based mainly on River's work with modifications made by Alderon and Altius through mapping, drilling, and interpretation of geophysical survey results including the 2010 airborne gravity survey.

The Property is underlain by folded, metamorphosed sequences of the Ferriman Group and includes (from oldest to youngest): Denault (Duley) Formation dolomitic marble (reefal carbonate) and Wishart (Carol) Formation quartzite (sandstone) as the footwall to the Sokoman (Wabush) Formation. The Sokoman (Wabush) Formation includes iron oxide, iron carbonate and iron silicate facies and hosts the iron oxide deposits. The overlying Menihek Formation resulted from clastic pelitic sediments derived from emerging highlands into a deep-sea basin and marks the end of the chemical sedimentation of the Sokoman Formation.

Proterozoic biotite-garnet-amphibole dykes and sills cut through all formations.

Altius' exploration was focused on three parts of the Property known as the Mills Lake, Rose Lake and the Mart Lake areas. Alderon's 2010 to 2012 drilling was focused on the Rose Lake and Mills Lake areas. On some parts of the Property, the Sokoman (Wabush) is directly underlain by Denault (Duley) Formation dolomite and the Wishart (Carol) Formation quartzite is missing or is very thin. In other places, both the dolomite and quartzite units are present.

Alderon interprets the Property to include two iron oxide hosting basins juxtaposed by thrust faulting. The principal basin, here named the "Wabush Basin", contains the majority of the known iron oxide deposits on the Property. Its trend continues NNE from the Rose Lake area, 9 km to the Wabush Mine and beyond the town of Wabush. The second basin called the "Mills Lake Basin", lies south of the Elfie Lake Thrust Fault and extends southwards, parallel with the west shore of Mills Lake. Each basin has characteristic lithological assemblages and iron formation variants.

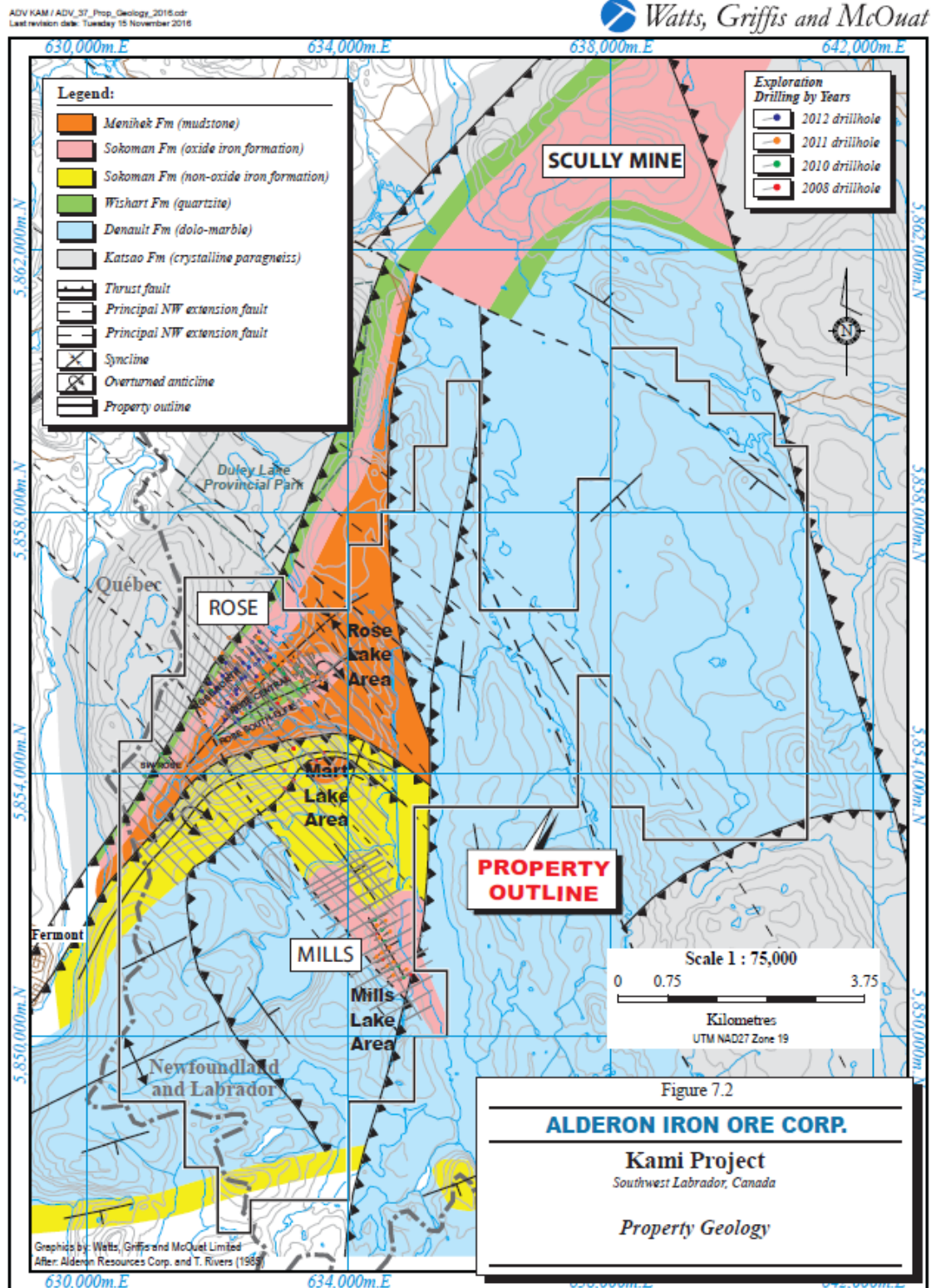


Figure 7-2: Property Geology

7.2.2 East of Mills Lake

The portion of the Property east of the western shore of Mills Lake is dominated by gently dipping (15° - 20° E) Denault Formation marble with quartz bands paralleling crude foliation. This block is interpreted as being thrust from the east onto the two (2) basin complexes above. The marble outcrops across the width of licence 017926M with consistent east dips. The thickness exposed suggests that several thrust faults may have repeated the Denault Formation stratigraphy. On River's (1985) maps, this is shown as an infolded syncline of Sokoman Formation, but recent mapping and shallow drilling by Alderon found Denault marble and minor Menihek Formation but no iron formation. Another area on licence 017926M, interpreted by Rivers (1985) as a syncline with Sokoman and Menihek formations in its core, did not show any airborne magnetic or gravity anomalies, and recent Alderon mapping found only dolomite marble.

Alderon initiated its 2010 program by re-logging Altius' drill core and replaced Altius' previous lithological codes with its codes. Amphibolite dykes and sills cut through all other rock units but are particularly common in the Menihek Formation schists and are a consideration, as they may negatively impact the chemistry of iron concentrates made from mineralization containing these rocks that may be difficult to exclude during mining.

7.3 Mineralization and Structure

Mineralization of economic interest on the Property is oxide facies iron formation. The oxide iron formation ("OIF") consists mainly of semi-massive bands or layers, and disseminations of magnetite and/or specular hematite (specularite) in recrystallized chert and interlayered with bands (beds) of chert with iron carbonates and iron silicates. Where magnetite or hematite represent minor component of the rock comprised mainly of chert, the rock is lean iron formation. Where silicate or carbonate becomes more prevalent than magnetite and/or hematite, then the rock is silicate iron formation ("SIF") and or silicate-carbonate iron formation and its variants. SIF consists mainly of amphibole and chert, often associated with carbonate and contains magnetite or specularite in minor amounts. The dominant amphibole on the Kami Property is grunerite. Where carbonate becomes more prevalent, the rock is named silicate-carbonate or carbonate-silicate iron formation. However, in practice, infinite variations exist between the OIF and silicate-carbonate iron formation composition end members. SIF and its variants and lean iron formation are also often interbedded with OIF.

The OIF on the Property is mostly magnetite-rich and some sub-members contain increased amounts of hematite (specularite). Hematite appears to be more prominent in Rose North mineralization than at either Rose Central or Mills Lake, but all zones contain mixtures of magnetite and hematite. At both Rose North and Rose Central and at Mills Lake, a bright pink

rhodonite, which is a manganese silicate, is associated with hematite-rich OIF facies. Deeply weathered iron formation in the Rose North deposit also contains concentrations of secondary manganese oxides. There may also be other manganese species present.

7.3.1 Weathering

The iron deposits in the region have all been affected to some degree by deep humid weathering, likely an extension of the Cretaceous weathering that formed the so-called Direct Shipping Ore (“DSO”) deposits around Schefferville, QC.

The weathering affects the Rose North limb from surface and continues below the base of the drilling at approximately -450 vertical m below surface. The weathering affects all rock types variably. Alderon’s interpretation, based on mineralogical and textural evidence, is that it appears to have two stages. The earlier stage appears to be neutral to slightly alkaline with low oxidation levels. This is expressed in the iron deposits by:

- Recrystallization of specular hematite to larger subhedral and euhedral crystals almost a magnitude larger than the original meta-taconite specular hematite;
- Leaching of quartz and carbonate from the non-oxide matrix;
- Destruction of Mn-silicate and carbonate minerals in the meta-taconite to Mn-oxides (psilomelane and pyrolusite) observed in several holes; and
- Destruction of Fe-silicates.

The host lithologies, including Menihek schist and Wishart quartzite, are typically changed to soft rock with the original textures preserved, like saprolite weathering, in the schist and extensive leaching of quartz in the quartzite, leaving a quartz-muscovite-calcite powder or porous rock. The iron in the micas is not oxidized. This pattern was observed in the SW Rose drilling in 2010 with all units and in the Wishart quartzite and Katsao paragneiss in the footwall of the Rose North deposit.

The second stage of weathering is superimposed on the first and is more intense closer to the surface. It is characterized by the onset of veins and fractures merging to larger replacements of the original iron formation with Fe-hydroxide minerals such as limonite and goethite with minor earthy red hematite. The manganese oxides remain as powdery psilomelane and minor crystalline pyrolusite in leached vugs.

The early stage weathering forms thin replacements along fracture and fault surfaces aligned with the later NW-trending extensional faults that cut all units. The fault fillings are mainly a dark green “chlorite” type mineral that have not been identified. Adjacent to the fractures, iron silicate is changed to the same “chlorite”, while carbonate grains are less affected. The fractures

occasionally change along strike over a few metres to open space fillings that can contain fresh pyrite crystals, fine psilomelane powder, and calcite (but not quartz); limonite-goethite are scarce in these places.

Controls on the weathering patterns appear to be the reticulate pattern of older thrust faults parallel with the trend of the deposits crosscut by the younger NW faults. The two likely provided a connected system for deeper groundwater inflows at the root of the weathering zone.

The weathering may affect the metallurgy characteristics of the iron deposit by increasing the Fe grade by the loss of matrix, increasing porosity, reducing density and hardness, and creating Mn-oxides that can interfere with the extraction process.

7.3.2 Wabush Basin – Rose Deposits

The Wabush Basin on the Property contains (from south to north) the South Rose/Elfie Lake deposit, the Rose Central deposit and the Rose North deposit. These deposits represent different components of a series of gently plunging NNE-SSW upright to slightly overturned anticlines and synclines with parasitic smaller-scale folding. The Rose syncline appears to be dismembered by thrust faulting parallel to the D₁ deformation from the SSE. The lateral extent of the southeast limb is limited, while the NW limb forms the long linear trend shown by the airborne magnetic and gravity anomalies and Rivers' (1985) maps. This fold system continues NNE from the western end of the Rose North deposit toward Long (Duley) Lake. The Wabush Mine deposit lies across the lake where the structure opens into a broad open syncline truncated by a northerly-trending late normal fault just west of Wabush.

The stratigraphy in the Rose area ranges from Katsao gneiss, north of the Rose syncline, up to the Menihek Formation mica schist. The contact between the Archean basement and the Denault marble is not exposed, nor has it been drilled to date. The Rose anticline exposes the Wishart Formation quartzite and drillholes also pass into Denault marble in the anticline core and also a thin Wishart unit abruptly passes down into Denault marble below the Mills Lake deposit. The contact relationship between the two units appears gradational to abrupt with increasing quartz at the base of the Wishart. The Wishart includes muscovite + biotite-rich schist and variations in quartzite textures. It appears more variable than the large quartzite exposures near Labrador City.

The upper contact of the Wishart Formation is abrupt. The base of the overlying iron formation often starts with a narrow layer of Fe-silicate-rich iron formation. Alderon's exploration team correlates this member with the Ruth Fm. Locally; this is called the Basal Iron Silicate Unit (Wabush Mines terminology). The thickness of this subunit ranges 0 to 20 m.

The Sokoman Formation in the Rose Lake area includes three iron-oxide-rich stratigraphic domains or zones separated by two thin low-grade units. This is similar to the sequence observed at the Wabush Mine. At Rose Lake, the low-grade units composed of quartz, Fe-carbonate plus Fe-silicates and minor Fe oxides are thinner and more erratically distributed than at the Wabush Mine. The three oxide divisions or domains in a gross sense are mineralogically distinct and were used as the basis for geo-metallurgical domains and for the subsequent Mineral Resource estimate. These are named RC-1, RC-2, and RC-3 from stratigraphic base to top.

RC-1, the lower stratigraphic level at Rose Lake, typically has substantially higher specular hematite to magnetite ratio; magnetite content can be minimal to almost absent and is mostly restricted to the margins of the hematite unit. The principal gangue mineral is quartz with a little carbonate or Fe-silicate. Crystalline rhodonite is locally common. Occasionally, magnetite can be observed replacing the hematite as crystalline clusters to 2 cm with rhodonite coronas. This is interpreted as indicating a broad reduction in Fe oxidation during the peak of metamorphism. The Mn-silicates appear to be cleanly crystallized with little entrainment of Fe oxides. Mn measured in Davis Tube magnetite concentrates, done as part of routine sample assaying, shows values to 0.8% Mn; however, the overall amount of magnetite is low in the unit. In the Rose Central deposit, this unit appears to thin out along trend and depth to the SW. In the Rose North deposit, the equivalent NR-1 unit includes some secondary manganese oxides developed in the deeply weathered zone. Where the rock is fresh in Rose North, NR-1 and RC-1 rocks appear to have the same characteristics.

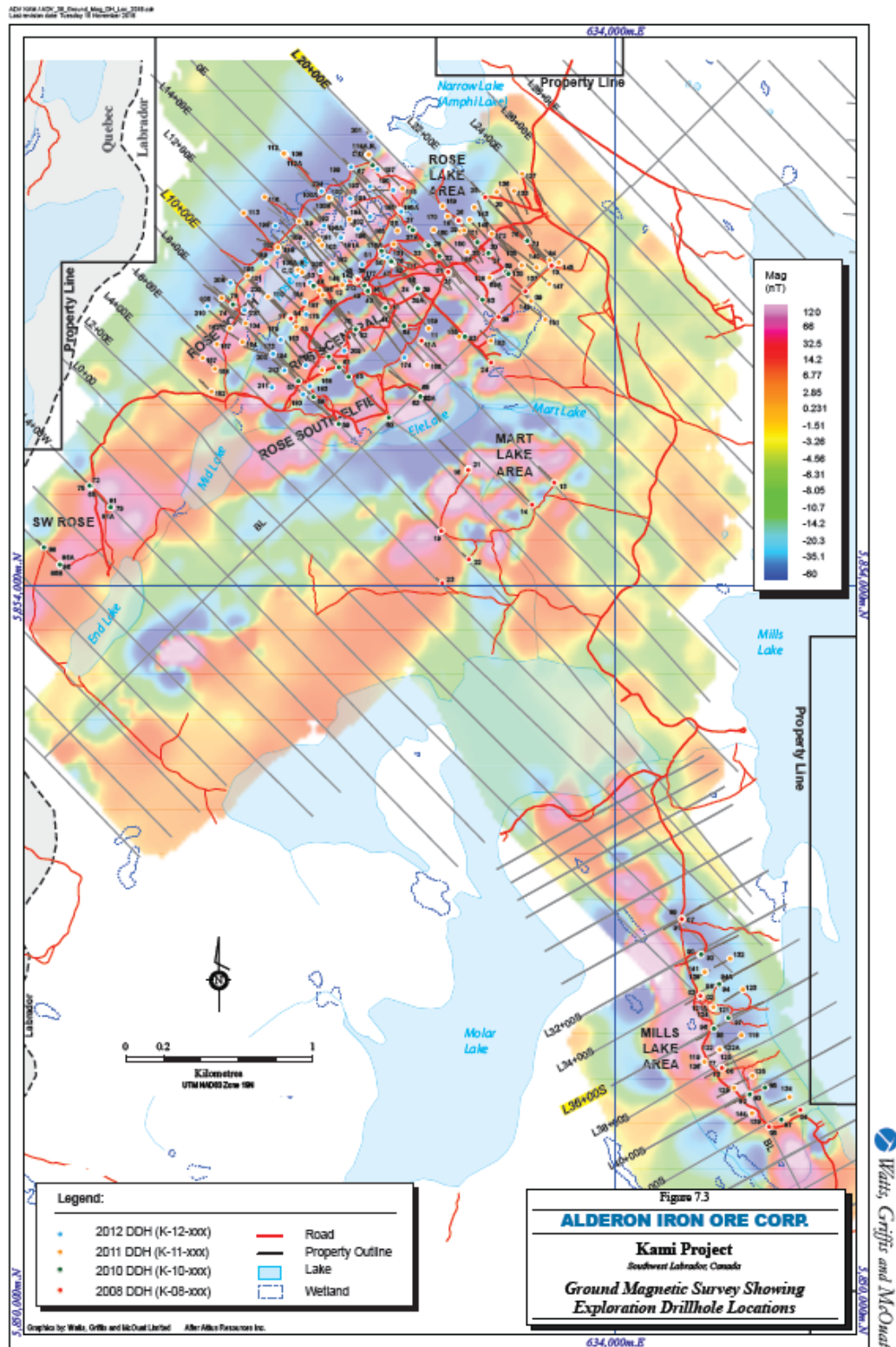
RC-2, the middle domain, typically is comprised of a series of interlayered hematite-rich and magnetite-rich OIF units with magnetite being more prominent. The mineralization is somewhat enriched in manganese as rhodochrosite. Davis Tube concentrates from the routine Davis Tube tests done as part of the sample assay program show Mn in the 0.6-1.2% Mn range. Gangue minerals include quartz, Fe-carbonate, and modest amounts of Fe-silicate. In the Rose North limb, the equivalent NR-2 forms two bands; the lower one is more consistent in thickness throughout the drilled length of the deposit while an upper part is thicker to the northeast and thins to the SW.

RC-3, the upper domain at Rose Lake, typically has a much higher magnetite:hematite ratio than the other domains, with hematite being uncommon in any quantity; however, the overall TFe% is the lowest of all three of the defined geo-metallurgical domains. The magnetite is typically finer-grained, although in parasitic fold crests can be coarser due to recrystallization. Characteristically, the Mn content of Davis Tube concentrates is relatively low at ~0.3% Mn. Upwards, this domain grades into assemblages containing less Fe oxide with increasing amounts of Fe-silicate and Fe-carbonate. In the Rose North area, the equivalent NR-3 is present in the same level and with similar Mn in magnetite concentrations as RC-3.

The uppermost part of the Sokoman is principally non-oxide facies. The thin magnetite layers that are present have the same level of Mn in magnetite bands as are typical of the RC-3 zone. The contact with the overlying Menihek Formation is a diachronous transition of interlayered Sokoman chemical sediments and Menihek flysch mud. The contact may locally be tightly folded or faulted by post-metamorphic movement parallel with the foliation, but many of the contacts between the two formations are delicately preserved and appear to be "one-way" and not folded stratigraphy. It is probable that all three contact controls are in play.

The Wabush Basin in the southern part of the Property is bounded to the south by a major arcuate ESE to SW-trending thrust fault along Elfie Lake towards Mills Lake. The east margin is bounded by a northerly thrust fault from the east and on the west by a curious probable thrust fault within the Denault Formation that truncates an ENE-striking open anticline.

Figure 7-3 shows the drilling areas and deposit with reference to ground magnetics. Figure 7-4 shows a typical cross section (20E) of the Rose Central – Rose North deposits. The magnetic profile from the ground magnetic survey shows peaks that correlate with magnetite-hematite mineralization intersected in the drillholes. Each of these zones are interpreted as limbs of a series of NE-SW trending, upright to slightly overturned shallow NE plunging anticlines and synclines but structural stacking may also play a role. On Section 20E, the anticlinal hinge of the South Rose-Rose Central is mapped out by drilling, but on sections to the SW and down plunge of Section 20E, this hinge zone has been eroded away (would be above ground surface) and only the SE and NW limbs, which are respectively the South Rose and Rose Central deposits, are present. It can be seen that Wishart Formation quartzite forms the core of the fold (intersected towards the bottoms of drillholes K-10-09, K-08-18, K-10-30 and K-10-35 on Section 20E) and Menihek Formations mica - graphitic schist is the stratigraphic hanging wall above the Sokoman Formation iron formation. The Rose North zone was the main focus of Alderon's 2011 and 2012 winter drill programs and the Rose Central deposit was the main focus of WGM's previous Mineral Resource estimate, dated May 2011.



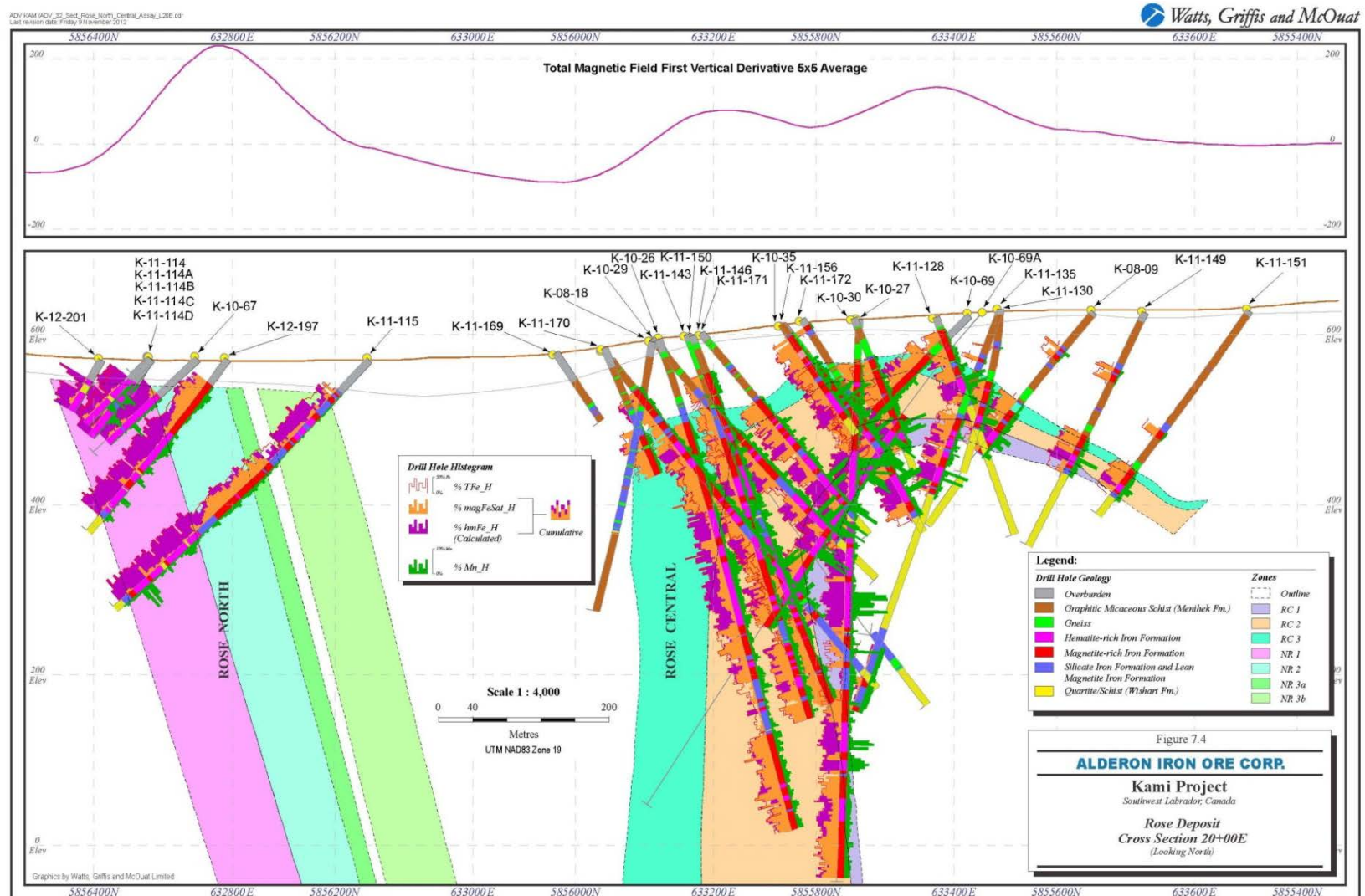


Figure 7-4: Rose Lake Area - Cross Section 20+00E

The true width of the Rose Central deposit as shown by the interpretation is in the order of 220 m wide, however, as shown, widths of mineralization rapidly attenuate through the hinge into the South Rose zone or limb and there is no consistent relationship between drillhole intersection length and true width. The true width of the Rose North deposit is in the order of 250 m to 350 m. The Rose North and the Rose Central deposits appear to represent respectively the NW and SW limbs of the same tight syncline. There is also likely another narrow highly attenuated perhaps tightly folded limb of Sokoman between the main Rose Central zone and the Rose North zone. The entire Rose system also appears to attenuate along strike to the SSW. WGM believes it likely that considerable second order and third order parasitic folding is also most likely present and is largely responsible for difficulties in tracing narrow layers of SIF, CSIF (variants) and magnetite and hematite-dominant OIF from drillhole intersection to intersection. Such folding would also, in WGM's opinion, be the main reason for the interlayering between Menihek-Sokoman-Wishart and even Denault formations, but as aforementioned, the relative importance of possible structural stacking also remains unresolved.

The 2011-12 infill drilling campaign indicated the effects of late, NW-striking, sub-vertical normal faulting. Alderon's interpretation suggests scale of movement is typically 40 to 180 m. The NW trend is sub-parallel with a major glaciation direction, thus obscuring these features. According to Alderon's interpretation, four of these faults cut the Rose deposit with interpreted offsets that appear to elevate the SW end of the Rose Central deposit and drop the NE anticline nose. These can be followed in topography and in detailed air-magnetic maps. The surface traces of these faults are shown on the property geology map, Figure 7-2.

The aforementioned interzone stratigraphy and hematite-magnetite zoning of the Rose Central-Rose North zones is apparent on the cross sections. Clearly, core logged as hematite-dominant as completed by Alderon's exploration crew correlates well with estimated %hmFe calculated from assays. However, the extent of hematite enrichment in Rose North may be exaggerated by the extent of secondary weathering leading to the development of limonite, goethite and secondary hematite after magnetite. In addition to the prominent hematite-rich layer near the stratigraphic base, there are other layers of hematite-rich OIF throughout the zone alternating with magnetite-rich, lean oxide and SIF and variants, but these are less prominent and difficult to trace. This difficulty in tracing individual iron formation variants from hole to hole is probably explained by the fact that these other layers are relatively thin and therefore the aforementioned second and third order folding has been more effective in shifting them in position and causing them to thicken and thin. The prevalence of down-dip drilling also makes interpretation more difficult.

In the main body of the Rose Central zone, manganese decreases in concentration from stratigraphic bottom towards the stratigraphic top and hematite also decreases in prevalence as magnetite-rich OIF becomes dominant. This same general pattern, perhaps not as obvious, is also present from footwall to hanging wall in the Rose North zone.

7.3.3 Mills Lake Basin – Mills Lake and Mart Lake Deposits

The Mills Lake Basin is developed south of the Wabush Basin. It is considered to be a separate basin because the amount and distribution of non-oxide facies iron formation is different from the Wabush Basin package at Rose and Wabush Mine.

The oldest lithology in the Mills Lake area is the Denault marble. It forms the core of the open anticline in outcrop west of the Mills deposit. The contact with the overlying Wishart is transitional to sharp. The Wishart is predominantly quartzite with lenses of micaceous schist up to 20 m thick, especially towards the upper contact with the Sokoman Formation. The base of the Sokoman is marked by the discontinuous occurrence of a basal silicate iron formation that ranges from nil to 20 m true thickness that Alderon correlates to the Ruth Formation.

The lower part of the Sokoman is Fe-carbonate-quartz facies IF with scattered zones of disseminated magnetite. The OIF facies forms two coherent lenses traced over 1,400 m on the Mills Lake deposit and similarly south of Mart Lake drilled in 2008 (Seymour et al. 2009). In the Mills Lake deposit, the lower oxide unit is 30-130 m true thickness and the upper one more diffuse and generally less than 25 m thick. In the Mart Zone, the two oxide layers are less than 30 m thick. They are separated by 20 to 50 m of carbonate facies IF. Above the upper oxide lens, more carbonate facies greater than 50 m thick cap the exposed stratigraphy. Alderon reports that the carbonate facies units often show zones of Fe-silicates, which they interpret as being derived from a decarbonation process during metamorphism leading to replacement textures indicating that, at least in the Mills Lake area, the origin of Fe-silicates is principally metamorphic and not primary. Disseminated magnetite is a common accessory with the Fe-silicates but isn't economically significant at this low level of replacement.

The lower oxide facies at the Mills Lake deposit has three levels or stratigraphic domains: a lower magnetite dominant domain, a specular hematite with rhodonite domain, and an upper magnetite domain. The two magnetite dominant domains show different amounts of manganese in magnetite-OIF with the upper portion being low in manganese and the lower one having moderate manganese enrichment. In the Mart zone, a similar pattern is apparent but the two magnetite-dominant OIF domains are more widely separated stratigraphically, are generally thinner, have lower Fe oxide grade, and the hematite member is less well developed.

Figure 7-5 is cross section 36E through the Mills Lake deposit showing the lower and wider lenses of iron formation intersected by three drillholes K-10-95, K-10-96 and K-10-97. The narrower upper lens is intersected only in the top of drillhole K-10-97. Also apparent is the narrow hematite dominant layer which occurs three quarters of the distance towards the top of the lower lens and divides the lower lens into three parts with a magnetic OIF dominant bottom and top. Similar to Rose Central mineralization, the core logging of various facies correlates well with hematitic Fe (%hmFe) calculated from assays. Again, similar to mineralization in the Rose Central and Rose North zones, manganese is significantly higher in hematite-rich OIF than the magnetite-rich OIF.

The Mills Lake Basin outcrop is controlled by an ENE-trending asymmetrical open syncline overturned from the SSE with a steeper north limb and shallow-dipping (18°E) east-facing limb. The fold plunges moderately to the ENE. The Mills Lake Basin is fault-bounded. The northern limit of the basin is the Elfie Lake Thrust Fault pushed from the SSE where it rides over the Wabush Basin package. The east limit is an (interpreted) thrust fault from the east that pushes Denault marble over the Sokoman Formation. The SSE fault appears to be the older of the two. Based on Rivers' mapping and field observations by Alderon staff, it includes the Mont-Wright deposit and several smaller iron deposits west of Fermont. The details of the basin dimensions are unknown.

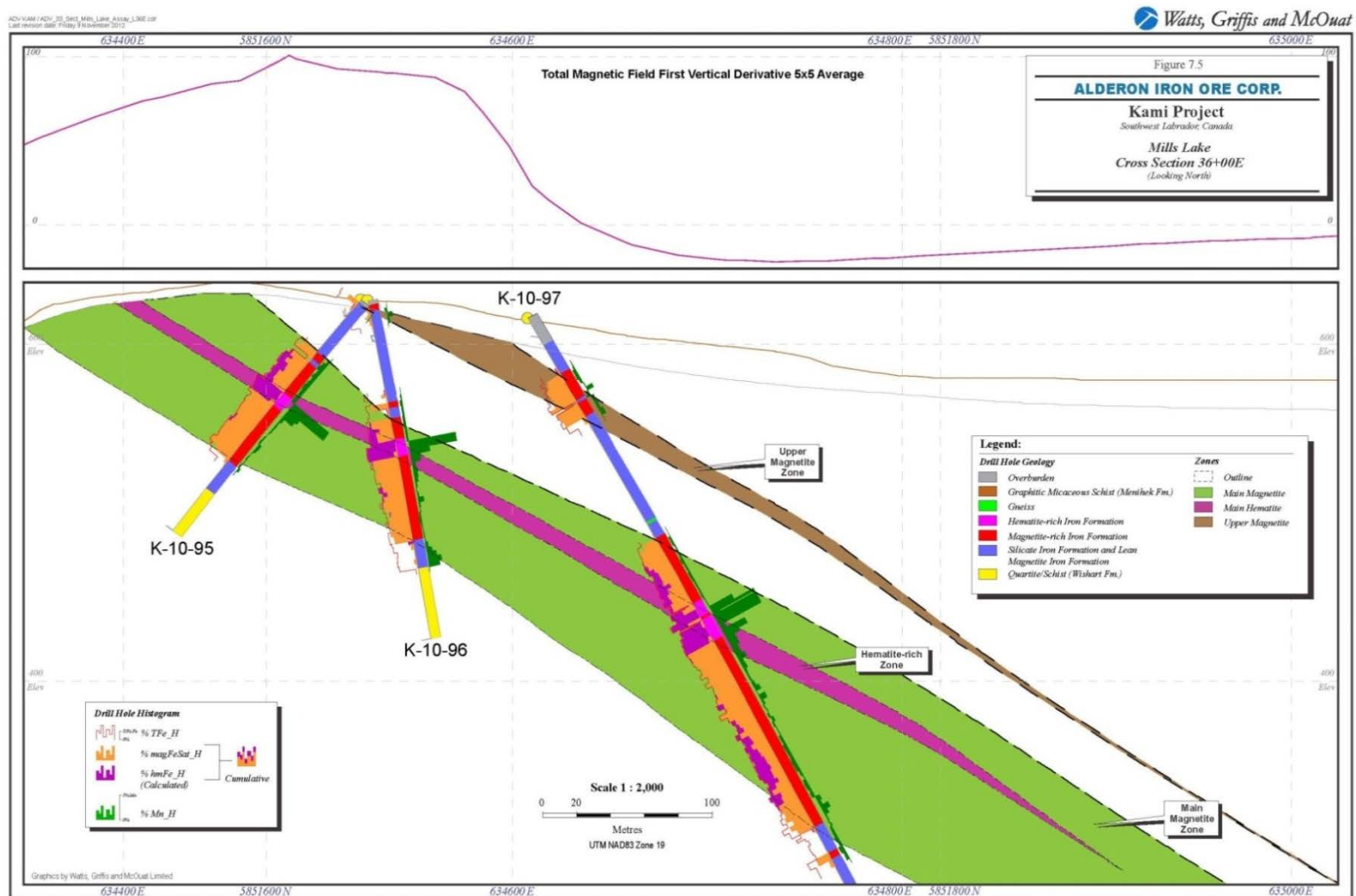


Figure 7-5: Mills Lake Area - Cross Section 36+00E

7.3.4 Mineralization by Rock Type and Specific Gravity

WGM completed studies on the average composition of rock types derived from drill core sample assays for all the deposits. The estimates of %Fe in the form of hematite (%hmFe) have been made by WGM using two different methods depending on the type of assay and testwork data available. For all cases, the distribution of Fe^{++} and Fe^{+++} to magnetite was done assuming the iron in magnetite is 33.3% Fe^{++} and 66.6% Fe^{+++} . The estimation method also assumes all iron in silicates, carbonates, and sulphides is Fe^{++} , and there are no other iron oxide species present in mineralization other than hematite and magnetite. This latter assumption is generally believed to be true only for the Rose Central and Mills Lake deposits. This assumption is not completely true for the Rose North zone where extensive deep weathering has resulted in abundant limonite, goethite and hematite development after magnetite. This weathering is particularly present in 2011 to 2012 drillholes that tested the mineralization mostly close to surface in Rose North. This development of limonite and goethite exaggerates the calculated %hmFe values, affects density of mineralization and also reduces recoverable Fe. It may also, in association with the Rose Lake drainage system, contribute to hydrological issues that may be concerns for potential pit development. A “Limonite Zone” was also one of the defined domains for the Rose North Mineral Resource estimate and all mineralization that fell within this domain was classified as Inferred.

TFe was determined by XRF for most Head or Crude samples, and for most samples, FeO was by titration and magFe were determined by Satmagan. Hematitic Fe, where Satmagan and FeO_H assays are available, was estimated by subtracting the iron in magnetite (determined from Satmagan) and the iron from the FeO analysis, in excess of what can be attributed to the iron in the magnetite, from %TFe, and then restating this excess iron as hematite, as shown below:

$$\%hmFe = \%TFe - (\text{Fe}^{+++}_{\text{(computed from Satmagan)}} + \text{Fe}^{++}_{\text{(computed from FeO)}})$$

In practice, %otherFe was computed as the first step in the calculation and $\%hmFe = \%TFe - (\%magFe + \%otherFe)$, where %otherFe is assumed to represent the Fe in sulphides, carbonates and/or silicates, is the iron represented by Fe^{++} from FeO_H that is not in magnetite.

$$\%otherFe = \text{Fe}^{++}_{\text{total (from FeO)}} - \text{Fe}^{++}_{\text{(from Satmagan)}}$$

Where Fe^{++} from magnetite exceeds Fe^{++} from %FeO_H, negative values accrue. These negative values are often small, less than 2% and represent minor but reasonably acceptable assay inaccuracy in either FeO_H or Satmagan results. Small negative values can also accrue for %hmFe where %TFe is smaller than magnetic Fe plus otherFe. For both cases, these small negative values are replaced with zero in WGM's process of completing the calculations. Where the negative values are greater than 2%, possible error for %TFe Head, Satmagan determinations or FeO_H are indicated and there are some samples in this category.

Not all samples of OIF containing significant hematite were assayed for FeO_H, and for these samples, %otherFe cannot be estimated from Head FeO assays and Satmagan. However, the samples that did not have FeO_H often had Davis Tube tests completed. Where Davis Tube tests were completed, these Davis Tube Tails ("DTT") were generally assayed for FeO and from these results %otherFe can be estimated.

Where Head FeO was not determined and Davis Tube weight recoveries for DTTs were available and DTTs had been assayed for FeO, the %hmFe was estimated as follows:

$$\%hmFe = \%TFe - (\%magFe\_Sat + \%otherFe_{\text{fromDT}}),$$

$$\text{Where: } \%otherFe_{\text{fromDT}} = \%Fe^{++}_{(\text{from FeO on DTT})} * \%DTTR / 100$$

$$\text{and } \%DTTR (\text{Davis Tube Tail Recovery}) := (\text{Davis Tube Feed wt} - \text{wt\_DTC}) * 100 / \text{Davis Tube Feed wt})$$

For some drill core OIF samples, %hmFe cannot be calculated because the necessary assay data is not available. Most of these samples were logged as low in hematite, i.e., magnetite-rich OIF or SIF, and the requisite assays to allow for the calculation of %hmFe were not completed because hematite contents were very low and not significant. Many samples of carbonate and silicate IF were also not assayed completely because they were judged as containing insignificant magnetite or hematite.

For OIF, the sums of %hmFe and %magFe generally approach %TFe. The difference between the sum of %hmFe and %magFe and %TFe for OIF samples is attributed to minor amounts of iron in silicates and or carbonates, i.e., "otherFe", or also due to the assays for individual iron components (%TFe, %FeO_H or magFe from Satmagan) not being absolutely accurate. The estimates for %hmFe generally appear to be accurate $\pm 2\%$ -3%. For silicate and carbonate IF lithologies, the sum of %hmFe and %magFe is often significantly less than %TFe. The "missing iron" is probably mostly in grunerite, which on the Property is a common iron silicate in IF and/or iron carbonates. Not much of the "otherFe" is likely in sulphides because sulphur levels in this mineralization are generally low.

Table 7-2 summarizes routine sample assay results for Rose drilling by lithology code (Rock Type). A total of 10,503 samples are represented in the table with the results for a few samples not shown. Samples not included consist of samples classified as pegmatites, quartz veins, overburden or mixed lithology code samples and one sample with no code. For the purpose of simplification, some regrouping from Alderon's logging lithology codes has been completed by WGM to regroup Menihek, Wishart, amphibolites and various SIF variants. This table includes averages for hmFe and otherFe as described. Rocks shaded in pink generally represent mineralization that is potential "ore" with higher magnetite and hematite iron. Other rock types depending on spatial factors, even without higher levels of magnetite and/or hematite, may be within the "ore" and may not be separable during mining.

Table 7-2: Summary of Rock Composition Grouped by Rock Type for Rose Area Drilling from Routine Sample Assays

Simplified LithCode	Amp	Men	HIF	HMIF	MHIF	MIF	HSIF	MSIF	MCIF	MCSIF	MHSIF	MHCIF	MQCIF	MQSIF	SIF	QZT	Wishart
Count	64	230	1502	1554	1222	4286	5	287	32	3	11	1	48	38	1071	93	41
pct_TFe (avg)	15.25	8.69	32.19	31.57	31.01	28.64	35.39	29.73	26.17	29.40	28.55	6.00	17.51	25.18	20.53	12.37	5.93
pctMagFe (avg)	3.4	1.4	1.6	8.7	18.8	22.4	1.2	14.5	12.9	15.4	12.3	4.2	7.0	9.8	2.3	2.6	0.6
pct_hmFe calculated (avg)	2.1	0.7	30.2	22.4	11.3	1.9	33.7	1.0	1.7	2.9	6.2	1.0	0.8	4.3	4.1	8.5	2.1
pct_OtherFe (avg)	9.1	6.2	0.4	0.6	1.0	4.4	0.5	13.3	11.2	11.2	10.1	0.8	10.0	9.6	14.4	1.5	3.5
pct_OxFe (avg)	6.24	2.23	31.80	31.01	29.97	24.46	34.86	17.07	15.29	18.25	18.45	5.20	10.24	15.81	6.49	11.21	2.74
pct_SiO ₂ (avg)	48.77	58.22	46.36	47.90	47.53	47.48	35.00	43.92	43.72	44.27	46.91	54.40	56.84	51.16	50.59	73.99	69.03
pct_Al ₂ O ₃ (avg)	11.23	11.25	0.16	0.16	0.21	0.33	0.11	0.42	0.51	0.20	0.26	19.70	0.42	0.39	1.13	1.12	7.77
pct_TiO ₂ (avg)	1.25	0.62	0.01	0.01	0.02	0.02	0.01	0.03	0.03	0.02	0.02	0.01	0.02	0.03	0.10	0.07	0.24
pct_CaO (avg)	4.70	2.29	1.04	1.52	1.95	3.10	1.55	3.62	4.13	3.57	2.87	0.99	4.88	3.09	4.64	1.52	2.79
pct_K ₂ O (avg)	1.41	2.82	0.03	0.02	0.03	0.05	0.01	0.05	0.09	0.04	0.02	4.07	0.10	0.04	0.18	0.30	3.28
pct_Na ₂ O (avg)	1.40	1.19	0.16	0.02	0.03	0.05	0.44	0.04	0.04	0.02	0.02	9.02	0.05	0.03	0.10	0.02	0.40
pct_MgO (avg)	4.71	3.04	0.95	0.97	1.33	2.38	0.93	2.81	3.41	2.41	2.26	0.49	3.24	3.06	4.07	1.00	2.41
pct_MnO (avg)	0.64	0.21	2.90	1.53	1.62	1.15	7.49	1.49	1.13	1.09	2.07	0.47	1.20	0.62	1.07	0.94	0.28
pct_P ₂ O ₅ (avg)	0.27	0.22	0.03	0.03	0.03	0.04	0.02	0.05	0.04	0.04	0.02	0.01	0.03	0.04	0.07	0.07	0.14
pct_LOI (avg)	3.44	6.75	2.41	2.82	2.96	4.44	3.27	5.00	8.30	7.26	4.98	1.65	8.48	5.76	8.50	3.37	4.53

Notes: Mart Lake and SW Rose drilling excluded. Alderon's Lean IF codes merged with other iron formation, Various SIF codes combined into SIF, Alderon's HBN-GN codes regrouped into AMP, Various Alderon Menihek codes regrouped as Menihek. Some samples not shown including one sample with no code, one sample coded as overburden, Quartz Veins, Pegmatites.

The results of WGM's analyses show that logging is generally in agreement with rock composition. There are a small percentage of samples that from the assay data appear to be misclassified in terms of lithology code. This misclassification may be due to errors in logging or sample sequencing, i.e., sample mix-up problems in the field or in the lab, or could have resulted from acceptable logging misclassification. Acceptable misclassification by lithology code can occur due to samples containing more than one rock type. This can occur and be acceptable because of the minimum requisite sample length constraints.

Samples logged and coded as magnetite-rich are indicated by assay results to contain more magnetic Fe than samples logged as hematite-rich or carbonate and silicate IF. Samples coded as hematite-rich contain more hematitic Fe. At both Rose and Mills, hematite-rich samples contain higher levels of manganese. This can be observed particularly in the groups coded as HIF and HSIF, respectively Hematite Iron Formation and Hematite-Silicate Iron Formation. Carbonate IF samples are generally higher in CaO. Mafic intrusive rocks (HBG-GN regrouped to AMP) contain higher levels of TiO_2 , Al_2O_3 and Mg than IF. Quartz schists, which generally represent Wishart Formation, are high in SiO_2 and Al_2O_3 , as are Menihek Formation samples. Denault Formation samples are high in CaO and MgO as this rock is marble or dolomitic marble. There are however, some anomalies probably resulting from mis-logging. Dolomitic samples can be mis-logged as quartzite. Some intervals or samples logged as mafic dykes (HBG-GN) contain high levels of hematite Fe. Samples or units logged as "Lean" iron formation with a Leading "L" in Alderon's lithology nomenclature, often have assays with significant oxide-iron grade. In Table 7-2, these "L" lithology codes have been regrouped by WGM with the "normal-grade" iron formation. Similarly, samples coded as SIF variants often have more oxide Fe than "otherFe" and these oxide Fe grades may be sufficient to be ore.

Davis Tube tests were completed on 2010 and 2011 drilling program samples using pulverization to 80% passing 70 microns neglecting any liberation studies or relevance to any iron ore processing flowsheets. Most of the tests were completed on Rose Central samples. Davis Tube magnetic concentrates were generally assayed for major elements by XRF. For some samples, Davis Tube Tails were analyzed for FeO. For a proportion of these samples, particularly hematite-rich samples, no XRF analysis on products was possible because the magnetic concentrate produced was too small or non-existent.

For drillholes that had both Satmagan determinations of %magFe and Davis Tube tests, (these samples are mostly OIF, but also include carbonate and silicate IF and even amphibolite gneiss), the results show that both methods for measuring %magFe produce very similar results with no significant bias. There are a few samples that correlate poorly. WGM communicated this list of suspected sample assays to Alderon. Alderon has completed some Check assaying (Chapter 11) of the most obvious samples but many of these samples selected could not be

relocated by SGS Lakefield. Some re-assays have also been completed on samples selected by WGM for checking the balance of Fe^{++} from FeO_H , versus Fe^{++} from Satmagan and %hmFe and some assay errors were located and corrected, but more undoubtedly exist and could be found and corrected with more aggressive Check assaying.

Results for the Davis Tube tests results show the expected high iron recoveries were achieved for magnetite-rich samples and lower recoveries for hematite-rich samples. Clearly, sample pulverization, 80% passing 70 microns, has resulted in a high degree of magnetite liberation. The liberation assay and mineralogical characteristics of the Davis Tube concentrates (because of the fine grinding) may however be misleading compared to the actual recoveries in an operating mine setting with a commercial processing plant. Iron concentrations in magnetic concentrates from magnetite-rich rocks are generally high, averaging close to 70% and ranging from 64% to 72%. Silica values for magnetite-rich lithologies range from 0.4 to 8% but generally average approximately 2%. Manganese in magnetic concentrates is weakly to moderately correlated with manganese in Head samples, but patterns are irregular.

For its 2010 program, Alderon completed bulk density determination on 175, 0.1 m length half split core samples for the purposes of calibrating the downhole density probe data. The samples tested spanned a number of rock types. The bulk densities were determined at SGS Lakefield using the weigh-in-water/weigh-in-air method. These 0.1 m samples represent the upper 0.1 m intervals of routine assay samples that are generally 3 m to 4 m long. There are no XRF WR assays for these specific 0.1 m samples as only the routine sample intervals, of which the 0.1 m samples were a part, were assayed. Figure 7-6 shows that bulk densities for these 0.1 m samples correlate poorly with the %TFe from assays on the longer interval routine samples of which they were a part of. This poor correlation is not unexpected by WGM since mineralization is rarely consistent over entire sample intervals. Note: Although there were 175 wet bulk density determinations, more than one result for the 0.1 m samples can match with a routine sample interval.

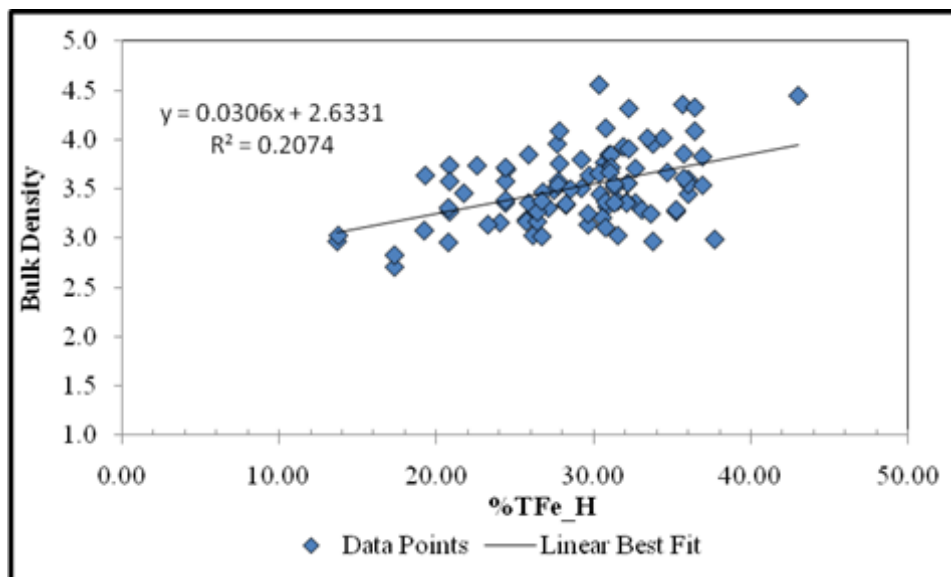


Figure 7-6: Bulk Density for 0.1 m Samples Intervals vs. %TFe on Routine Samples

Alderon also completed SG determinations on the rejects from 33 routine samples at SGS Lakefield using the gas comparison pycnometer method. The SG results for these samples versus XRF WR %TFe results are shown on Figure 7-7. The plot also shows the results of DGI downhole density results. This plot shows that SG by pycnometer results correlate strongly with %TFe. It also illustrates that probe determined density averaged over the same sample intervals similarly correlate strongly with both %TFe from assay and with pycnometer determined density.

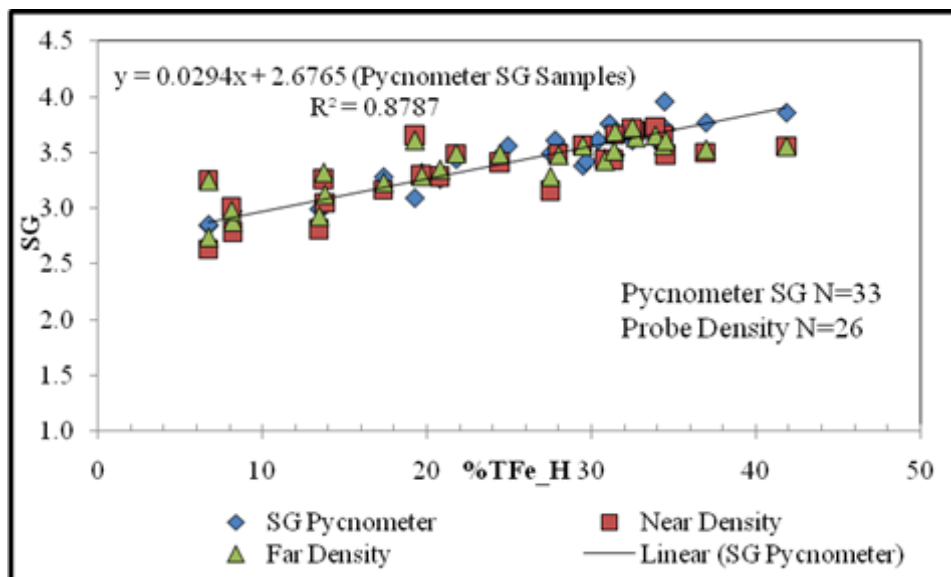


Figure 7-7: SG by Gas Comparison Pycnometer on Pulps vs. %TFe on Routine Assay Samples

WGM's experience is that there is invariably a strong positive correlation between SG and/or density and %TFe assays for fresh unweathered/un-leached OIF. This occurs because OIF generally has a very simple mineralogy consisting predominantly of hematite and/or magnetite and quartz. Because the iron oxide component is much denser than the quartz and the OIF mineralogy is simple, the Fe concentration of a sample provides an excellent measure of the amount of magnetite and/or hematite present in the sample and hence the density of the sample. Invariably, the relationship between %TFe and SG is much the same from one deposit to the next. Pycnometer determined SG on pulps is not the ideal method for proving the SG to %TFe relationship because any porosity in samples could lead to misleading results. However, where bulk density and pulp density or SG have been determined on fresh unweathered OIF samples, WGM has found that results will be very comparable.

WGM also assessed the gas comparison pycnometer SG results for the 26 samples it collected from Alderon and Altius' drill core during site visits in 2009 and 2010 and also compared the DGI's density results from downhole probe averaged over the same Tos and Froms as the WGM sample intervals. Pycnometer SG and %TFe correlated well and the best fit relationship line is similar to Alderon's 33 SG pycnometer results and similar to that for other iron deposits WGM has reviewed. However, the probe densities do not correlate well with either the pycnometer SG or iron assays. WGM believes the discrepancy between the relationships may be due to poor correlation between sample Tos and Froms from sampling, logging, the core meterage blocks and the probe depth indexing.

In late 2012, WGM again reviewed the density data available for the Project. Figure 7-8 shows all DGI probe near densities for all 2008-2012 drillholes from the Rose Lake area. Also shown is the best fit line, previously defined. Figure 7-9 shows DGI probe densities for Mills Lake samples where the best fit line from WGM is practically coincident to the best fit line through DGI probe densities plotted against Head %TFe.

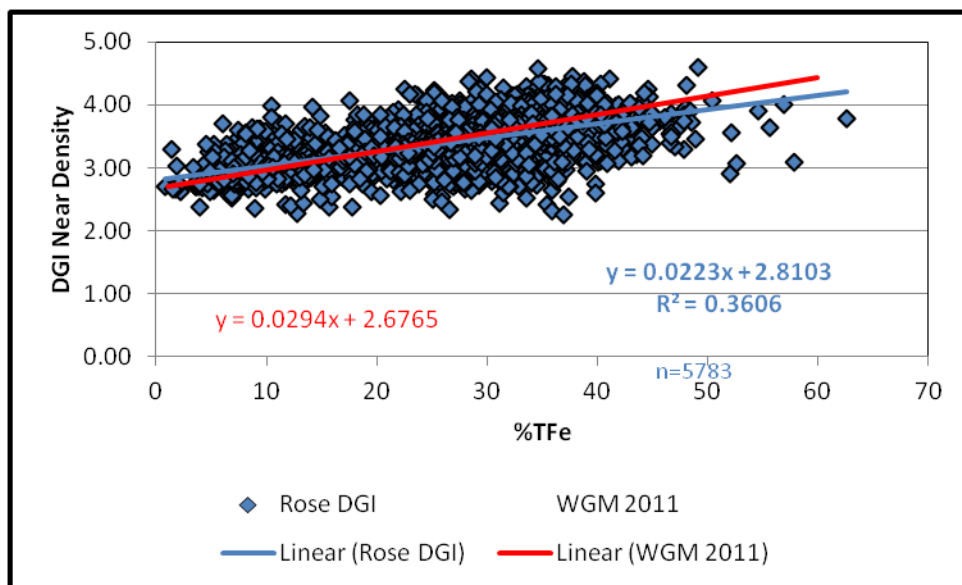


Figure 7-8: DGI Probe Densities for all 2012-2008 Drillholes of Rose Lake

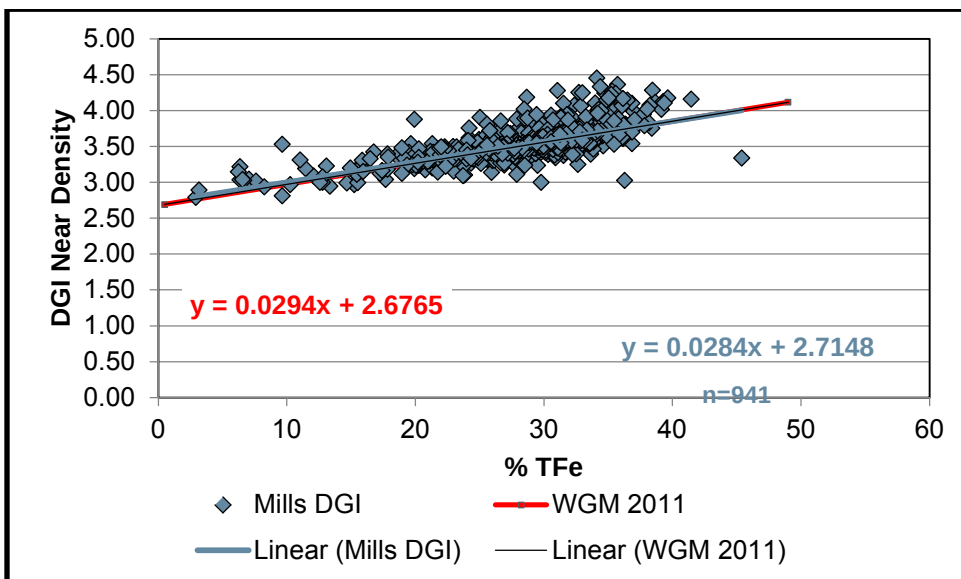


Figure 7-9: DGI Probe Densities for Mills Lake Samples

From this review, WGM recommended further determinations of SG to be completed at SGS Lakefield. This recommended testwork completed has confirmed that the probe densities are not very accurate and at least for fresh, unweathered iron formation, sample density is best predicted from Head %TFe. The probe densities would potentially be of more value for Rose North-type weathered mineralization, but for most of the holes testing Rose North mineralization, no probing was completed because of the fragile nature of these drillholes and the fear of losing the probe down the hole.

For the Mineral Resource estimate, Alderon has chosen for its modelling to use the relationship between probe density and %TFe rather than individual probe density values or probe density values aggregated over sample intervals. This decision was made because the probe density versus %TFe models are a little more conservative than the models using the pycnometer SG values. WGM agrees this is acceptable but wants to emphasize that for Rose North weathered mineralization, the distribution of weathering is complex and the relationship between rock density and iron grade and mineralogy is also complex. The density/SG models applied are generally correct only for a portion of that mineralization that is unweathered.

8. DEPOSIT TYPE

The iron formation on the Property is iron formation of the Lake Superior type. Lake Superior-type iron formations consist of banded sedimentary rock composed principally of bands of iron oxides, magnetite and hematite within quartz (chert)-rich rock with variable amounts of silicate, carbonate and sulphide lithofacies. Such iron formations have been the principal sources of iron throughout the world (Gross, 1996). Table 8-1, after Eckstrand, Editor (1984), presents the salient characteristics of the Lake Superior-type iron deposit model.

Lithofacies that are not highly metamorphosed or altered by weathering and are fine grained are referred to as taconite.

Metamorphosed taconites are known as meta-taconite or itabirite (particularly if hematite-rich). The iron deposits in the Grenville part of the Labrador Trough in the vicinity of Wabush and Mont-Wright, operated by IOC (Rio Tinto), ArcelorMittal and Cliffs Natural Resources ("Cliffs") (Wabush Mine) are meta-taconite. The Bloom Lake iron deposit acquired with the recent purchase of Consolidated Thompson by Cliffs is also a meta-taconite. The iron formation on the Property is similarly Lake Superior-type meta-taconite.

For non-supergene-enriched iron formation to be mined economically, iron oxide content must be sufficiently high but also, the iron oxides must be amenable to concentration (beneficiation) and the concentrates produced must be low in deleterious elements such as silica, aluminum, phosphorus, manganese, sulphur and alkalis. For bulk mining, the silicate and carbonate lithofacies and other rock types interbedded within the iron formation must be sufficiently segregated from the iron oxides. Folding can be important for repeating iron formation and concentrating iron formation beds to create economic concentrations of iron.

Table 8-1: Deposit Model for Lake Superior-Type Iron Formation after Eckstrand (1984)

Commodities	Fe (Mn)
Examples: Canadian - Foreign	Knob Lake, Wabush Lake and Mont-Wright areas, Québec and Labrador - Mesabi Range, Minnesota; Marquette Range, Michigan; Minas Gerais area, Brazil.
Importance	Canada: the major source of iron. World: the major source of iron.
Typical Grade, Tonnage	Up to billions of tonnes, at grades ranging from 15 to 45% Fe, are averaging 30% Fe.
Geological Setting	Continental shelves and slopes possibly contemporaneous with offshore volcanic ridges. Principal development in middle Precambrian shelf sequences marginal to Archean cratons.
Host Rocks or Mineralized Rocks	Iron formations consist mainly of iron and silica-rich beds; common varieties are taconite, itabirite, banded hematite quartzite, and jaspilite; composed of oxide, silicate and carbonate facies and may also include sulphide facies. Commonly intercalated with other shelf sediments: black
Associated Rocks	Bedded chert and chert breccia, dolomite, stromatolitic dolomite and chert, black shale, argillite, siltstone, quartzite, conglomerate, red beds, tuff, lava, volcanoclastic rocks; metamorphic equivalents.
Form of Deposit, Distribution of Ore Minerals	Mineable deposits are sedimentary beds with cumulative thicknesses typically from 30 m to 150 m and strike lengths of several kilometres. In many deposits, repetition of beds caused by isoclinal folding or thrust faulting has produced widths that are economically mineable. Ore mineral distribution is largely determined by primary sedimentary deposition. Granular and oolitic textures are common.
Minerals: Principal Ore Minerals - Associated Minerals	Magnetite, hematite, goethite, pyrolusite, manganite, hollandite. Finely laminated chert, quartz, Fe-silicates, Fe-carbonates and Fe-sulphides; primary or metamorphic derivatives.
Age, Host Rocks	Precambrian, predominantly early Proterozoic (2.4 to 1.9 Ga).
Age, Ore	Syngenetic, same age as host rocks. In Canada, major deformation during Hudsonian and, in places, Grenvillian orogenies produced mineable thicknesses of iron formation.
Genetic Model	A preferred model invokes chemical, colloidal and possibly biochemical precipitates of iron and silica in euxinic to oxidizing environments, derived from hydrothermal effusive sources related to fracture systems and offshore volcanic activity. Deposition may be distal from effusive centres and hot spring activity. Other models derive silica and iron from deeply weathered land masses, or by leaching from euxinic sediments. Sedimentary reworking of beds is common. The greater development of Lake Superior-type iron formation in early Proterozoic time has been considered by some to be related to increased atmospheric oxygen content, resulting from biological evolution.
Ore Controls, Guides to Exploration	1. Distribution of iron formation is reasonably well known from aeromagnetic surveys. 2. Oxide facies is the most economically important, of the iron formation facies. 3. Thick primary sections of iron formation are desirable. 4. Repetition of favorable beds by folding or faulting may be an essential factor in generating widths that are mineable (30 to 150 m). 5. Metamorphism increases grain size, improves metallurgical recovery. 6. Metamorphic mineral assemblages reflect the mineralogy of primary sedimentary facies. 7. Basin analysis and sedimentation modeling indicate controls for facies development, and help define location and distribution of different iron formation facies.
Author	G.A. Gross

9. EXPLORATION

9.1 General

Historic exploration is summarized under the History section of the Report. Altius' initial exploration was in 2006, culminating in a diamond drilling program in 2008. Alderon conducted its first exploration program in the summer of 2010. WGM understands that no exploration has been conducted since 2012.

9.2 Altius Exploration Programs 2006 – 2009

Reconnaissance mapping and rock sampling commenced during the summer of 2006 and was completed during the 2007 field season. Ten (10) 2006 samples of outcrop and boulders were assayed at SGS Lakefield for major elements. Grab samples yielded iron values typical of oxide facies iron formation. Further outcrop sampling was completed during the 2008 program. A total of 63 rock samples were collected, 29 of which were for chemical analysis, while the remaining were collected for physical properties testing. The 2007 samples were sent to Activation Laboratories in Ancaster, Ontario and assayed for major elements, FeO and total sulphur. Nine (9) rock samples from the Mills Lake area returned Fe values ranging from 9.7% Fe to 43.6% Fe and manganese values ranging from 0.43% Mn to 13.87% Mn. From the Molar Lake area, five (5) rock samples were collected yielding 13.7% Fe to 23.6% Fe and 0.1% to 0.69% Mn. From the Elfie Lake area, two grab samples were collected that respectively returned assay results of 25.9% Fe and 0.95% Mn and 17.9% Fe and 1.07% Mn. From the Mart Lake area, one sample was collected that yielded 16.3% Fe and 0.15% Mn. From the Rose Lake area, a few outcrops over a strike length of approximately 430 m were grab sampled. Values ranged from 5.6% Fe with 9.73% Mn from a sample near the iron formation – Wishart Formation contact to 29.7% Fe with 1.05% Mn from a magnetite specularite sample of iron formation.

Altius' 2007 exploration program also included a high resolution helicopter airborne magnetic survey carried out by Mcphar Geosurveys Ltd. The purpose of the airborne survey was to acquire high resolution magnetic data to map the magnetic anomalies and geophysical characteristics of the geology. The survey covered one block. Flight lines were oriented northwest-southeast at a spacing of 100 m. Tie lines were oriented northeast-southwest at a spacing of 1,000 m. A total of 905 line kms of data were acquired. Data was acquired by using precision differential GPS positioning. The rock samples were collected from the Property and sent for physical properties testing to support interpretation of the airborne magnetic survey results.

The results of the 2007 exploration program were positive with rock samples returning favorable iron values and the airborne magnetic survey effectively highlighting the extent of the iron formation. Following the 2007 exploration program, licenses 013935M, 013937M, 010501M, 011927M, 012853M and 012854M were grouped to form license 15037M and licenses 14957M, 14962M, 14967M and 14968M were staked.

The 2008 exploration program on the Property consisted of physical properties testing of the rock samples collected in 2007, line cutting, a ground gravity and magnetic survey carried out by Géosig of Saint Foy, Québec, a high resolution satellite imagery survey (Quickbird), an integrated 3-D geological and geophysical inversion model and 6,129.49 m of diamond drilling in 25 holes. The drilling program was designed to test three known iron ore occurrences on the Property (namely Mills Lake, Mart Lake and Rose Lake) that were targeted through geological mapping and geophysics.

The ground gravity and total field magnetic surveys were conducted along 69.8 km of cut gridlines spaced from 200 m to 400 m apart and oriented northwest-southeast. Gravity surveying and high resolution positional data were collected at 25 m intervals. The magnetic survey stations were spaced at 12.5 m along the lines.

Mira Geoscience ("Mira") was contracted to create a 3-D geological and geophysical inversion model of the Property. Mira was provided with the geological cross sections, airborne and ground geophysics data and the physical rock properties from each of the different lithologies. The 3-D geological and geophysical model was completed to help with target definition and drillhole planning.

Drilling confirmed (see following sections in this Report) the presence of oxide-rich iron formation at the three iron occurrences and was successful in extending the occurrences along strike and at depth. Drilling was also fundamental in testing stratigraphy and structure to help refine the geological and structural models for each area to aid in drillhole targeting.

9.3 Alderon's Summer 2010 Exploration Program

The 2010 exploration program started on June 1st, 2010 and finished December 1, 2010. The program consisted mainly of a drilling program described under Drilling (Chapter 10), but also included an airborne geophysical survey covering the three licenses Alderon holds in Newfoundland and Labrador and the re-logging and lithology re-coding of Altius' 2008 drill core. The airborne geophysical survey consisted of 1,079 line kms of gravity and magnetic surveying covering a 130 km² area.

The geophysical survey measuring the gradient of the gravity field and magnetics was carried out by Bell Geospace Inc. ("BGI") of Houston, Texas and flown over the Property from November 8th through November 11, 2010 onboard a Cessna Grand Caravan. The crew and equipment were stationed in Wabush. The survey was flown in a north-south direction with perpendicular tie lines. Eighty five survey lines and 13 tie lines were flown. The survey lines were 100 m apart on the western side of the survey area, and 300 m apart on the eastern side. The tie lines were 1,000 m apart. The survey lines vary from 10.3 km to 12.4 km in length, and the tie lines varied in length from 5.5 km to 11.7 km.

The survey plan defines a flight path that maintains a constant distance from the ground for the entire length of each survey line. However, it is not always possible to maintain the constant clearance because of variations in terrain relief. Ground clearance does not vary greatly in this survey due to the lack of severe terrain features and ground clearance ranged from 60 m to 187 m.

Magnetic data was acquired with a cesium vapor sensor. A radar altimeter system is deployed to measure the distance between the airplane and the ground. Along with the plane's altitude acquired via GPS, radar altimetry data is used to produce a Digital Elevation Model ("DEM"). The full Tensor Gravity Gradiometry (Air "FTG") system contains three Gravity Gradient Instruments ("GGIs"), each consisting of two opposing pairs of accelerometers arranged on a rotating disc.

Processing of the gravity data includes line leveling, terrain correction and noise reduction. Measured free air and terrain corrected maps for each of the six tensor components are provided.

Minimal data correction is required for magnetics. The majority of erroneous data is removed by the compensation process that corrects the data for the effects of the aircraft, as heading and position changes, relative to the magnetic field. A base magnetometer was also used to record and remove the daily variations in the magnetic field due to regional factors. A lag correction is applied to correct the distance between the mag sensor and the GPS antenna. The lag correction is computed based on speed and distance to accurately shift the magnetic data to the GPS reference point and ensure that lines flown in opposite directions are not biased by the distance between the sensor and antennae. The earth's field is calculated and removed. Only minor line adjustments are required to remove any remnant errors that are apparent at line intersections. The data is then ready for reduction to the magnetic pole to approximate the anomaly directly over the causative body, and other derivative calculations to accentuate the anomalies.

9.4 Alderon's Winter 2011 Exploration Program

Alderon's winter 2011 program consisted of a drilling program on the Rose North deposit. Drilling started in early February and was completed on April 6. Alderon has also completed a LIDAR (Light Detection and Ranging) and air photo survey, however, this data has not been reviewed by WGM but it was used by Alderon to create a topographic surface for the mineral resource estimate and for subsequent mine design by BBA.

9.5 Alderon's 2011 - 2012 Exploration Program

Alderon's 2011-2012 exploration program was mostly a drilling program described in Chapter 10 of this Report. The program started in June 2011 and continued to April 30, 2012 with a break for freeze-up. Drilling comprised infill holes on both the Rose and Mills Lake areas plus geotechnical drillholes and holes for collection of sample for metallurgical testwork. Geological reconnaissance mapping was done in several areas south and east of the Rose deposit, principally for condemnation study around the areas proposed for the mine site civil works.

An aerial photography orthorectification LIDAR survey was flown over the Property in August-September 2011. Aéro-Photo (1961) Inc. of Québec, Qc performed the work. Imagery was to a resolution of 20 cm per pixel. Allnorth Land Surveyors' ("Allnorth") of Kamloops, B.C., participated in establishing ground location control. A follow-up flight over just the original Kami Property was completed in fall 2012 using the same 20 cm resolution in order to document the reclamation works conducted on the 2008-2012 drill areas.

10. DRILLING

10.1 Historic Drilling

In 1957, IOC remapped an area of 86.2 km² to the west of Long Lake on a scale of 1" = 1,000 ft. and test drilled shallow holes throughout the area through overburden cover to determine areas underlain by iron formation. Dip needle surveying served as a guide for determining the locations of iron formation in drift-covered areas.

According to Hird (1960), 272 holes aggregating a total of 7,985 m (26,200 ft.) were drilled during IOC's 1957 program. Approximately 66 of these holes were located on the property. Mathieson (1957) reported that there were no new deposits found as a result of the drilling, however, definite limits were established for the iron formation outcrops found during previous geological mapping.

In 1979, one diamond drillhole was drilled by LM&E near the north end of Elfie Lake. The hole (No. 57-1) was drilled vertically to a depth of 28 m (Grant, 1979) and did not encounter oxide iron formation. In 1983, as reported by Avison et al., 1984, LM&E collared a 51 m deep (168 ft.) diamond drillhole 137 m north of Elfie Lake (DDH No. 57-83-1). The drillhole encountered iron formation from 17 m to a depth of 51 m. Of this, however, only 2 m was oxide facies. Core recovery was very poor, (20%).

10.2 Altius 2008 Drilling Program

Altius' 2008 drilling program consisted of 25 holes totaling 6,046 m testing the Mills Lake, Mart Lake and Rose Lake iron occurrences (see Chapter 7). Aggregate drillhole lengths are revised slightly from previous reports and vary to some extent depending on what is included and revisions to individual depths depending on whether probe or logged depths are used. Descriptions of mineralization and estimated true widths are discussed under Mineralization (Chapter 7 of this Report). Drillhole locations and collar information are given in Table 10-1. Drilling was carried out between June and October by Lantech Drilling Services of Dieppe, New Brunswick, using a Marooka mounted JKS300 drill rig. A second, larger drill rig was added to the program in September, to help complete the program before freeze-up. The second rig was a skid mounted LDS1000 towed by a Caterpillar D6H dozer. Both drills were equipped for drilling BTW sized core. Drilling took place on a two-shift per day basis, 20 hours per day, and seven days per week. The remaining four hours were used up with travel to and from the drill site and shift change.

Table 10-1: Drilling Summary – Altius 2008 Program

Hole ID	Prospect	Easting	Northing	Elv	Start Date	End Date	Collar Azi	Collar Dip	Core Size	Depth
K-08-01	Rose Lake	633105	5855675.99	615.02	06/06/2008	06/06/2008	315	-45	BTW	275
K-08-02	Mills Lake	634452.91	5851805.11	635.49	11/11/2010	11/11/2010	240	-50	BTW	145.4
K-08-03	Mills Lake	634453.56	5851804.34	635.32	11/11/2010	11/11/2010	240	-90	BTW	186.9
K-08-04	Mills Lake	634987.31	5851195.09	588.34	30/06/2008	30/06/2008	240	-50	BTW	98
K-08-05	Mills Lake	634820.31	5851104.32	609	05/07/2008	05/07/2008	240	-90	BTW	57
K-08-06	Mills Lake	634568.42	5851419.46	627.57	08/07/2008	08/07/2008	240	-51	BTW	192.8
K-08-07	Mills Lake	634353.57	5852215.55	620.57	12/07/2008	12/07/2008	240	-51	BTW	178.4
K-08-08	Rose Lake	633374.31	5855436.56	626.87	20/07/2008	20/07/2008	315	-50	BTW	241
K-08-09	Rose Lake	633517.08	5855574	628.62	28/07/2008	28/07/2008	315	-51	BTW	317.8
K-08-10	Rose Lake	633658.52	5855708.95	636.94	02/08/2008	02/08/2008	315	-50	BTW	316
K-08-11	Rose Lake	632962.74	5855308.18	644.67	11/08/2008	11/08/2008	135	-50	BTW	38.4
K-08-11A	Rose Lake	632962.74	5855308.18	644.67	12/08/2008	12/08/2008	135	-50	BTW	280
K-08-12	Rose Lake	632622.64	5855634.83	585.84	28/08/2008	28/08/2008	135	-50	BTW	427.8
K-08-13	Mart Lake	633673.87	5854549.78	686.76	04/09/2008	04/09/2008	315	-50	BTW	192.5
K-08-14	Mart Lake	633552.83	5854432.87	684.88	08/09/2008	08/09/2008	315	-50	BTW	281
K-08-15	Rose Lake	632266.32	5855424.82	576.85	10/09/2008	10/09/2008	135	-50	BTW	316
K-08-16	Mart Lake	633221.92	5854610.32	677.22	16/09/2008	16/09/2008	315	-90	BTW	351
K-08-17	Rose Lake	632263.84	5855427.02	576.46	16/09/2008	16/09/2008	315	-50	BTW	208.8
K-08-18	Rose Lake	633160.58	5855951.69	592.08	22/09/2008	22/09/2008	135	-50	BTW	386.9
K-08-19	Mart Lake	633068.07	5854291	685.77	26/07/2010	26/07/2010	315	-50	BTW	334.8
K-08-20	Rose Lake	633303.64	5856075.9	601.4	30/09/2008	30/09/2008	135	-50	BTW	441
K-08-21	Mart Lake	633211.05	5854623.03	679.25	04/10/2008	04/10/2008	315	-50	BTW	333.2
K-08-22	Mart Lake	633214.49	5854139.41	658.72	11/10/2008	11/10/2008	315	-50	BTW	75
K-08-23	Mart Lake	633070.52	5854011.82	645.6	15/10/2008	15/10/2008	315	-50	BTW	64
K-08-24	Rose Lake	633333.89	5855191.54	630.36	01/10/2008	01/10/2008	315	-50	BTW	307.8
Total 25 Holes										6,046.5
Coordinates are UTM NAD83, Zone 19N										

10.3 Alderon 2010 Drilling Program

The 2010 drill program consisted of a total of eighty-two drillholes aggregating 26,145 m NQ diamond drilling. The objective of the program was to delineate an Inferred iron oxide Mineral Resource of 400-500 MT on two areas: the Rose Central and Mills Lake deposits. The drilling included testing the Rose North Lake zone, the South West Rose Lake zone and the Elfie Lake/South Rose zone. The 2010 program included: borehole geophysics on many of the 2008 and 2010 holes, detailed 3-D, differential global positioning system ("DGPS") surveying of 2008 and 2010 drillhole collars, and logging and sampling of drill core including the re-logging of 2008 drillholes.

Landdrill International Ltd. ("Landdrill") based in Notre-Dame-du-Nord, QC, was the Drill Contractor for the entire campaign. Throughout the campaign, between three and five diamond drill rigs were operating. Some rigs were brought in for special purposes, like a heli-supported drill for several holes on Rose North and a track-mounted drill to access an area with a restricted access permit. A total of eighty-two holes were collared, but only seventy-two holes were drilled to the desired depths, with the remaining holes being lost during casing or before reaching their target depth because of broken casing, detached rods, bad ground, etc. Table 10-2 provides a summary of 2010 drilling by target zone.

Table 10-2: 2010 Drilling Summary by Deposit or Zone

Deposit or Zone	Number of Holes	Metres
Rose Lake	56	20,410.6
Mills Lake	16	4,310.9
SW Rose	<u>10</u>	<u>1,423.9</u>
Total	82	26,145.3

Several Rose drillholes also tested the Rose North zone at depth, allowing for a preliminary evaluation.

The drill campaign consisted of three continuous, and at times, simultaneous phases of exploration:

1. The drilling began on the north-east extent of the Rose Central Lake trend (L22E) and progressed south-west along the established 200 m spaced northwest-southeast oriented gridlines to Section L8E. Each section was drilled and interpreted with the interpretation extrapolated and integrated into previous sections.

2. Towards the middle of the program, drilling expanded to test the Rose North and South-West Rose zones, also following 200 m spaced lines. This expansion was done by increasing the number of drills on the Property to allow focus to continue on the Rose Central Zone. The Rose North and South-West Rose zones were difficult to test due to the topography, thick overburden and swampy terrain.
3. The last phase of exploration focused on the Mills Lake deposit and utilized two drills (one heli-supported, the other self-propelled track driven) over eight weeks.

Drilling on the South-West Rose zone was limited to two cross sections. Drilling was difficult due to a combination of thick overburden (37-65 m vertical depth) with deep saprolitic weathering. Core recovery ranged from adequate to very poor. The weathering decreased at depths below 170 vertical metres, but most holes did not achieve that depth. Drilling on this target was suspended due to poor production.

Drilling on the Rose North zone was limited to two sites due to accessibility. The terrain overlying this target is swampy lowland surrounding a shallow lake. Several holes testing the Rose Central deposit were extended to test the deeper portions of this north zone and indicate this zone requires additional drilling and may significantly contribute to the overall Rose Lake tonnage. This target is best tested during a winter program when the area is frozen and more readily accessible.

Core recovery was generally very good throughout the drilling focused on the Rose and Mills Lake deposits and is not a factor of the Mineral Resource estimate. Core recovery is often poor for the drilling on the Rose North zone due to intensive weathering along fault systems. The South-West Rose zone is not part of the present Mineral Resource estimate.

The holes drilled in 2010 are listed in Table 10-3.

Table 10-3: Drilling Summary – Alderon 2010 Program

Hole ID	Prospect	Easting	Northing	Elv	Start	End	Collar	Collar	Core Size	Depth
					Date	Date	Azi	Dip		
K-10-25	Rose Lake	633293.96	5856085.98	598.85	01/06/2010	01/06/2010	315	-80	NQ	458
K-10-26	Rose Lake	633163.11	5855954.98	592.27	06/06/2010	06/06/2010	315	-80	NQ	323.4
K-10-27	Rose Lake	633326.87	5855774.48	617.87	07/06/2010	07/06/2010	315	-80	NQ	662.2
K-10-28	Rose Lake	632990.72	5855827.07	586.6	10/06/2010	10/06/2010	135	-80	NQ	623
K-10-29	Rose Lake	633167.99	5855949.06	592.9	14/06/2010	14/06/2010	135	-67	NQ	597
K-10-30	Rose Lake	633320.25	5855776.87	617.46	21/06/2010	21/06/2010	135	-65	NQ	191
K-10-31	Rose Lake	633107.81	5855672.11	615.03	24/06/2010	24/06/2010	135	-45	NQ	38
K-10-32	Rose Lake	633057.57	5855759.87	600.61	25/06/2010	25/06/2010	135	-50	NQ	212.3
K-10-33	Rose Lake	633000.06	5855817.6	588.67	27/06/2010	27/06/2010	135	-45	NQ	366
K-10-34	Rose Lake	632947.53	5855585.44	627.82	27/06/2010	27/06/2010	315	-80	NQ	507
K-10-35	Rose Lake	633261.49	5855835.28	609.56	02/07/2010	02/07/2010	135	-50	NQ	212
K-10-36	Rose Lake	632898.35	5855913.52	576.37	03/07/2010	03/07/2010	135	-50	NQ	40
K-10-37	Rose Lake	632916.5	5855899.24	577.58	04/07/2010	04/07/2010	135	-45	NQ	60
K-10-37A	Rose Lake	632916.4	5855899.37	577.85	06/07/2010	06/07/2010	135	-50	NQ	609
K-10-38	Rose Lake	632617.51	5855641.1	584.83	05/07/2010	05/07/2010	135	-70	NQ	444.7
K-10-39	Rose Lake	632943.93	5855589.25	627.77	06/07/2010	06/07/2010	315	-60	NQ	97.6
K-10-39A	Rose Lake	632943.93	5855589.25	627.77	09/07/2010	09/07/2010	315	-60	NQ	517.7
K-10-40	Rose Lake	632672.64	5855580.14	600.97	14/07/2010	14/07/2010	135	-45	NQ	314
K-10-41	Rose Lake	632769.78	5855482.37	635.21	17/07/2010	17/07/2010	135	-75	NQ	141.1
K-10-42	Rose Lake	632807.42	5855724.79	587.43	18/07/2010	18/07/2010	135	-55	NQ	409.7
K-10-43	Rose Lake	632657.31	5855603.34	595	18/07/2010	18/07/2010	135	-60	NQ	183.6
K-10-44	Rose Lake	632769.67	5855483.31	635.02	20/07/2010	20/07/2010	315	-80	NQ	140.6
K-10-45	Rose Lake	632615.89	5855643.13	584.71	22/07/2010	22/07/2010	135	-80	NQ	528
K-10-46	Rose Lake	632675.91	5855577.03	601.29	21/07/2010	21/07/2010	135	-65	NQ	704
K-10-47	Rose Lake	632808.04	5855724.17	587.67	26/07/2010	26/07/2010	135	-82	NQ	609.2
K-10-48	Rose Lake	632386.05	5855601.01	574.67	03/08/2010	03/08/2010	135	-45	NQ	596.2
K-10-49	Rose Lake	632675.88	5855575.38	601.5	03/08/2010	03/08/2010	315	-45	NQ	672
K-10-50	Rose Lake	632801.23	5855732.06	586.12	04/08/2010	04/08/2010	315	-75	NQ	77
K-10-51	Rose Lake	632748.92	5855788.74	579.83	06/08/2010	06/08/2010	315	-50	NQ	278
K-10-52	Rose Lake	632612.9	5855371.98	667.44	14/08/2010	14/08/2010	315	-70	NQ	533
K-10-53	Rose Lake	632385.55	5855601.48	574.59	14/08/2010	14/08/2010	135	-60	NQ	449
K-10-54	Rose Lake	632257.5	5855434.12	575.46	10/08/2010	10/08/2010	315	-45	NQ	196
K-10-55	Rose Lake	632573.32	5855115.37	619.66	27/08/2010	27/08/2010	315	-50	NQ	560.5
K-10-56	Rose Lake	632466.66	5855222.28	631.63	28/08/2010	28/08/2010	315	-50	NQ	324
K-10-57	Rose Lake	632304.06	5855092.34	607.24	31/08/2010	31/08/2010	315	-55	NQ	362.3
K-10-58	Rose Lake	632384.85	5855007.48	593.11	31/08/2010	31/08/2010	315	-50	NQ	65
K-10-59	Rose Lake	632520.28	5854863.85	607.95	01/09/2010	01/09/2010	315	-50	NQ	569
K-10-60	Rose Lake	632787.91	5854897.21	613.81	04/09/2010	04/09/2010	315	-55	NQ	131
K-10-61	Rose Lake	632521.15	5855166.73	625.87	08/09/2010	08/09/2010	315	-50	NQ	377
K-10-62	Rose Lake	632955.98	5855013.36	616.9	07/09/2010	07/09/2010	315	-80	NQ	24
K-10-62A	Rose Lake	632955.98	5855013.36	616.9	08/09/2010	08/09/2010	315	-80	NQ	235
K-10-63	Rose Lake	632955.25	5855014.04	617.04	11/09/2010	11/09/2010	315	-45	NQ	293.1
K-10-64	Rose Lake	632867.99	5855387.91	643.9	13/09/2010	13/09/2010	315	-60	NQ	521.5
K-10-65	SW Rose	631195.7	5854526.62	627.34	22/09/2010	22/09/2010	315	-80	NQ	150
K-10-66	Rose Lake	632942.51	5855587.48	627.53	19/09/2010	19/09/2010	315	-45	NQ	708
K-10-67	Rose Lake	632700.9	5856247.17	573.99	24/09/2010	24/09/2010	315	-45	NQ	165
K-10-68	Rose Lake	632955.79	5855009.24	617.69	22/09/2010	22/09/2010	135	-45	NQ	234.6
K-10-69	Rose Lake	633414.31	5855677.34	625	26/09/2010	26/09/2010	315	-45	NQ	159
K-10-69A	Rose Lake	633427.8	5855665.53	625.55	27/09/2010	30/09/2010	315	-45	NQ	720
K-10-70	Rose Lake	632611.41	5855369.2	667.58	27/09/2010	27/09/2010	315	-45	NQ	788.6
K-10-71	Rose Lake	633526.06	5855844.3	629.69	27/09/2010	27/09/2010	315	-50	NQ	141
K-10-72	SW Rose	631194.86	5854527.57	627.34	29/09/2010	29/09/2010	315	-45	NQ	174
K-10-73	Mills Lake	634567.65	5851420.83	627.63	30/09/2010	30/09/2010	60	-50	NQ	351.9
K-10-74	Rose Lake	631954.54	5855502.95	578.83	03/10/2010	03/10/2010	315	-45	NQ	201
K-10-75	SW Rose	631187.71	5854532.95	628.32	06/10/2010	06/10/2010	135	-45	NQ	94.5
K-10-76	Rose Lake	633527.66	5855842.63	629.94	06/10/2010	06/10/2010	315	-50	NQ	357
K-10-77	Mills Lake	634566.6	5851420.2	627.5	06/10/2010	06/10/2010	60	-80	NQ	236
K-10-78	Rose Lake	631955.22	5855502.33	578.66	08/10/2010	08/10/2010	315	-70	NQ	189.3
K-10-79	SW Rose	631301.32	5854416.66	613.58	11/10/2010	11/10/2010	315	-45	NQ	147
K-10-80	Mills Lake	634716.34	5851277.28	613.85	11/10/2010	11/10/2010	240	-45	NQ	218
K-10-81	SW Rose	631300.56	5854417.46	613.61	17/10/2010	17/10/2010	315	-80	NQ	10
K-10-81A	SW Rose	631300.56	5854417.46	613.61	18/10/2010	18/10/2010	315	-80	NQ	384.4



Hole ID	Prospect	Easting	Northing	Elv	Start	End	Collar	Collar	Core Size	Depth
					Date	Date	Azi	Dip		
K-10-82	Mills Lake	634717.8	5851278	613.65	14/10/2010	14/10/2010	240	-80	NQ	230
K-10-83	Rose Lake	633288.41	5855526.75	625.31	15/10/2010	15/10/2010	315	-45	NQ	669.4
K-10-84	Rose Lake	633659.98	5855711.68	636.92	18/10/2010	18/10/2010	315	-45	NQ	696
K-10-85	Mills Lake	634799.01	5851314.63	607.22	21/10/2010	21/10/2010	60	-80	NQ	317
K-10-86	SW Rose	631029.3	5854111.34	623	24/10/2010	24/10/2010	315	-80	NQ	66
K-10-86A	SW Rose	631029.3	5854111.34	620	24/10/2010	24/10/2010	315	-75	NQ	69
K-10-86B	SW Rose	631029.3	5854111.34	623	26/10/2010	26/10/2010	315	-85	NQ	155
K-10-87	Mills Lake	634886.18	5851142.5	601.61	29/10/2010	29/10/2010	240	-75	NQ	81.7
K-10-88	SW Rose	630944.3	5854203.34	625	31/10/2010	31/10/2010	315	-70	NQ	174
K-10-89	Mills Lake	634354.47	5852216.17	620.64	10/11/2010	29/11/2010	240	-70	NQ	248
K-10-90	Mills Lake	634451.77	5852022.48	617.98	01/11/2010	01/11/2010	240	-50	NQ	185
K-10-91	Mills Lake	634356.25	5852216.81	620.67	05/11/2010	05/11/2010	60	-60	NQ	284
K-10-92	Mills Lake	634458.68	5852026.93	617.17	04/11/2010	04/11/2010	60	-55	NQ	408.3
K-10-93	Rose Lake	633194.2	5855330.45	636.8	07/11/2010	08/11/2010	315	-45	NQ	129
K-10-94	Mills Lake	634553.31	5851867.33	616.16	12/11/2010	12/11/2010	60	-80	NQ	200
K-10-94A	Mills Lake	634553.52	5851867.7	616.16	13/11/2010	13/11/2010	60	-75	NQ	309
K-10-95	Mills Lake	634522.52	5851628.21	626.19	12/11/2010	12/11/2010	240	-50	NQ	177
K-10-96	Mills Lake	634526.02	5851629.9	625.79	15/11/2010	15/11/2010	60	-80	NQ	204
K-10-97	Mills Lake	634602.72	5851687.33	615.05	19/11/2010	19/11/2010	60	-60	NQ	429.9
K-10-98	Mills Lake	634553.94	5851867.97	616.27	20/11/2010	20/11/2010	60	-55	NQ	431
Total 82 Holes										26,145.3
Coordinates are UTM NAD83, Zone 19N										



10.4 Alderon 2011 Winter Drilling Program

The program began in early February and was completed in the middle of April. Total drilling, summarized in Table 10-, aggregated 4,625 m in twenty-nine drillholes, including several holes that were lost and had to be re-drilled. All drilling except for one hole was done on the Rose North deposit. This one hole, K-11-117–336 m was completed on the Rose Central deposit and was for the purpose of collecting a sample for metallurgical testwork. It was a twin of K-10-42. Landdrill was again the drilling contractor.

Core recovery continued to be poor for the winter 2011 near-surface drilling on the Rose North Zone due to intensive weathering along fault systems. The poor core recovery is a factor influencing categorization of the Rose Mineral Resources, particularly in the Limonite zone (see Section 14.7.4).

Table 10-4: Drilling Summary – Alderon 2011 Winter Program

Hole ID	Prospect	Easting	Northing	Elv	Start	End	Collar	Collar	Core Size	DEPTH
					Date	Date	Azi	Dip		
K-11-100	North Rose	632468.13	5856073.27	573.73	09/02/2011	09/02/2011	307	-45	HQ	34.5
K-11-100A	North Rose	632468.07	5856073.37	573.85	09/02/2011	09/02/2011	315	-50	NQ	24
K-11-100B	North Rose	632468.07	5856073.37	573.85	10/02/2011	10/02/2011	307	-45	HQ	132
K-11-101	North Rose	632032.97	5855655.29	574.82	14/02/2011	14/02/2011	312	-45	HQ	164
K-11-102	North Rose	632577.4	5855957.22	572.43	21/02/2011	21/02/2011	312	-50	HQ	308
K-11-103	North Rose	632431.56	5855819.73	571.96	16/02/2011	16/02/2011	315	-50	HQ	124.5
K-11-104	North Rose	632022.56	5855401.55	572.26	18/02/2011	18/02/2011	311	-50	HQ/NQ	326
K-11-105	North Rose	632301.3	5855685.34	527.2	12/04/2011	12/04/2011	315	-50	HQ	45
K-11-105B	North Rose	632302.3	5855686.34	572.2	25/02/2011	25/02/2011	315	-50	HQ	91
K-11-105C	North Rose	632303.3	5855687.34	572.2	12/04/2011	12/04/2011	315	-50	NQ	21
K-11-105D	North Rose	632303.3	5855687.34	572.2	04/03/2011	04/03/2011	315	-47	HQ/NQ	139
K-11-106	North Rose	631894.97	5855537.15	583.66	03/03/2011	03/03/2011	307	-45	HQ	172
K-11-107	North Rose	632195.41	5855808.65	573.48	05/03/2011	05/03/2011	310	-45	HQ	166.3
K-11-108	North Rose	632236.1	5856302.48	586.31	03/03/2011	03/03/2011	131	-45	HQ	229.8
K-11-109	North Rose	632413.31	5855843.34	571.4	10/03/2011	10/03/2011	315	-50	HQ	225
K-11-110	North Rose	632142.3	5855543.34	571.9	16/03/2011	16/03/2011	315	-50	HQ	283.2
K-11-111	North Rose	632324.3	5855674.34	572.2	21/03/2011	21/03/2011	315	-50	HQ/NQ	210
K-11-112	North Rose	632227.59	5856309.08	587.07	12/04/2011	12/04/2011	135	-45	NQ	30
K-11-112A	North Rose	632227.46	5856309.26	587.33	03/04/2011	03/04/2011	129	-45	HQ	219
K-11-113	North Rose	632012.13	5855991	596.55	31/03/2011	31/03/2011	136	-50	NQ	216

Hole ID	Prospect	Easting	Northing	Elv	Start	End	Collar	Collar	Core Size	DEPTH
					Date	Date	Azi	Dip		
K-11-114	North Rose	632677.68	5856303.45	573.37	12/04/2011	12/04/2011	314	-45	NQ	27
K-11-114A	North Rose	632677.79	5856303.37	573.72	04/04/2011	04/04/2011	315	-45	NQ	106
K-11-114B	North Rose	632677.79	5856303.37	573.72	10/04/2011	10/04/2011	315	-60	NQ	50
K-11-114C	North Rose	632677.87	5856303.16	573.23	10/04/2011	10/04/2011	319	-58	NQ	50
K-11-114D	North Rose	632680.87	5856304.26	573.14	12/04/2011	12/04/2011	316	-50	NQ	115
K-11-115	North Rose	632861.3	5856122.18	572.46	04/04/2011	04/04/2011	314	-45	HQ	417
K-11-116	North Rose	632125.38	5856076.73	590.62	07/04/2011	07/04/2011	136	-50	HQ/NQ	192
K-11-117	North Rose	632807.51	5855718.76	587.71	10/04/2011	10/04/2011	135	-45	NQ	336
K-11-99	North Rose	632309.52	5855947.97	574.34	09/02/2011	09/02/2011	316	-45	HQ	171.7
Total 29 Holes										4,625
Coordinates are UTM NAD83, Zone 19N										

10.5 Alderon Summer 2011 - 2012 Drilling Program

The summer 2011-2012 program started in June 2011 and continued through to the end of April 2012. The holes were drilled throughout the Rose Lake area and a number of holes were also completed on the Mills Lake deposit. Total exploration drilling aggregated to one hundred exploration drillholes aggregating 29,668 m. An additional forty-six geotechnical holes under Stantec's management, including several abandoned drillholes were drilled for pit slope design and general site planning purposes. Four additional holes of the KXN-series were drilled from the north end of Mills Lake north towards the northern boundary of the Kami Property for condemnation purposes.

The purpose of the 2011-2012 drilling program was to advance the Project to feasibility stage by upgrading the classification of Mineral Resources and to provide more information for mine planning and metallurgical testwork. No additional exploration drilling has been completed after this program.

Table 10-5 provides a summary of the summer 2011-2012 Exploration Program holes by mineralized zone and Table 10-6 lists all of the exploration drillholes. Drilling was done by both Cabo Drilling Corp. out of its Montreal office (Mills Lake deposit) and Major Drilling International Inc., based in Sudbury, ON (Rose deposit & KXN holes).

WGM understands that core recoveries for the Rose North zone were better for the summer 2011–2012 program than for the winter 2011 and 2010 programs. Elsewhere, core recoveries were excellent, as was typically the case.

Table 10-5: Summary of Summer Exploration 2011-2012 Drilling

Prospect	Count Of Hole ID	Sum Of Depth
Mills Lake	18	2,844.4
Rose North	46	13,873.5
Rose Central	33	12,333.2
Rose Lake	4	617
Total	100	29,668.2

Table 10-6: Drilling Summary – Summer 2011-2012 Exploration Drillholes

Hole ID	Prospect	Easting	Northing	Elv	Start	End	Collar	Collar	Core	Depth
					Date	Date	Azi	Dip	Size	(m)
K-11-118	Mills Lake	634671.99	5851594.44	603.9	15/06/2011	15/06/2011	240	-55	NQ	199
K-11-119	Mills Lake	634474.08	5851451.66	627.52	11/06/2026	11/06/2026	245	-55	NQ	95.2
K-11-120	Mills Lake	634555.96	5851516.89	619.46	27/06/2011	27/06/2011	240	-50	NQ	144.6
K-11-121	Mills Lake	634519.54	5851743.09	628.86	02/07/2011	02/07/2011	240	-52		36
K-11-121A	Mills Lake	634519.31	5851743.33	628.86	05/07/2011	05/07/2011	240	-52	NQ	138.1
K-11-122	Mills Lake	634556.69	5851517.42	621.22	10/07/2011	10/07/2011	0	-90	HQ	20.9
K-11-122A	Mills Lake	634556.69	5851517.2	621.21	11/07/2011	11/07/2011	0	-90	HQ	160
K-11-123	Mills Lake	634680.83	5851838.91	603.97	24/07/2011	24/07/2011	240	-55	HQ	204.5
K-11-124	Mills Lake	634522.64	5851744.68	628.52	18/07/2011	18/07/2011	63	-80	NQ	155
K-11-125	Mills Lake	634730.95	5851376.98	608.71	26/07/2011	26/07/2011	245	-58	HQ	234.2
K-11-126	Mills Lake	634475.68	5851452.45	627.56	25/07/2011	25/07/2011	135	-78	NQ	140
K-11-127	Rose Cntrl	633500.57	5856200.31	606.35	28/07/2011	28/07/2011	135	-60	HQ	517
K-11-128	North Rose	633325.31	5855645.34	618.55	29/07/2011	29/07/2011	135	-70	HQ	271
K-11-129	Mills Lake	634633.51	5851311.89	620.28	15/08/2011	15/08/2011	245	-54	NQ	176
K-11-130	Rose Cntrl	633499.21	5855712.63	629.6	04/08/2011	04/08/2011	315	-70	HQ	500.8
K-11-131	Rose Cntrl	632814.71	5855824.61	580.29	11/08/2011	11/08/2011	130	-50	HQ/NQ	576
K-11-132	Mills Lake	634612.35	5852004.1	605.09	12/08/2011	12/08/2011	240	-65	HQ	236.5
K-11-133	Rose Cntrl	633456.65	5856109.23	612.19	07/08/2011	07/08/2011	135	-60	HQ	426.9
K-11-134	Mills Lake	634929.91	5851263.21	591.07	15/08/2011	15/08/2011	245	-54	HQ	203
K-11-135	Rose Cntrl	633498.36	5855711.48	629.76	14/08/2011	14/08/2011	225	-50	HQ	248
K-11-136	Rose Cntrl	633364.89	5856104.12	604.86	17/08/2011	17/08/2011	135	-55	HQ	549.5
K-11-137	Rose Cntrl	633577.27	5855699.53	633.77	19/08/2011	19/08/2011	315	-60	HQ	539
K-11-138	Mills Lake	634480.7	5851934.29	619.67	24/08/2011	24/08/2011	60	-84	HQ	212.4
K-11-139	Mills Lake	634729.45	5851176.91	612.42	31/08/2011	31/08/2011	240	-80	NQ	176
K-11-140	Rose Cntrl	633647.61	5855740.52	637.11	31/08/2011	31/08/2011	315	-58	HQ	500
K-11-141	Mills Lake	634476.53	5851932.35	620.21	10/09/2011	10/09/2011	240	-58	HQ	143
K-11-142	Rose Cntrl	632610.96	5855627.03	585.89	04/09/2011	04/09/2011	135	-55	HQ	533
K-11-143	Rose Cntrl	633245.54	5856021.59	595.87	02/09/2011	02/09/2011	135	-55	HQ	536
K-11-144	Mills Lake	634728.82	5851176.46	612.49	05/09/2011	05/09/2011	245	-50	NQ	170
K-11-145	Rose Cntrl	633697.35	5855727.11	633.79	11/09/2011	11/09/2011	315	-75	HQ	377
K-11-146	Rose Cntrl	633220.19	5855954.57	597.98	16/09/2011	16/09/2011	135	-70	HQ	473
K-11-147	Rose Cntrl	633645.82	5855612.11	631.8	18/09/2011	18/09/2011	315	-65	HQ	365
K-11-148	North Rose	632539.28	5855607.6	582.68	20/09/2011	20/09/2011	315	-55	HQ/NQ	597
K-11-149	Rose Cntrl	633547.62	5855520.57	627.49	24/09/2011	24/09/2011	315	-65	HQ	307
K-11-150	Rose Cntrl	633169.69	5855894.86	596.83	28/09/2011	28/09/2011	135	-70	HQ	461
K-11-151	Rose Lake	633624.47	5855422.91	629.98	30/09/2011	30/09/2011	315	-54	HQ	299
K-11-152	North Rose	631839.29	5855035.56	585.56	10/10/2011	10/10/2011	315	-58	HQ	174
K-11-153	Rose Lake	633332.87	5855309.64	628.85	07/10/2011	07/10/2011	315	-68	HQ	196
K-11-154	Rose Lake	632415.23	5855576.79	578.84	12/10/2011	12/10/2011	315	-55	HQ	80
K-11-155	Rose Cntrl	633163.52	5855329.96	638.08	13/10/2011	13/10/2011	315	-60	HQ	131
K-11-156	Rose Cntrl	633207.53	5855783.91	610.02	14/10/2011	14/10/2011	135	-57	HQ	156
K-11-157	North Rose	631792.97	5855215.7	592.37	21/10/2011	31/10/2011	315	-60	HQ	289.4
K-11-158	North Rose	631858.37	5855158.35	585.7	21/10/2011	21/10/2011	315	-65	HQ	169.2
K-11-159	Rose Cntrl	633000.63	5855374.24	640.42	16/10/2011	05/11/2011	315	-60	HQ	620
K-11-160	Rose Cntrl	633027.96	5855900.75	580.19	18/10/2011	02/11/2011	135	-54	HQ	512
K-11-161	Rose Cntrl	632435.9	5855552.81	583.97	18/10/2011	09/11/2011	315	-55	HQ	671
K-11-162	North Rose	631938.18	5855374.78	576.53	31/10/2011	05/11/2011	315	-52	HQ	241
K-11-163	North Rose	632293.33	5855383.74	584.42	05/11/2011	19/11/2011	315	-50	HQ	585
K-11-164	North Rose	632005.27	5855302.08	573.18	16/11/2011	04/12/2011	315	-65	HQ	377
K-11-165	North Rose	632834.86	5855896.28	577.66	07/11/2011	24/11/2011	315	-60	HQ	512
K-11-166	Rose Cntrl	632992.61	5855179.49	646.56	14/11/2011	10/12/2011	315	-57	HQ	587
K-11-167	North Rose	631868.87	5855289.62	583.81	16/11/2011	21/11/2011	315	-52	HQ	231.2
K-11-168	Rose Cntrl	632431.46	5855151.29	622.56	14/11/2011	21/11/2011	315	-50	HQ	328
K-11-169	Rose Cntrl	633075.71	5856027.83	576.17	26/11/2011	29/11/2011	135	-55	HQ	96
K-11-170	Rose Cntrl	633102.39	5855974.27	582.47	04/12/2011	10/12/2011	135	-62	HQ	161.7
K-11-171	Rose Cntrl	633189.84	5855898.74	598.4	26/11/2011	03/12/2011	135	-50	HQ	311
K-11-172	Rose Cntrl	633338.08	5855879.66	615.42	04/12/2011	10/12/2011	135	-60	HQ	287
K-12-173	North Rose	632209.96	5855313.14	583.19	12/01/2012	17/01/2012	315	-65	HQ	224
K-12-174	Rose Cntrl	632870.44	5855219.57	633.81	12/01/2012	12/02/2012	315	-55	HQ	414
K-12-175	North Rose	632345.66	5855449.13	583.41	12/01/2012	25/01/2012	315	-50	HQ	323
K-12-176	North Rose	632782.31	5855752.34	580	14/01/2012	17/01/2012	315	-48	HQ	48
K-12-176A	North Rose	632754.1	5855766.14	581.7	18/01/2012	09/02/2012	315	-55	HQ	596.5

Hole ID	Prospect	Easting	Northing	Elv	Start	End	Collar	Collar	Core	Depth
					Date	Date	Azi	Dip	Size	(m)
K-12-177	North Rose	632644.9	5855717.03	580.71	13/01/2012	01/02/2012	315	-52	HQ	561
K-12-178	Rose Cntrl	632343.66	5855177.22	618.71	15/01/2012	04/02/2012	315	-50	HQ	294
K-12-179	North Rose	632209.84	5855313.3	580.91	17/01/2012	14/02/2012	315	-53	HQ	546
K-12-180	Rose Cntrl	632329.3	5855021.34	610	30/01/2012	04/02/2012	315	-55	HQ	35
K-12-181	North Rose	632532.31	5855859.34	578	04/02/2012	10/03/2012	315	-55	HQ	69
K-12-181A	North Rose	632532.31	5855859.34	578	10/03/2012	14/03/2012	315	-55	HQ	1.5
K-12-182	North Rose	632487.3	5855719.93	573.28	08/02/2012	03/03/2012	315	-50	HQ	456
K-12-183	North Rose	632365.72	5855066.11	609.98	07/02/2012	20/02/2012	315	-55	HQ	360.2
K-12-184	North Rose	632687.34	5855972.31	573.65	15/02/2012	02/03/2012	315	-60	HQ	479
K-12-185	North Rose	632846.18	5856006.45	573.33	17/02/2012	22/02/2012	315	-60	HQ	126
K-12-185A	North Rose	632854.91	5855997.95	573.18	23/02/2012	12/03/2012	315	-60	HQ	513
K-12-186	North Rose	632366.38	5855619.99	573.22	17/02/2012	14/03/2012	315	-50	HQ	423
K-12-187	North Rose	632337.75	5855515.72	575.84	17/02/2012	14/03/2012	315	-55	HQ	522
K-12-188	North Rose	632332.67	5855830.35	576.58	22/02/2012	02/03/2012	315	-50	HQ	267
K-12-189	North Rose	632192.89	5855781.25	572.83	06/03/2012	15/03/2012	315	-70	HQ	258
K-12-190	North Rose	632810.93	5856113.5	573.15	06/03/2012	14/03/2012	270	-60	HQ	224
K-12-191	North Rose	632581.21	5856068.92	572	16/03/2012	24/03/2012	315	-58	HQ	246
K-12-192	North Rose	632441.87	5855923.68	572.77	15/03/2012	23/03/2012	315	-50	HQ	253
K-12-193	North Rose	632687.51	5856133.65	572.76	15/03/2012	22/03/2012	315	-55	HQ	299
K-12-194	North Rose	632168.47	5855238.7	581.27	17/03/2012	27/03/2012	270	-60	HQ	300
K-12-195	North Rose	632132.32	5855725.83	572.85	26/03/2012	03/04/2012	315	-60	HQ	200
K-12-196	North Rose	632623.9	5855903.97	574.13	26/03/2012	03/04/2012	315	-65	HQ	124
K-12-196A	North Rose	632623.1	5855904.9	574.14	04/04/2012	22/04/2012	315	-65	HQ	461
K-12-197	North Rose	632727.16	5856224.13	572.75	24/03/2012	31/03/2012	315	-52	HQ	260
K-12-198	North Rose	632181.72	5855923.64	575.69	27/03/2012	04/04/2012	315	-70	HQ	134.5
K-12-199	North Rose	632586.11	5856237.4	574.92	25/03/2012	05/04/2012	315	-65	HQ	144
K-12-200	North Rose	632168.3	5855238.34	581.26	27/03/2012	21/04/2012	315	-52	HQ	550
K-12-201	North Rose	632692.94	5856399.53	571.83	01/04/2012	05/04/2012	315	-60	HQ	69
K-12-202	North Rose	632039.84	5855549.35	574.38	04/04/2012	11/04/2012	315	-55	HQ	219
K-12-204	North Rose	632427.62	5856106.84	574.1	05/04/2012	08/04/2012	315	-70	HQ	96
K-12-205	Rose Lake	632408.66	5856144.39	573.73	08/04/2012	13/04/2012	354	-55	NQ	42
K-12-206	North Rose	632423.45	5855681.29	572.89	10/04/2012	23/04/2012	315	-50	HQ	413
K-12-207	North Rose	632016.27	5855472.05	574.22	12/04/2012	20/04/2012	315	-65	HQ	345
K-12-208	North Rose	631941.13	5855617.85	582.59	12/04/2012	16/04/2012	315	-70	HQ	179
K-12-209	Rose Cntrl	632549.55	5855253.65	638.94	16/04/2012	26/04/2012	315	-53	HQ	244
K-12-210	North Rose	631817.14	5855493.84	596.57	17/04/2012	22/04/2012	315	-65	HQ	137
K-12-211	Rose Cntrl	632162.84	5855059.71	583.68	23/04/2012	29/04/2012	315	-52	HQ	138.4
K-12-212	Rose Cntrl	632549.68	5855623.26	581.94	21/04/2012	30/04/2012	180	-50	HQ	263
K-12-213	Rose Cntrl	632230.35	5855150.06	594.97	23/04/2012	28/04/2012	315	-55	HQ	175
Total 100 Holes										29,668.2
Coordinates are UTM NAD83, Zone 19N										

The geotechnical boreholes listed in Table 10-7 were completed as part of the Overburden Pit-Slope design program. The drillholes listed in Table 10-8 were part of the Site-Wide Geotechnical Feasibility Study to provide a general overview of the site. Both components were managed by Stantec. The drilling was completed by Lantech and all of the geotechnical drillholes were vertical. This stage of the site-wide geotechnical investigation was completed in the fall of 2011 and covered five broad areas based on the following infrastructure groupings: crusher area, access road area, process plant area, rail loop and tailings impoundment.

Additional stages of field investigations in support of detailed design are ongoing. Preliminary field data gathered during these investigations has been utilized in support of the Feasibility Study for other Project tasks. These tasks included the Tailings and Waste Rock Management feasibility level design and the site location optimization and foundation design for the crusher and process plant information. These Stantec holes penetrated 5 m into bedrock. These rock cores were logged by Alderon's exploration staff following normal protocols providing geological mapping information in areas of the Property with very little outcrop exposure.

Table 10-7: Drilling Summary – Overburden Pit-Slope Design Program

Hole ID	Easting	Northing	Elv	Start Date	End Date	Core Size	Depth (m)	Comments
ROB-11-01A	632960.00	5856137.21	571.16	15-Oct-11	15-Oct-11	NQ	50.90	
ROB-11-01B	632959.41	5856137.38	571.16	15-Oct-11	15-Oct-11		0	Nested piezometer
ROB-11-02	632806.16	5856396.96	569.00	21-Oct-11	21-Oct-11		25.91	
ROB-11-03	632664.15	5856508.36	576.07	22-Oct-11	22-Oct-11		23.65	
ROB-11-04	632174.85	5856405.10	595.10	25-Oct-11	25-Oct-11		24.38	
ROB-11-05A	631856.57	5856183.12	629.00	25-Oct-11	25-Oct-11		19.58	
ROB-11-06	631514.52	5855592.14	653.32	25-Oct-11	25-Oct-11		13.72	
ROB-11-07	631706.96	5855027.57	600.33	26-Oct-11	26-Oct-11		60.05	
ROB-11-08	631993.67	5855014.80	579.20	26-Oct-11	26-Oct-11		28.96	
ROB-11-09	632254.41	5854883.95	589.70	26-Oct-11	26-Oct-11		30.48	
ROB-11-10	632690.36	5854892.26	617.29	01-Nov-11	01-Nov-11	HQ	7.62	
ROB-11-11A	632955.38	5854998.09	618.39	26-Oct-11	26-Oct-11		5.82	
ROB-11-11B	632955.38	5854998.09	618.39	29-Oct-11	29-Oct-11	HQ	0	Nested piezometer
ROB-11-12	633286.28	5855172.30	631.15	29-Oct-11	29-Oct-11	HQ	7.47	
ROB-11-13A	633820.97	5855457.83	633.20	26-Oct-11	26-Oct-11		15.24	
ROB-11-13B	633823.97	5855457.83	633.20	26-Oct-11	26-Oct-11		0	Nested piezometer
ROB-11-14	633912.93	5855987.07	605.80	26-Oct-11	26-Oct-11		9.14	
ROB-11-15	633514.81	5856372.84	598.60	26-Oct-11	26-Oct-11		8.97	
ROB-11-16	633255.27	5856318.82	571.24	29-Oct-11	29-Oct-11	HQ	16.51	
ROB-11-17	632814.92	5855818.98	580.75	15-Oct-11	15-Oct-11	NQ	47.85	
ROB-11-18	632235.30	5855896.41	575.17	28-Oct-11	28-Oct-11		30.48	
ROB-11-19	632386.31	5855601.34	574.40	29-Oct-11	29-Oct-11		14.96	
ROB-11-20	633298.49	5855771.52	616.80	29-Oct-11	29-Oct-11	HQ	15.11	
Total 23 Holes							456.80 m	

Table 10-8: Drilling Summary – Feasibility Level Site-Wide Geotechnical Program

Hole ID	Easting	Northing	Elev	Date Start	Date End	Hole Depth (m)	Area
BH-GE-01	634018.96	5856263.23	618.736	05/09/2011		4.62	Primary Crusher Building
BH-GE-02	634454.29	5855940.154	592.461	06/09/2011		15.37	Mine Services Building
BH-GE-03	634481.63	5855689.58	591.41	07/09/2011	08/09/2011	15.47	Mine Services Building
BH-GE-04	636103.01	5855686.427	563.893	09/09/2011		11.73	Conveyor Transfer
BH-GE-05	636475.87	5855743.434	542.211	10/09/2011		16.56	Waldorf River Crossing
BH-GE-06	636623.84	5855827.478	540.262	12/09/2011		15.85	Waldorf River Crossing
BH-GE-07	637426.4	5855986.656	542.756	13/09/2011		10.9	Domed Crushed Ore Stockpile
BH-GE-08	637657.66	5856101.844	548.036	14/09/2011		8.23	Process Plant Area
BH-GE-09	637872.39	5856143.35	564.441	15/09/2011	16/09/2011	9.37	Process Plant Area
BH-GE-10	637911.19	5855870.715	559.707	17/09/2011		9.19	Process Plant Area
BH-GE-10B			559.707	13/11/2011	14/11/2011	16.56	Process Plant Area
BH-GE-11	637705.65	5855818.732	550.234	14/09/2011	15/09/2011	9.14	Process Plant Area
BH-GE-11B			550.234	15/11/2011	01/12/2011	52.73	Process Plant Area
BH-GE-12	637583.73	5855632.664	553.513	18/09/2011		12.42	Tailings Management Area
BH-GE-13	637933.79	5855287.11	557.218	19/09/2011		10.79	Tailings Management Area
BH-GE-14	638730.4	5854148.866	577.064	20/09/2011		11.12	Tailings Management Area
BH-GE-15	640870.21	5854983.456	607.584	20/09/2011	21/09/2011	9.75	Tailings Management Area
BH-GE-16	638671.51	5856705.835	583.405	21/09/2011		4.57	Concentrate Load-Out Silo
BH-GE-17	640506.78	5857310.921	590.449	22/09/2011	24/09/2011	9.32	Kami Rail Spur
BH-GE-18	639762.85	5858719.204	582.964	24/09/2011	25/09/2011	13.36	Kami Rail Spur
BH-GE-19	640500.48	5858714.644	573.262	28/09/2011		10.67	Riordon Lake Crossing
BH-GE-20	640559.26	5858772.874	570.811	27/09/2011		12.42	Riordon Lake Crossing
BH-GE-32				02/12/2011	05/12/2011	9.37	Conveyor
Total 23 Holes						299.5 m	

The condemnation KXN-series holes were drilled from the north end of Mills Lake north, towards the northern boundary of the Kami Property. These holes were aligned west with -50 to -60 inclination.

KXN-01 and KXN-02 were drilled to test modest magnetic anomalies underlying the proposed civil works for the Kami mine development (condemnation drilling). Both encountered low-grade magnetite-rich mineralization coincident with the anomaly in the Sokoman Formation. Oxidized faults caused the termination of the holes before completely crossing the iron formation. The units were interpreted as dipping sub-vertically and the drillhole traces crossed the projected magnetic anomalies. KXN-03 and KXN-04 continued north of the first two along the same trend that was detailed by airborne magnetic geophysics. KXN-04 was lost in the fault zone. The interpretation was a tight fold aligned north-south with a probable steep dip to the east. Both holes collared in Denault marble then passed into strongly iron-oxidized faults. Neither gave a sufficient test of the potential width of the Sokoman Formation stratigraphy.

10.6 Drillhole Collar Surveying

Drillhole collars for the 2008 program were spotted prior to drilling by chaining in the locations from the closest gridline picket and drilling azimuths were established by lining up the drill by sight on the cut gridlines. For subsequent programs, similar practice was maintained but for areas where no cut lines were available, the drills were lined up using handheld GPS. Drill inclinations or drillhole collar dips for all programs were established using an inclinometer on the drill head.

Once a drillhole was finished, the Drill Geologist placed a fluorescent orange picket or painted post next to the collar labelled with the collar information on an aluminum tag. Generally, casing was left in the ground where holes were successful in reaching bedrock. The X, Y and Z coordinates for these collar markers were surveyed using handheld GPS.

Formal precision surveying of the 2008 program drillhole collar locations was not completed until the end of the 2010 drilling program. At the end of the 2010 drilling campaign, the X, Y and Z coordinates of all the new drillholes and the 2008 drillholes were precisely DGPS surveyed using dual frequency receivers in Real-Time Kinematic mode by the land surveying firm N.E. Parrott Surveys Limited ("Parrott") of Labrador City, NL, and tied into the federal geodesic benchmark. Most of the 2008 and 2010 collars were identified and surveyed during the first (October 23rd to 27th) or second (December 5th) surveying campaign. Two collars, K-08-05 and K-10-43 could not be located.

At the end of the 2011 winter program, a crew from Parrott again arrived on the Property and surveyed the 2011 winter collars for position and azimuth. Collars for four of the drillholes

(K-11-103, 105, 109 and 111) could not be located and were not surveyed by Parrott. Their locations are defined by setup coordinates. The drillhole dips in the database are currently those measured at drillhole setup.

At the end of the summer 2011-2012 program, collars for 94 of the summer 2011-2012 drillholes plus forty-six of the collars from earlier programs were surveyed by Allnorth. The seven summer 2011-2012 collars not surveyed were not surveyed because they could not be accurately located in the field. Of these forty-six previous program collars, all but one had been previously surveyed by Parrott. Allnorth and Parrott results are in excellent agreement.

10.7 Downhole Attitude Surveying

Downhole attitude surveys using Flexit or Reflex EZ-Shot instruments were performed routinely during drilling in 2008 at intervals of 50 m downhole. Azimuth, inclination and magnetic field data were recorded by the driller in a survey book kept at the drill. A copy of the page is taken from the book, placed in a plastic zip lock bag and placed in the core box and the test was recorded by the geologist. These instruments use a magnetic compass for azimuth, so the azimuth readings from Alderon's Property are of no value because of the strong ambient magnetic environment, but the drillhole inclinations are of value and are retained in Alderon's database.

Towards the end of Alderon's 2010 program, the gyro surveying of completed drillholes was started using a north-seeking gyroscope instrument. This gyro surveying was done as a part of the borehole geophysics program conducted by DGI. The surveys were done immediately after the termination of the drillhole while the drill rig was still on site. The downhole attitude surveys were performed with the rods inside the borehole to prevent the borehole from collapsing, thus minimizing risk to the equipment. The 2010 gyro surveying program included returning to 2008 program drillholes for gyro surveying where possible. However, for these 2008 drillholes, only casing shots were completed to eliminate the risk of open-hole logging.

During this 2010 surveying, it was detected that the azimuth information produced by the gyro did not match the planned azimuths of the boreholes. Parrott was hired by DGI to provide corroboration to either the planned or measured azimuths of the boreholes, and Parrott, during its December 5th visit, surveyed the azimuths of twenty-four drillholes. These results were received in early November 2010. The Parrott azimuths for twenty of the twenty-four drillholes correlated most closely with the planned azimuths. For four drillholes, (K-10-60, K-10-25, K-10-96 and K-10-94A), the planned azimuths departed from the Parrott azimuths by more than 5 degrees. As a result, DGI recommended that the gyro instrument be immediately removed from the field for problem diagnosis at the manufacturer's facility.

A sensor was replaced and extensive calibration checks were performed at the manufacturer's facility with DGI's Vice President of Operations in attendance. The calibration checks demonstrated a high degree of repeatability and accuracy for the instrument. Once tests were completed to the satisfaction of the manufacturer and DGI, the gyro was returned to the Kami Project.

A thorough review of all calibration data, QA/QC tests, and repeat field measurements compared to the Parrott collar surveys and planned drill azimuths, indicated that the gyro information should be treated as relative. That is, prior to having repairs completed by the manufacturer, the instrument measured the correct relative change in azimuth downhole, but not the correct absolute azimuth. This is the same method as used for normal gyro data. The relative accuracy of the instrument throughout the duration of the Project is supported by the manufacturer.

Alderon elected to use the planned azimuths as the collar azimuths of all of the 2008 and 2010 drillholes and adjust the DGI gyro downhole azimuths to the planned collar azimuths. These corrections were also applied to the Optical Televiwer ("OTV") structure data to compute orientations for the picked structures.

No downhole geophysical surveys were conducted as a part of the 2011 winter drill program.

DGI continued to provide advanced geophysical (described in Section 10.8) and gyro downhole surveying for Alderon for its summer 2011-2012 drilling program. Survey parameters remained as they are described for the 2010 program. DGI, in addition to completing gyro surveys on the summer 2011-2012 program drillholes, also completed casing shots for a number of earlier drillholes where azimuth information was poorer quality due to instrument breakdown during the 2010 program.

The results are a survey file where collar locations have been completed on different occasions by different contractors using several different methods. Alderon subsequently processed the various generations of data to arrive at a best set of coordinates and downhole attitude survey results.

10.8 Geophysical Downhole Surveying

DGI, from 2010 through the 2011 summer-2012 drilling programs, employed a multi-parameter digital logging system designed by Mount Sopris Instrument Co. and along with gyroscopic downhole drillhole attitude surveying included, natural gamma, poly electric, magnetic susceptibility, calliper, and OTV instrumentation. This surveying was attempted on most drillholes but complete surveying was not possible for all drillholes. In particular, Rose North drillholes, because of bad ground conditions, were not generally surveyed.

The Poly Gamma probe measures variations in the presence of natural radioactivity. Changes in natural radioactivity are typically related to concentrations of uranium, thorium and potassium. Data acquired from this parameter is useful in identifying lithological changes.

The Gamma-Gamma Density probe measures rock density, as a function of porosity, fluid content and mineralogical composition and heavy elements increase the density signature of the host rock. It is used to derive formation porosity, which is defined as the ratio of pore volume to total volume of the rock; plus identification of open fractures towards achieving quantitative in-situ density.

The Poly-Electric probe measures: normal resistivity, spontaneous potential ("SP"), single-point resistivity ("SPR"), fluid resistivity, fluid temperature and natural gamma radiation. Resistivity measurements can be used to identify lithology changes, often resulting from changes in porosity. Fluid resistivity measurements are often used to correct the resistivity measurements of the rock from the influence of drilling mud and borehole fluid, and can also be indicative of borehole fractures. Temperature contrast data can identify zones of water movement through borehole fractures and faults relative to static water in the borehole column.

The Magnetic Susceptibility probe delineates lithology by analyzing changes in the presence of magnetic minerals. Magnetic susceptibility data can illustrate lithological changes and degree of homogeneity, and can be indicative of alteration zones. The magnetic susceptibility probe is stabilized in the borehole fluid prior to calibration checks and the start of the survey runs. Calibration checks are performed before the deployment run and after the retrieval run using two points of known magnetic susceptibility. Susceptibility data was used in conjunction with assay data to develop an equation converting magnetic susceptibility (CGS units) to a % magnetite content value estimate.

The OTV provides a detailed visualization of the borehole by capturing a high-resolution image of the borehole wall with precise depth control. The OTV captures a high-resolution 360° image perpendicular to the plane of the probe and borehole. This allows borehole bedding and fractures to be inspected by a direct camera angle. This 360° high-resolution image can be used to identify measure and orient bedding, folding, faulting and lithological changes in the borehole. The use of a gyro provides the relative orientation data to correct the image and feature orientation. 2-D and 3-D projections of this data provide a variety of interpretive options for analysis.

The OTV data is reported as True Azimuth and as True Dip. It should be noted that Azimuth True for the feature is the azimuth of the dip direction rather than the strike of the feature. The strike azimuth for a feature is 90° from the value reported in the True Azimuth data column.

Once a final data set was completed, a statistical characterization was performed using the physical properties data.

The gamma-gamma density information was used by Alderon as a measure of rock density for the Mineral Resource estimate. Some discussion of this data is provided in Chapter 7, Mineralization. WGM has not completed a thorough review of all of the downhole geophysical information.

10.9 WGM Comments on Altius and Alderon Drilling

WGM is satisfied that Altius' 2008 and Alderon's drilling programs were generally well run but documentation and reporting should be improved considerably. In 2008, drillhole collars were surveyed using handheld GPS. Fortunately, casings were left in the ground so the collars could be resurveyed at a later date. As part of the 2010 program, Alderon resurveyed all of Altius' collars using DGPS, except for two that could not be located.

In 2008, downhole surveying was done using a Flexit instrument. This instrument determines azimuths based on a magnetic compass. Altius ignored azimuth readings from the instrument and utilized only the inclination information from the survey. WGM agrees that this was acceptable practice. Alderon attempted gyro surveys of the collars of many of these holes as part of the 2010 program, however, it was later concluded that the gyro azimuths were not accurate. During the summer 2011-2012 program, Allnorth and DGI completed positional and downhole attitude surveys, or at least casing shots for many of these drillholes to generate more accurate information, and replaced previous information in the database with the new results where available.

Some holes still remain without downhole or collar azimuth surveys because these holes could not be found or re-entered. For some drillholes, collar azimuths by different contractors and methods do not match well and for these cases, Alderon has generally elected to go with collar azimuths that are invariantly propagated down the holes based on surveyed or non-surveyed azimuths closest to planned azimuths. WGM believes that these missing survey data will have minimal effect on the Mineral Resources. Drillhole orientation relative to rock structure varies from nearly perpendicular to dip to almost down dip, and the rocks and mineralization are folded. Consequently, the relationship between true widths and drillhole intersection length also varies considerably from hole to hole, or even within a hole.

11. SAMPLE PREPARATION, ANALYSIS AND SECURITY

Drill core samples collected and prepared by Alderon and Altius were submitted to SGS Minerals Services ("SGS"), which is an accredited laboratory. As such, accredited laboratories must follow specific guidelines and procedures for sample preparation, testwork and assaying. BBA and WGM have taken reasonable precautions to review laboratory reports and the routine analytical and testwork results provided by SGS and BBA were present during some of the testwork. As such, BBA and WGM believe that the assaying and testwork have been performed in conformity with applicable industry standards and procedures.

11.1 Field Sampling and Preparation

The description and discussions herein for sampling are for the drilling programs conducted from 2008 to 2012 by Altius and Alderon and are derived mostly from reports and protocol documents completed by or for Altius and Alderon and direct observations by WGM during its site visits.

11.1.1 2008 Drill Core Handling and Logging

Core was removed from the core tube by the driller's helper at the drill and placed into core trays labelled with hole and box number. Once the tray was filled, (approximately 4 to 4.5 m per box), it was secured at both ends, labelled and set aside. Core was picked up at the drill site by Altius Personnel each day. Core was transported from the drill site to a truck road using all-terrain vehicles and a trailer. Core was then transferred to an Altius truck and transported directly to Altius' secure core facility in Labrador City. A geologist was always on site at the core facility to receive the core deliveries. Core boxes were then checked for proper labelling and correct positioning of tags. The end of box interval was measured and marked on the end of each tray with an orange china marker. Box numbers, intervals and Hole ID were recorded on a spreadsheet and on aluminum tags, which were subsequently stapled to the tray ends for proper cataloguing. All core was photographed, both wet and dry, in groups of four trays by a geotechnician or geologist.

Rock quality designation ("RQD"), specific gravity and magnetic susceptibility measurements were completed for each drillhole and recorded on spreadsheets. A measurement of specific gravity was obtained from each lithological unit in each drillhole by selecting short pieces of whole or split core and weighing each in air and in water. Magnetic susceptibility was measured using a magnetic susceptibility KT-9 Kappameter (distributed by Exploranium G.S. Limited) by taking one measurement every metre as an approximation of magnetic susceptibility.

A geologist logs the core and records the data on logging sheets. All geological and geotechnical information was recorded digitally at the end of each day.

11.1.2 2008 Sampling Method and Approach

Sample intervals were determined on a geological basis, as selected by the drill geologist during logging and marked out on the drill core with a china marker during descriptive logging. All rock estimated to contain abundant iron oxide was sampled. In addition, two 3 m samples on either side of all "ore grade" iron formation were taken, where possible, to bracket all "ore grade" iron formation sequences.

Core was first aligned in a consistent foliation direction. Iron formation was sampled systematically at 5 m sample intervals where possible, except where lithological contacts are less than 5 m.

Three-part sample tickets with unique sequential numbers were used to number and label samples for assaying. One tag contains information about the sample (such as date, drillhole ID, interval and description) and is kept in the sample log book. A second tag is stapled into the core box at the beginning of the sample interval. The third tag is stapled into the plastic poly bags containing that sample for assaying. Sample numbers and intervals were entered into a digital spreadsheet.

Core was sawn in half using a rock saw at the Altius core facility by an Altius geotechnician. One half of the core comprising the sample is placed into the labelled sample bags and stapled closed immediately after the sample is inserted. The remaining half of the split core is returned to the core tray and inserted in its original order and orientation and retained for future reference. Where duplicate samples were required, quarter samples were taken after being sawn in half again. Each sample is then secured within plastic pails labelled with the sample number. Lids were secured on the pails and the pails were then taped closed for extra security. The buckets were placed onto pallets where they were subsequently shrink-wrapped and also secured with plastic straps for loading onto transport trucks for shipment to SGS Lakefield.

11.1.3 2008 Core Storage

After core logging and sampling were completed, core trays containing the reference half or one-quarter split core and the archive sections of whole core were stacked on timber and rebar core racks at the Labrador City core facility.

11.1.4 Alderon 2010-2012 Drill Core Handling and Logging

Alderon managed the drilling and core logging for the Project from June, 2010 through May 2012. The core was brought in twice daily at shift changes to Alderon's core facility located in a building in Labrador City, NL, in order to reduce the possibility of access by the public near the drill staging area southwest of Labrador City. Public access to the core facility was restricted by signage and generally closed doors. Only Alderon or its contractor's employees were allowed to handle core boxes or to visit the logging or sampling areas inside the facility.

Geologists in the 2010 program included Elsa Hernandez-Lyons, William Strain and Bryan Sparrow ("GIT-PEGNL"), and were supervised by Edward Lyons, a member of the Association of Professional Engineers and Geoscientists of British Columbia ("APEGBC"), the Professional Engineers and Geoscientists of Newfoundland and Labrador ("PEGNL"), and the Ordre des Géologues du Québec ("OGQ"), and Qualified Person on the Project. Mr. Lyons and Ms. Hernandez-Lyons have recent experience on similar deposits in the Fermont/Fire Lake district. In winter 2011, the logging geologists included Vlad Strimbu and Steve Janes, and were supervised by Edward Lyons. The summer-fall 2011 and winter 2012 drill campaigns were logged by Elsa Hernandez-Lyons, Vlad Strimbu and Steve Janes, and were supervised by Edward Lyons, as before.

After the core was placed in the core trays, the geologists checked the core for meterage blocks and continuity of core pieces. The geotechnical logging was done by measuring the core for recovery and rock quality designation ("RQD"). This logging was done on a drill run block-to-block basis, generally at nominal three metre intervals. Core recovery and rock quality data were measured for all holes. Drill core recovery was close to 100% with virtually every 3 m run. The RQD was generally higher than 92%. Lower values were observed and measured for the first 3 to 5 m of some holes where the core is slightly broken and occasionally slightly weathered. Near faults and shears RQD dropped somewhat but was rarely below 65%. This mainly occurs in the schistose stratigraphic hanging wall Menihek Formation rather than in the iron formation. Additional geotechnical data for fractures, joints, and shears was collected starting in August, following the procedures described by Stantec for pit shell design parameters. All data were entered in the AcQuire database on site.

The core was logged for lithology, structure and mineralization, with data entered directly into laptop computers using MS Access forms developed by Alderon geomatics staff. In summer 2012, the MS Access database was migrated to the AcQuire system using the previous logging parameters. The geology of the iron formation was captured using a facies approach with the relative proportions of iron oxides, as well as the major constituent gangue components of the iron formation using a Fe-oxides–Quartz–Fe-silicates–Fe-carbonates quaternary diagram developed by Mr. Lyons. Other formations were logged based on descriptions and lithological variations. Drillhole locations, sample tables, and geotechnical tables were originally created in MS Access, then later migrated into AcQuire and are able to be merged with the geological tables at will.

Prior to sample cutting, the core was photographed wet and dry. Generally, each photo includes five core boxes. A small white dry erase board with a label is placed at the top of each photo and provides the drillhole number, box numbers and From-To intervals in metres for the group of trays. The core box was labelled with an aluminum tag containing the drillhole number, box number and From-To in metres stapled on the left (starting) end. Library samples approximately

0.1 m long of whole core were commonly taken from most drillholes to represent each lithological unit intersected. Once the core logging and the sampling mark-up was completed, the boxes were stacked in core racks inside the core facility. After sampling, the core trays containing the remaining half core and the un-split parts of the drillholes were stored in sequence on steel core racks in a locked semi-heated warehouse located in the Wabush Industrial Park. The warehouse contains the entire core from Altius' 2008 and Alderon's 2010–winter 2011 drilling campaigns. The exterior roofed core racks contain the core post-April 2011 to the end of the drilling program in May 2012.

11.1.5 Alderon 2010-2012 Sampling Method and Approach

The Alderon sampling approach was similar to the previous Altius exploration programs, with most samples taken to start and stop at the meterage blocks, at 3.0 m intervals, with variation in sample limits adaptable to changes in lithology and mineralization. Samples were therefore generally 3.0 m long and minimum sample length was set at 1.0 m. Zones of unusual gangue like Mn mineralization or abnormally high carbonate were treated as separate lithologies for sampling.

The bracket or shoulder sampling of all "ore grade" mineralization by low grade or waste material was promoted. The protocol developed for the program also stated that silicate and silicate iron formation intervals in the zones of oxide iron formation should generally all be sampled unless exceeding 20 m in intersection length. In the abnormal circumstance where core lengths for these waste intervals were greater than 20 m, then only the low/nil grade waste intervals marginal to OIF were to be sampled as bracket samples.

In-field Quality Control materials consisting of Blanks, Certified Reference Standards and quarter core Duplicates were inserted into the sample stream with a routine sequential sample number at a frequency of one per ten routine samples. The Duplicates were located in the sample number sequence within nine samples of the location of its corresponding "Original". The Duplicates accordingly, do not necessarily directly follow their corresponding Original.

Similar to the 2008 practice, the 2010–2012 procedures entailed the use of three tag sample books. Geologists were encouraged to try and use continuous sequences of sample numbers. The geologists were instructed to mark the Quality Control ("QC") sample identifiers in the sample books prior to starting any sampling. The sample intervals and sample identifiers are marked by the geologist onto the core with an arrow, an indelible pen or wax marker. The sample limits and sample identifiers are also marked on the core tray.

The book-retained sample tags are marked with the sampling date, drillhole number, the From and To of the sample interval and the sample type (sawn half core, Blank, Duplicate or Standard) and if it is a Standard, then the identity of the Standard is also recorded. The first detachable ticket recording the From and To of the sample was stapled into the core tray at the start of the sample interval. Quality Control sample tags were also stapled into the core tray at the proper location. Quarter core Duplicates were flagged with flagging tape to alert the core cutters.

The core cutters saw the samples coaxially, perpendicular to the foliation/banding orientation, as indicated by the markings, and then placed both halves of the core back into the core tray in original order. The sampling technicians completed the sampling procedure, which involves bagging the samples.

The second detachable sample tags are placed in the plastic sample bags; these tags do not record sample location. As an extra precaution against damage, the sample number on these tags was covered with a small piece of clear packing tape. The sample identifiers were also marked with indelible marker on the sample bags. The bags are then closed with a cable tie or stapled and placed in numerical order in the sampling area to facilitate shipping. The samplers inserted the samples designated as Field Blanks before shipping.

Samples are checked and loaded into pails or barrels and strapped onto wood pallets for shipping. In early 2012, at the request of SGS Lakefield, samples were put in wooden crates built on the pallets in order to reduce lifting injuries at the receiving laboratory. This protocol was followed through the remainder of the program. Pails, barrels, and crate-pallets were individually labelled with the laboratory address and the samples in each shipping container are recorded. The pallets were picked up at the core facility with a forklift and loaded into a closed van and carried by TST Transport to SGS Lakefield via Baie-Comeau, Québec and Montréal.

11.1.6 WGM Comments on Sampling for 2008 through 2012 Drilling Programs

WGM examined sections of Altius' 2008 drill core during its October 2009 site visit and Alderon's 2010 drill core during its July and November 2010 site visits and found the core for both campaigns to be in good order. The drill logs have also been reviewed and WGM agrees they are comprehensive and are generally of excellent quality. Core descriptions in the logs were found to match the drill core. During WGM's site visits, sample tickets in the trays were checked and confirmed that they were located as reported in the drill logs. Drill core after sampling was also in good order. WGM did not make a site visit during the winter 2011 program and has not viewed the recent drill core or 2011 through 2012 sampling and logging.

A drill core sampling approach using 1 m to 5 m long samples respecting lithological contacts is acceptable practice. Few of the winter 2011 drillholes completely penetrated and tested the entire Rose North zone and core recovery was less than optimum for parts of several of these drillholes. The 2012 drilling on the Rose North deposit was more effective. This sparse drilling and less than optimum recovery is a factor in the Mineral Resource estimate categorization of mineralization in Rose North. WGM agrees that the Library samples do not materially impact assay reliability and/or accuracy.

11.2 Laboratory Sample Preparation and Assaying

SGS Lakefield at its Lakefield, Ontario facility was the Primary assay lab. SGS Lakefield is an accredited laboratory meeting the requirements of ISO 9001 and ISO 17025. SGS Lakefield is independent of both Altius and Alderon. All in-lab sample preparation for both Altius and Alderon was performed by SGS Lakefield at its Lakefield facility. Assaying continues as of the date of this Report.

11.2.1 Altius 2008 Preparation and Assaying

All of Altius' drill core samples were crushed to 9 mesh (2 mm) and 500 g of riffle split sample was pulverized to 200 mesh (75 µm) and subject to a standard routine analysis including whole rock analysis ("WR") by lithium metaborate fusion XRF, FeO by H₂SO₄/HF acid digest-potassium dichromate titration providing a measure of total Fe⁺⁺, and magnetic Fe and Fe₃O₄ by Satmagan. Neither the Satmagan nor the FeO determinations were completed on all in-field QA/QC materials. A group of 14 samples were analyzed for S by LECO, with sample selection based on visual observation of sulphide in the drill core. A total of 676 samples including in-field QC materials were sent for assay. Sample and analysis statistics are summarized in Table 11-1.

Table 11-1: Sampling and Analysis Summary, Altius 2008 Drill Program

Sample Classification	Analysis	Number
Routine	XRF WR, FeO_H and Satmagan	613
S	S	14
In-Field Blank	XRF WR and Satmagan	19
In-Field ¼ Core Duplicate	XRF WR and Satmagan	24
In-Field Standards (TBD-1, SCH-1)	XRF WR and Satmagan	20
SGS Lakefield Preparation Duplicate		7
SGS Lakefield Replicates Analytical Duplicates		22
SGS Lakefield Certified Standards and Blanks	Variable	
Note: An additional 52 samples originally drilled as part of the 2008 program were cut and assayed as part of later Alderon programs. Alderon also completed Davis Tube tests on 405 samples from 2008.		

11.2.2 Alderon 2010-2012 Sample Preparation

SGS Lakefield remained the Primary laboratory for Alderon's 2010–2012 exploration programs. Sample preparation for assaying included crushing the samples to 75% passing 2 mm; a 250 g (approximate) sub-sample was then riffled out and pulverized in a ring-and-puck pulverizer to 80% passing 200 mesh. Standard SGS Lakefield QA/QC procedures applied. These included crushing and pulverizing screen tests at 50 sample intervals. Davis Tube tests were also performed on selected samples. The material for the Davis Tube tests was riffled out directly from the pulverized Head samples and therefore the grind was not necessarily optimized to reflect potential mine processing plant specifications or optimum liberation requirements. Sample statistics for the 2010, winter 2011 and summer 2011 to 2012 programs are summarized in Table 11-2 and Table 11-3. These sample totals are generally reliable but may not be completely accurate in comparison to the current Project database because of recent updates and revisions.

Table 11-2: Sampling and Analysis Summary, Alderon 2011 Winter Drill Program

Sample Classification	Analysis	Number
Routine	XRF - WR	844
	Satmagan	842
	FeO_H	842
Routine Davis Tube Tests	Weight Recovery	336
	XRF_DTC	335
	FeO_DTT	0
In-Field Blank	XRF WR and Satmagan	29
	FeO_H	24
In-Field 1/4 Core Duplicate	XRF - WR and Satmagan	26
	FeO_H	19
	DT	2
In-Field Standards (STD A=FER-4, STD B= SCH-1)	XRF WR and Satmagan	48
	FeO_H	41
SGS Lakefield Preparation Duplicate	Variable –see text	
SGS Lakefield Replicates Analytical Duplicates	Variable –see text	
SGS Lakefield Certified Standards and Blanks	Variable –see text	
Note: Sample totals are not necessarily the same here as in previous reports since more samples from the program have since been assayed.		

Table 11-3: Sampling and Analysis Summary, Alderon Summer 2011-2012 Drilling Program

Sample Classification	Analysis	Number
Routine	XRF - WR	5,620
	Satmagan	5,621
	FeO_H	5,619
Routine Davis Tube Tests	Weight Recovery	3,221
	XRF_DTC	3,073
	FeO_DTT	0
In-Field Blank	XRF WR and Satmagan	209
	FeO_H	209
In-Field 1/2 Core Duplicate	XRF - WR and Satmagan	241
	FeO_H	241
	DT	49
In-Field Standards (STD A=FER-4, STD B= SCH-1)	XRF WR and Satmagan	217
	FeO_H	213
SGS Lakefield Preparation Duplicate	Variable –see text	
SGS Lakefield Replicates Analytical Duplicates	Variable –see text	
SGS Lakefield Certified Standards and Blanks	Variable –see text	

11.2.3 Alderon 2010-2012 Sample Assaying

Alderon's 2010 to 2012 drill core sample assay protocol was similar to the Altius 2008 protocol with WR analysis for major oxides by lithium metaborate fusion XRF requested for all samples and magnetic Fe or Fe_3O_4 determined by Satmagan. In 2010, however, FeO was not determined on all Heads. For a proportion of 2010 samples, FeO was determined on Heads by $\text{H}_2\text{SO}_4/\text{HF}$ acid digest-potassium dichromate titration, as previously done. Generally, where FeO on 2010 Heads was not completed, Davis Tube tests were performed. Sample selection criteria for 2010 samples for Davis Tube testwork included magnetite by Satmagan greater than 5%, or hematite visually observed by the core logging geologists. Where Davis Tube tests were completed, Davis Tube magnetic concentrates were generally analyzed by XRF for WR major elements. During the first half of the 2010 program, FeO was also determined in Davis Tube Tails. Alderon made this switch in methodology because it believed Davis Tube Tails were being overwashed. For its winter 2011 program, Davis Tube tests were completed on all samples containing appreciable magnetite, but no determinations of FeO on Davis Tube Tails ("FeO DTT") were performed. For the summer 2011–2012 programs, FeO was determined on all Head samples, but again no FeO determinations on Davis Tube Tails were completed.

In addition to the "routine" assaying, 175, 0.1 m 2010 samples of half split core were sent to SGS Lakefield for bulk density determination by the weighing-in-water/weighing-in-air method. The purpose of this work was to provide rock density for different rock types and types of mineralization to calibrate DGI's downhole density probe. These samples were taken from the upper 0.1 m long intervals of routine assay sample intervals, each generally 3 m to 4 m long. After SGS Lakefield completed the bulk density tests, these core pieces were returned to the field so they could be placed back into the original core trays. In addition to the bulk density testwork, 33 sample pulps had SG determined by the gas comparison pycnometer method. Some discussion of these results is under Mineralization, Section 7.2 of this Report.

In 2010, Alderon also cut 58 new samples from the 2008 drill core that had not been previously sampled and assayed. A total of 5,501 routine samples and field-inserted QA/QC materials had Head Assays by XRF completed.

For the 2011 winter program, a total of 947 samples including in-field QC materials were sent for Head assaying to SGS Lakefield. No Secondary Laboratory assaying was done but re-assays of a selection of previous samples was completed.

For the summer 2011 to 2012 programs, 6,287 routine core samples, plus field-inserted QA/QC samples were assayed for WR-XRF, Satmagan and FeO on Heads. In addition, 3,221 samples had Davis Tube tests completed. Davis Tube concentrates were analyzed by WR-XRF. FeO was not determined on Davis Tube products.

11.3 Sampling and Assaying QA/QC

11.3.1 2008 through 2012 QA/QC

For Altius' 2008 drilling program and for Alderon's 2010 through 2012 programs, the in-field QA/QC program conducted during initial core sampling involved insertion of Blanks, Duplicates and Standards into the sample stream going to SGS Lakefield. SGS Lakefield also conducted its own in-lab internal QA/QC program. Samples and analysis for both these programs are summarized in the tables shown previously. Alderon's 2011 program additionally included a Secondary or Referee Check Assay component, which involved the assay of a selection of pulps at Inspectorate Laboratory, located in Vancouver; B.C. Inspectorate holds a number of international accreditations including ISO 17025. Another Check assay program was undertaken in late 2012 at AcmeLabs, Vancouver. AcmeLabs is also accredited under ISO 9001:2000 and ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories. Some results have been received, but further checking is being done both at SGS Lakefield and AcmeLabs. Both Inspectorate and AcmeLabs are independent of Alderon.

In-Field QA/QC

In the field, both Altius for the 2008 program and Alderon for the later programs alternately inserted Standard, Blanks and Duplicate samples every 10th routine sample. The material used for Blanks was a relatively pure quartzite and was obtained from a quarry outside of Labrador City. Duplicate samples were collected by quarter sawing the predetermined sample intervals and using ¼ core for the Duplicate sample, ¼ for the regular samples, and the remaining half core was returned to the core tray for reference. The Certified Standard Reference materials used were CANMET's TBD-1 and SCH-1; CANMET's FER-4 was used when the TBD-1 material was exhausted in the latter half of the 2008 program. This material was pre-packaged in envelopes and, as required, a sachet was placed in a regular sample bag and given a routine sequential Project sample number. The Standards were not assayed consistently for all relevant analytes during all programs. Certified and provisional values for iron and selected other elements for these three Standards are listed in Table 11-4.

Table 11-4: Certified Standard Reference Materials Used for the In-Field QA/QC Programs - Altius 2008 and Alderon 2010

Standard ID	Material	Certified Values					
		%Fe	%FeO	%SiO ₂	%Mn	%P	%S
SCH-1	Schefferville Hematite IF	60.73	NA	8.087	0.777	0.054	0.007
TDB-1	Saskatchewan - Diabase	10.4	NA	50.2	0.1577	0.08	0.03
FER-4	Sherman Mine Ontario – cherty magnetite IF	27.96	15.54	50.07	0.147	0.057	0.11

Figure 11-1 and Figure 11-2 respectively, show TFe_H and magFe_{Sat} results for the field-inserted Certified Reference Standards for all drilling programs 2008 through 2012. Results are only shown for FER-4 and SCH-1, as there are few instances of TDB-1. Certified Reference values are not available for magFe and determination of magFe in the Standards was not completed for all programs. Figure 11-1 also shows results for field-inserted Blanks.

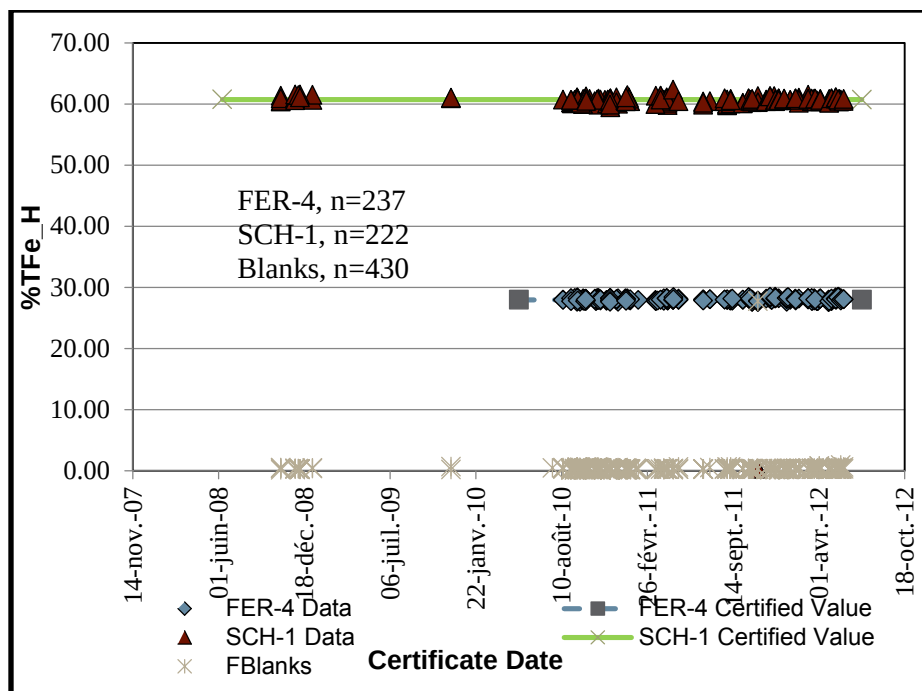


Figure 11-1: TFe_H Results for the Field-Inserted Certified Reference Standards for all Drilling Programs 2008 through 2012

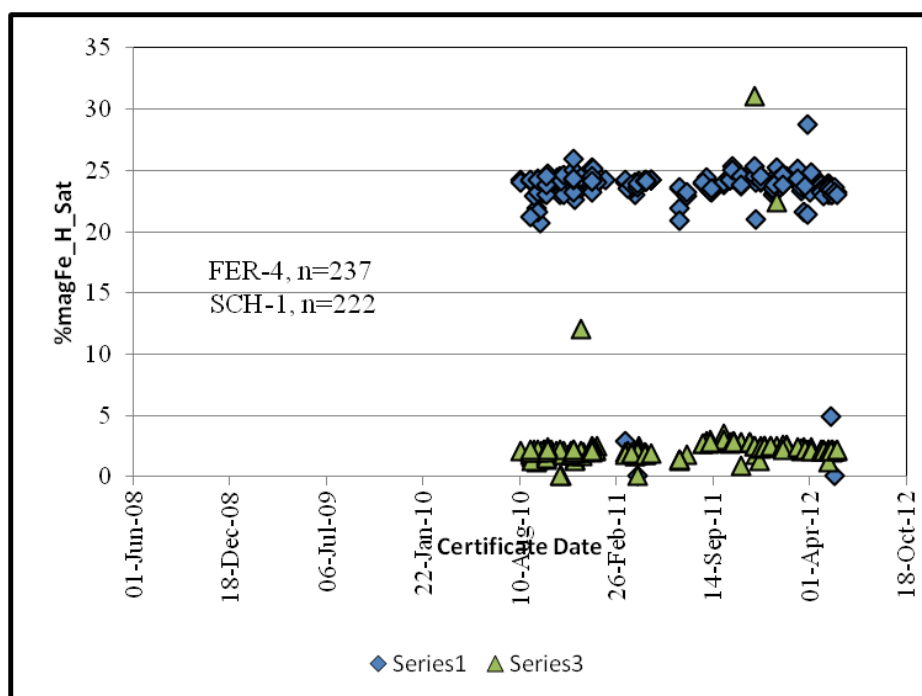


Figure 11-2: MagFe_Sat Results for the Field-Inserted Certified Reference Standards for all Drilling Programs 2008 through 2012

In general, the Standards and Blanks performed well as indicated by the clustering of results and the concentration averages, which are close to the Certified Reference values summarized in the previous tables. There is however, some scattering of results, particularly for determinations of magFe for both Standards and Blanks and there are several samples that obviously were misidentified that in WGM's opinion should have been followed-up to identify the issue and re-assay as required. One Blank returned 27.7% TFe and also was high in magFe and FeO. It is probably FER-4, rather than a Blank. If the issue cannot be resolved in the field by reviewing archived core and sample books, then re-assaying of this and adjacent samples is required.

Figure 11-3 to Figure 11-6 present %TFe and %magFe_Satmagan, and FeO and Davis Tube results for analysis of Duplicate ¼ drill core samples for drilling programs 2008 through 2012. Generally, Duplicate and Original results are strongly correlated. A few outliers can be identified that represent errors made in the field or in the lab, but generally, the results indicate that assays are precise. In WGM's opinion, checking and resolution of possible errors should be completed.

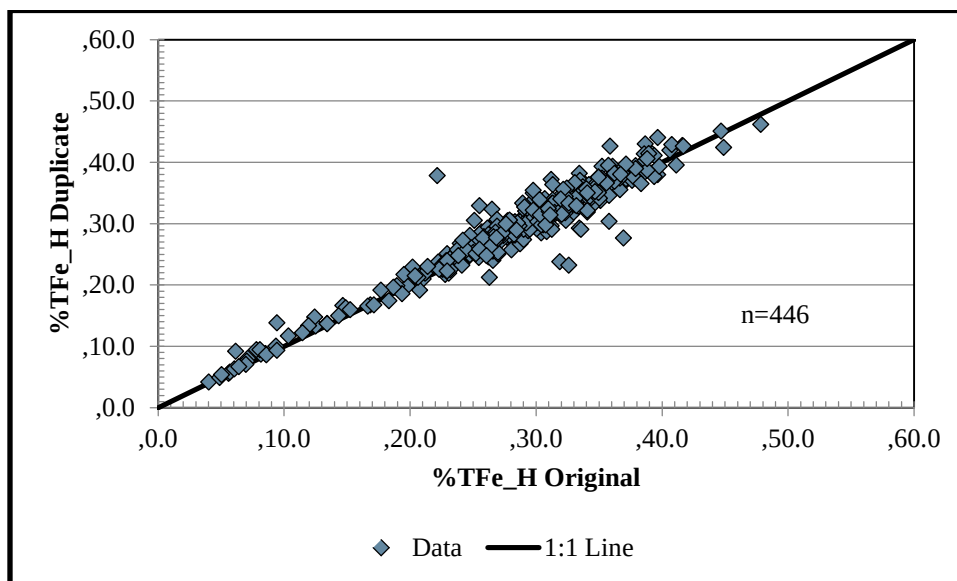


Figure 11-3: Results for Duplicate ¼ Split Drill Core Samples - %TFe_H 2008 through 2012 Programs

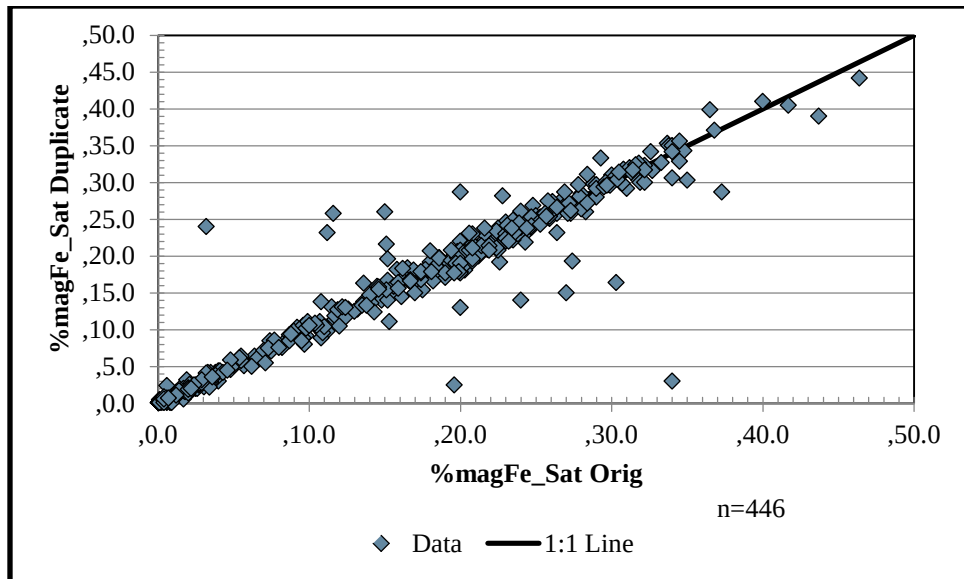


Figure 11-4: Results for Duplicate $\frac{1}{4}$ Split Drill Core Samples – %magFe Satmagan_H 2008 through 2012 Programs

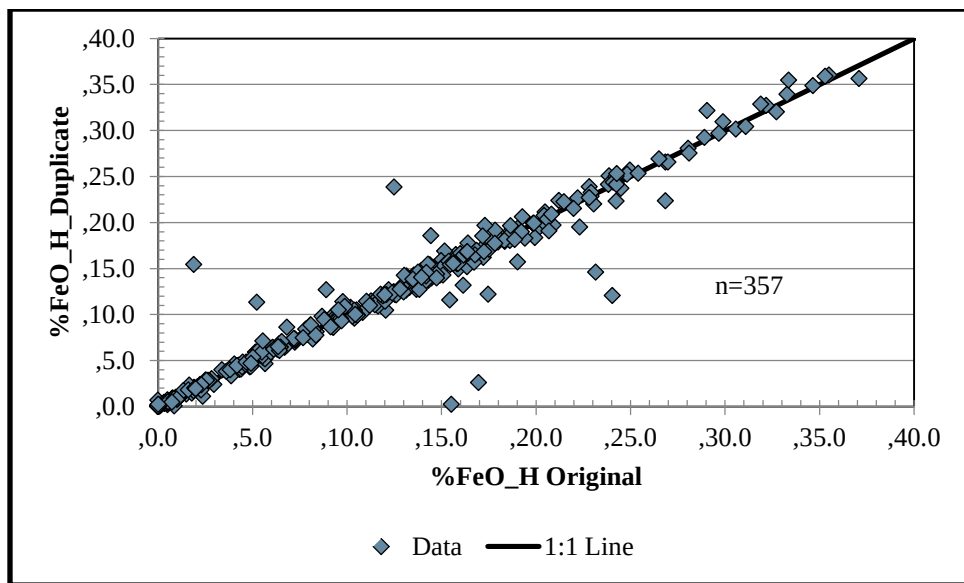


Figure 11-5: Results for Duplicate $\frac{1}{4}$ Split Drill Core Samples - %FeO_H 2008 through 2012 Programs

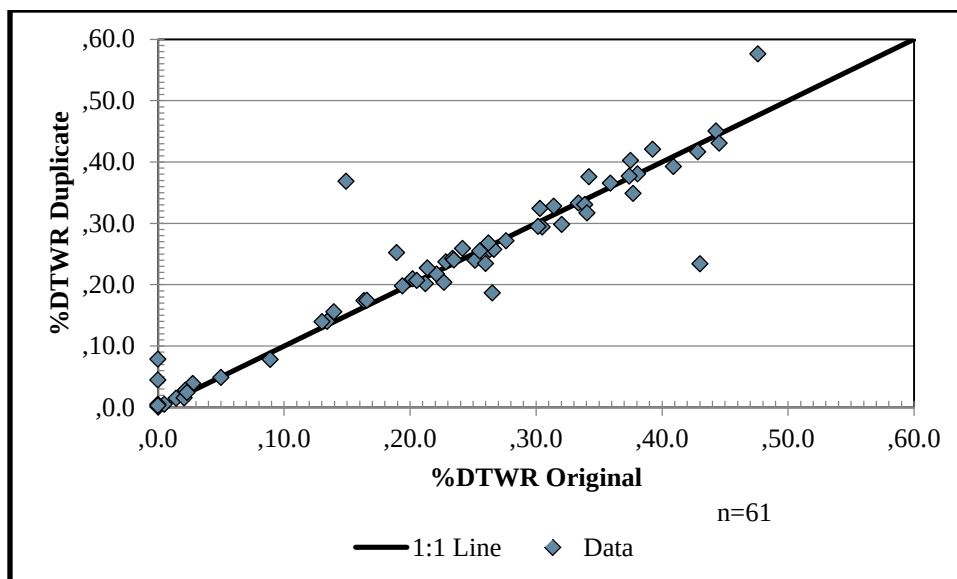


Figure 11-6: Results for Duplicate $\frac{1}{4}$ Split Drill Core Samples - %DTWR 2008 through 2012 Programs

Primary Laboratory (SGS Lakefield) QA/QC

As aforementioned, SGS Lakefield is an accredited laboratory and operates its own internal QA/QC program. Its internal QA/QC for the 2008 through April 2012 programs were similar and included screen tests for crushing and pulverizing, Preparation Duplicates (Replicates), Preparation Blanks, Analytical Duplicates, and Blanks and Standards. These Quality Control analyses were completed both on Heads and Davis Tube products.

Preparation Duplicates or Replicates are second pulps made by splitting off a second portion from a coarse reject. SGS Lakefield prepared and assayed Preparation Duplicates and Preparation Blanks at a rate of one every 50 to 70 routine samples. Analytical Duplicates, which involved a new fusion and disc, were prepared and assayed at a frequency of one sample every 20 to 25 routine samples.

Results for Preparation Duplicates (Replicates) and Analytical Duplicates for the 2008 through 2012 programs for selected elements are shown on the figures in the following section of this Report.

WGM has not performed a comprehensive review of the results from SGS Lakefield's internal QA/QC program and is relying on it as an accredited expert. Table 11-5 however, shows results for the Certified Reference and other Standards that SGS Lakefield assayed as part of the 2008 through 2012 programs for its monitoring and control of Head analysis for iron determined by XRF.

Table 11-5: Summary Results for SGS Lakefield Lab Standards for Head Analysis Fe₂O₃ 2008 – 2012 Programs

Standard ID	Certified Value TFe (%)	Count Samples	Avg TFE (%)	Min TFE (%)	Max TFE (%)
120c		1	0.74	0.74	0.74
607-1	30.89	29	30.87	30.43	31.4
676-1	39.76	2	39.73	39.73	39.73
680-1	59.98	1	59.8	59.8	59.8
681-1	33.21	52	33.24	32.87	33.57
879-1	18.97	3	18.74	18.6	18.88
BCS-313/1	0.00839	6	0.01	0.01	0.03
BCS-369	7.2	1	7.2	7.2	7.2
GBM304-15		2	18.64	18.6	18.67
GBM904-15		10	14.26	14.06	14.41
GBW03114	0.336	1	0.34	0.34	0.34
GIOP-31	37.4	9	37.48	37.28	37.63
GIOP-32	30.2	5	30.33	30.22	30.5
GIOP-39	56.6	10	56.68	56.44	57
IPT 51	0.83	3	0.83	0.83	0.84
IPT 72	0.06	3	0.06	0.06	0.06
IPT123	65.1	27	64.98	64.56	65.54
Lithium Blank		4	0.01	0.01	0.01
Lkfd-SamplePrepBLK		4	1.47	0.13	5.42
NBS-69b		1	4.9	4.9	4.9
NCSDC14004a	65.58	7	65.55	65.33	66.03
NCSDC14004b	62.79	6	62.89	62.67	63.16
SARM-12	66.6	137	66.59	66.17	67.22
SARM-42	3.273	4	3.28	3.2	3.34
SARM-5	8.84	3	8.98	8.88	9.02
SARM-73		3	6.66	6.64	6.69
SCH-1	60.73	126	60.77	60.29	61.34
STD SO-18		8	5.27	5.24	5.32
SY4	4.34	32	4.37	4.32	4.44
29		500			

The table shows that 29 different Standards were used by SGS Lakefield during the drilling programs to monitor assays received for Fe in Heads. These Standards were sourced from a number of different providers and some, in fact, are Standards SGS Lakefield themselves have developed. All are not certified for Fe and different Standards were used for different analytes. The certified value for the Standard, where available, is listed in Column 2. Column 3 lists the number of instances the designated Standard was used and reported on its Certificates of Analysis. The last three columns present the average, minimum and maximum assay value SGS Lakefield reported for the assay of the Standard.

To monitor determinations of magFe by Satmagan, SGS Lakefield uses a set of Standards that are set mixtures of magnetite and quartz. Table 11-6 shows results for 237 of these Standards used for Head analysis. All of these 237 results are, however, from the summer 2011 through 2012 program and none from prior programs. Before this date, analytical results for these Satmagan Standards were either not posted on SGS Lakefield's certificates or these Standards were not used.

Table 11-6: Summary Results for SGS Lakefield Lab Standards for Head Analysis MagFe Summer 2011–2012 Program

STD ID	Certified Value magFe(%)	Count Samples	Avg MagnFe_Sat (%)	Min MagnFe_Sat (%)	Max MagnFe_Sat (%)
Sat-000	0	2	0.2	0.2	0.2
Sat-001	0.7	36	0.88	0.7	1.2
Sat-005	3.6	49	3.67	3.5	3.9
Sat-010	7.2	55	7.34	7	7.7
Sat-025	18.1	52	17.97	17.4	19
Sat-050	36.2	37	35.53	34	36.9
Sat-075	54.3	3	54.2	54.2	54.2
Total		237			

Table 11-7 summarizes results for SGS Lakefield's determination of FeO on Heads.

Table 11-7: Summary Results for SGS Lakefield Lab Standards for Head Analysis FeO 2008–2012 Programs

STD ID	Certified Value FeO(%)	Count Samples	Avg FeO_Tit (%)	Min FeO_Tit (%)	Max FeO_Tit (%)
607-1	7.65	4	7.66	7.65	7.68
609-1		33	20.1	19.65	20.43
681-1		15	9.26	8.46	17.9
FER-1	23.34	100	23.32	23.06	23.6
FER-2	15.24	19	15.88	15.26	23.48
FER-3		25	13.83	13.67	14
FER-4	15.54	82	15.64	15.29	15.83
GIOP-31		1	27.6	27.6	27.6
Lkfd-SamplePrepBLK		3	0.17	0.15	0.18
MO1-1		9	11.26	11.05	11.37
MW-1	1.75	137	1.72	1.6	1.88
SARM-12		2	0.37	0.36	0.38
12		430			

Standards 681-1 and FER-2 show irregularities as the range of values listed are too wide. FER-2 probably includes an instance of FER-1. The source of the error for Standard 681-1 is not as obvious.

The results indicate that the Certified Reference Standards performed well for the 2008 through 2012 programs. The averages for the Standards assayed at SGS Lakefield through a range of analytes are very close to the Certified Reference values. Further analysis shows that most assays are closely clustered along Constant Value Lines, but there are however occasionally, assays that indicate either a Standard was misidentified in the field or mixed-up in the lab. These types of irregularities are not “material” because they are infrequent, but nevertheless, scrutinizing the data for these issues and taking action to resolve these issues results in higher quality data and should always be done.

11.3.2 Supplemental QA/QC

In August 2012, WGM completed a brief review of assay and QA/QC results for Alderon's summer 2011 through 2012 drilling campaign. MagFe results for Satmagan and Davis Tube were compared where determinations for a sample were done by both methods, checked for

magFe exceeding TFe and for negative values less than -2%, for calculated hmFe, and otherFe for all samples in the dataset. WGM brought to Alderon's attention instances of samples suspected of having assay issues. WGM also warned that SGS's tests were not very comprehensive and recommended further Check assaying be completed. WGM further recommended that a selection of 200 samples have SG determinations completed at SGS Lakefield. The samples for SG determinations were selected to represent intervals that had the highest and lowest downhole DGI probe densities.

All of the samples selected by Alderon could not be located for re-assaying. In total, 276 samples were re-assayed at SGS Lakefield for WR-XRF, Satmagan and FeO. SG was determined on 270 samples by gas comparison pycnometer.

The new assay values were substituted into the Project database by Alderon. The Mineralization, Section 7.2 in this Report contains comments pertaining to the new SG results. The new Check assays confirmed some of the original Davis Tube magFe values, while for other cases confirmed the original Satmagan values were correct. All of the negative calculated hmFe values were eliminated in the re-assays. For some of the samples, the negative otherFe values were eliminated, but for most of the samples selected for Check assaying, because of this type of issue, the small negative otherFe values were maintained. This result indicates that using a value of -2%, otherFe as threshold for selecting questionable samples may be too severe. Figure 11-7 is a plot of magFe from DT versus magFe from Satmagan. This plot includes the supplemental Check assaying incorporating corrections arising from this Check assaying.

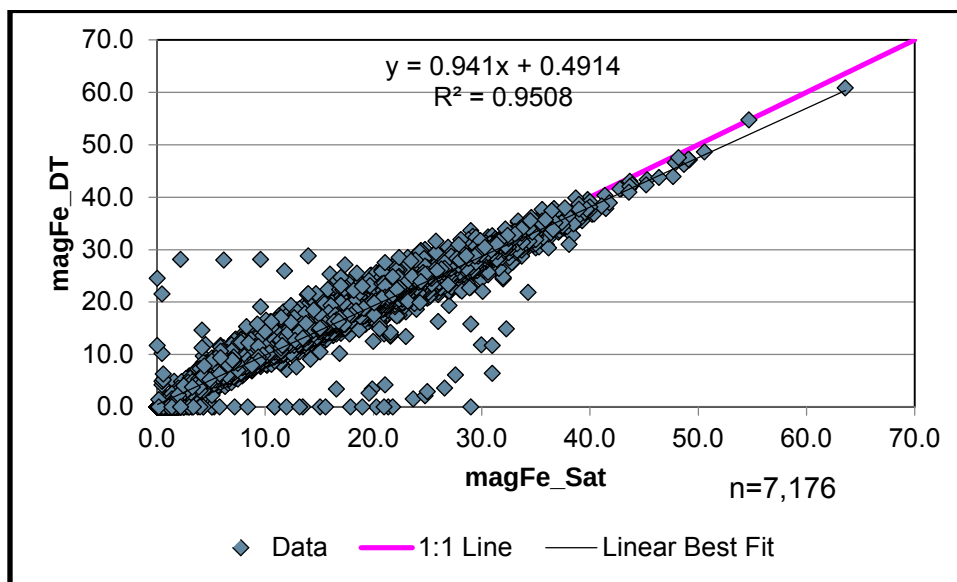


Figure 11-7: magFe from Davis Tube versus magFe from Satmagan

The plot shows that there still remain a number of samples where magFe from the two methods does not agree well. Some of these data points will be the samples that were previously identified but could not be located for re-assaying, but many are other samples. Since not all samples had DT tests completed, more rather than less discrepancies are in fact present and for thorough checking, adjacent samples to the suspect sample, as well as the suspect samples, require Check assaying.

Secondary Laboratory – Inspectorate Check Assay Program 2011

Two hundred and eighty-seven pulps from eight different Alderon drillholes representing different lithology and mineralization were forwarded to Inspectorate Labs, Vancouver, in January 2011.

Analysis for WR by XRF, S, FeO by potassium dichromate titration and Satmagan were completed. Initially, the FeO analysis was completed using a HCL-H₂SO₄ digestion. Subsequently, a selection of samples was reanalyzed using a HF-H₂SO₄ digestion. The HF - H₂SO₄ digestion is similar to SGS Lakefield's digestion and is required in order to break down silicates so near total Fe can be measured. Figure 11-8 to Figure 11-12 show Inspectorate assays versus SGS Lakefield's original results for corresponding samples.

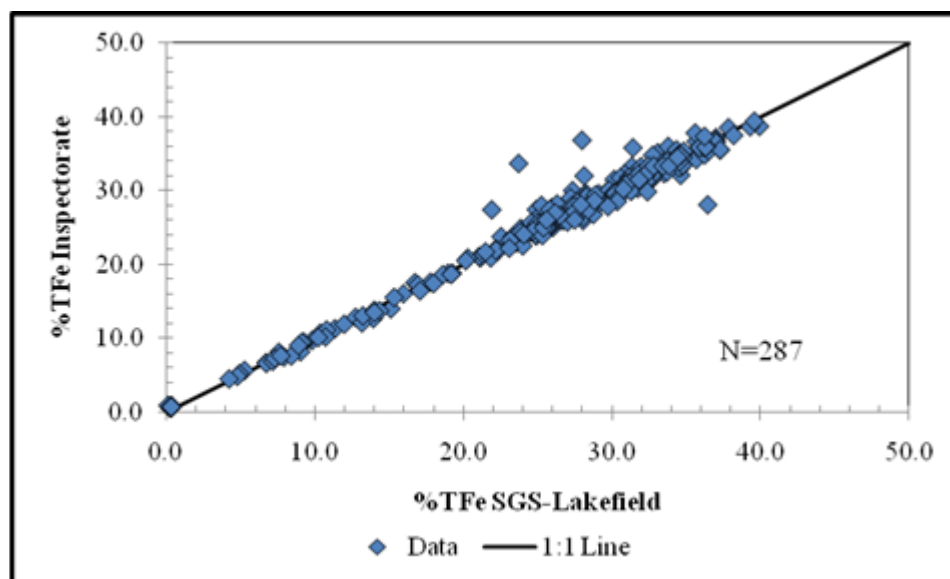


Figure 11-8: %TFe_H at Inspectorate vs. SGS Lakefield

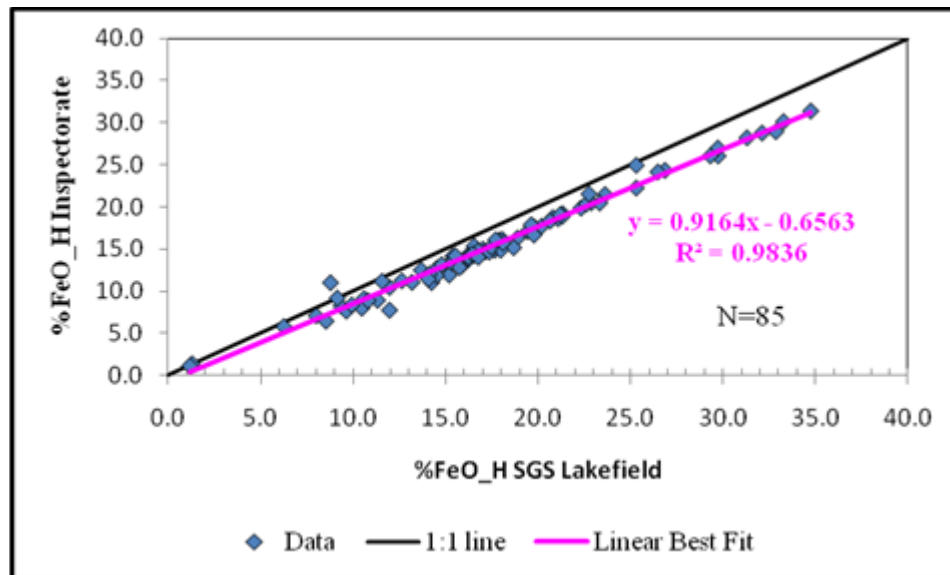
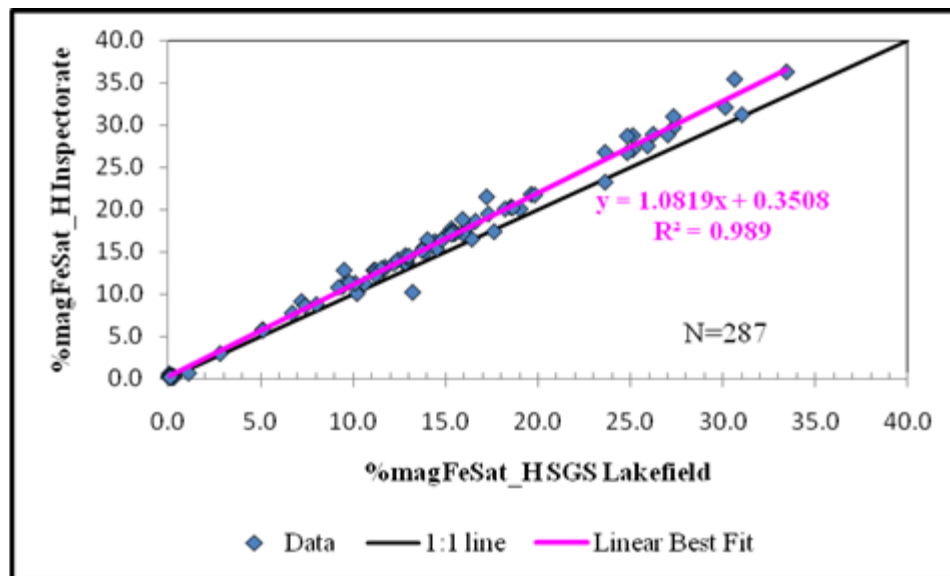
Figure 11-9: %FeO_H by HF-H₂SO₄ Digestion at Inspectorate vs. SGS Lakefield

Figure 11-10: %magFeSat at Inspectorate vs. SGS Lakefield

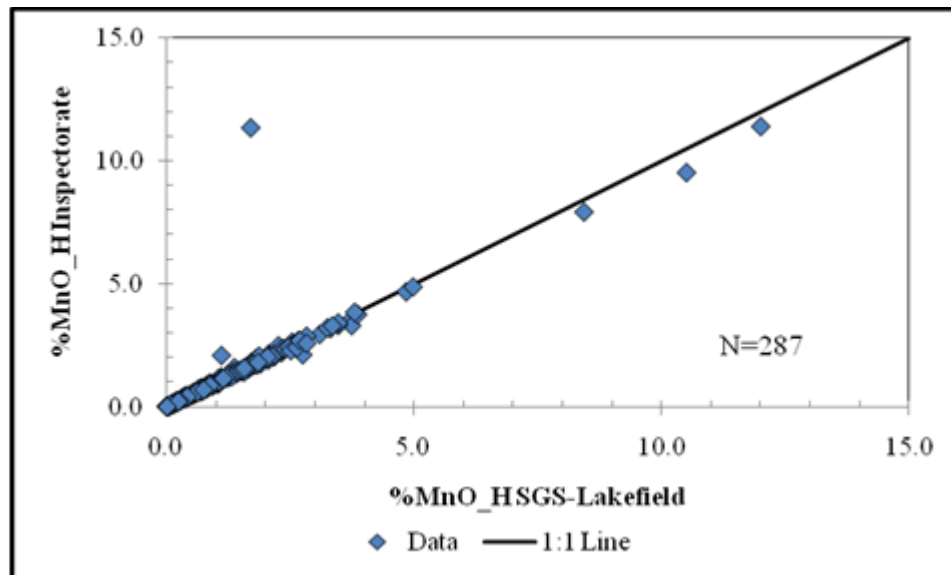


Figure 11-11: %MnO_H at Inspectorate vs. SGS Lakefield

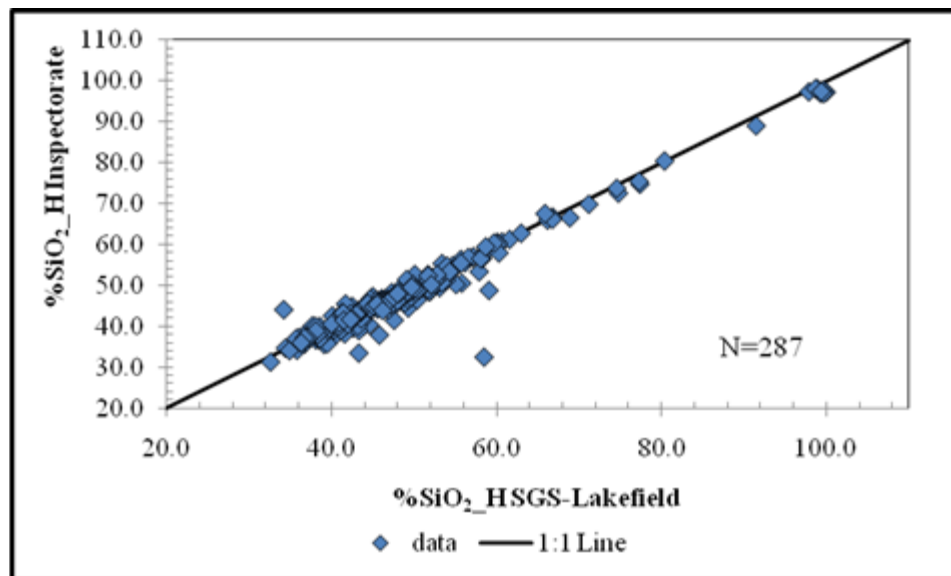


Figure 11-12: %SiO₂_H at Inspectorate vs. SGS Lakefield

The WR Check assaying results indicate that SGS Lakefield's assays of TFe, SiO₂ and MnO are reliable and unbiased. The FeO results from Inspectorate are strongly positively correlated with original SGS Lakefield results, but are biased slightly lower. The Satmagan determinations completed at Inspectorate are also highly correlated with original SGS Lakefield results but are systematically biased slightly higher. If Inspectorate's Satmagan and FeO results are more accurate than SGS Lakefield's, it would mean that estimates of %magFe for the Mineral Resource estimate are perhaps slightly low. Assuming Inspectorate's FeO and Satmagan are more correct than SGS Lakefield's, then the estimated %hmFe probably would not change much because Inspectorate's results are both higher in magnetic Fe and lower in FeO.

The samples at Inspectorate were also assayed for S and only a few samples from the Project have been previously assayed for S. The new S results confirm that mineralization is generally low in S but there are occasional intervals with S at levels of 1% to 3%. WGM recommends that Alderon check these samples against drill logs, and, if required, against archived drill core to confirm if possible, the presence of sulphides in these sample intervals.

Secondary Laboratory – AcmeLabs Check Assay Program 2012

Alderon completed another Secondary Laboratory or Reference Check assaying program in 2012. Alderon selected 106 samples from 2011 and 2012 drillholes previously prepared and assayed at SGS Lakefield. Of these, SGS Lakefield managed to find 88. SGS Lakefield prepared 1-kg riffle-split cuts from homogenized coarse rejects and these samples were forwarded to AcmeLabs, Vancouver. Alderon requested that each be analysed by WR-XRF, Satmagan and FeO (AcmeLabs codes: 4X30, SAT and G806) similar to original SGS Lakefield assaying.

AcmeLabs' preparation protocol R200-250 was applied. Each sample was homogenized; 250 g was riffle split out and pulverized to 85% passing 200 mesh (75 microns). The crusher and pulverizer were cleaned by brush and compressed air between routine samples. Granite/Quartz wash scours equipment after high-grade samples, between changes in rock colour and at end of each file. Granite/Quartz is crushed and pulverized as first sample in sequence and carried through to analysis. The determination of FeO was done by a similar extraction as used at SGS Lakefield—H₂SO₄-HF. Davis Tube tests were also completed using a subsample from the pulp prepared for the Head analysis.

Figure 11-13 to Figure 11-16 compare AcmeLabs results for TFe, magFe, FeO and MnO all on Heads, against original assays completed by SGS Lakefield.

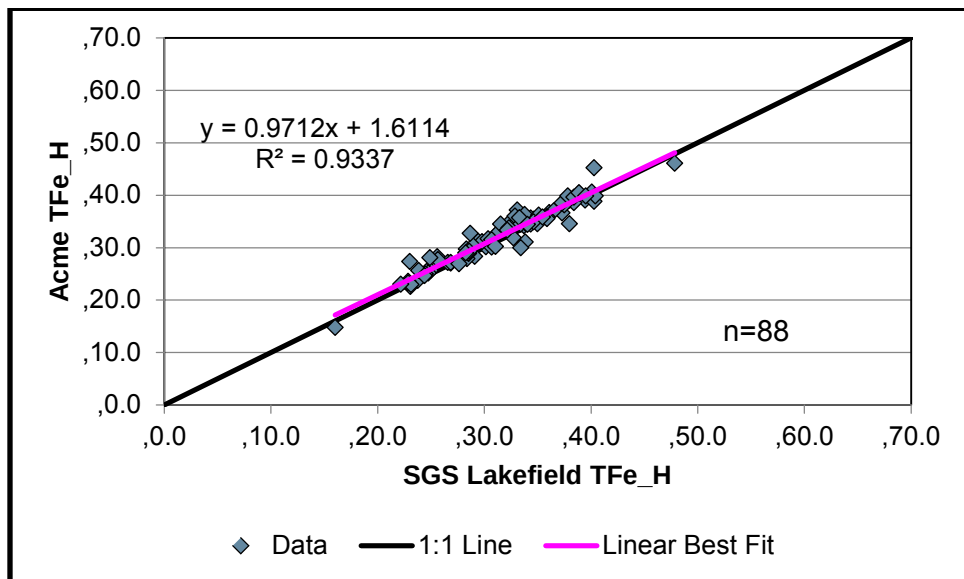


Figure 11-13: %TFe on Heads at AcmeLabs versus SGS Lakefield

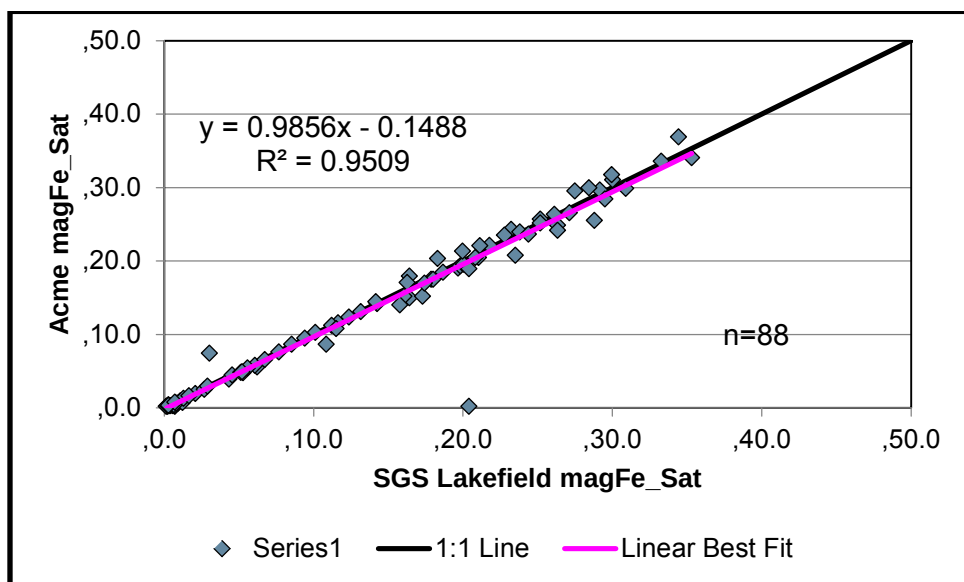


Figure 11-14: %magFe on Heads by Satmagan at AcmeLabs versus SGS Lakefield

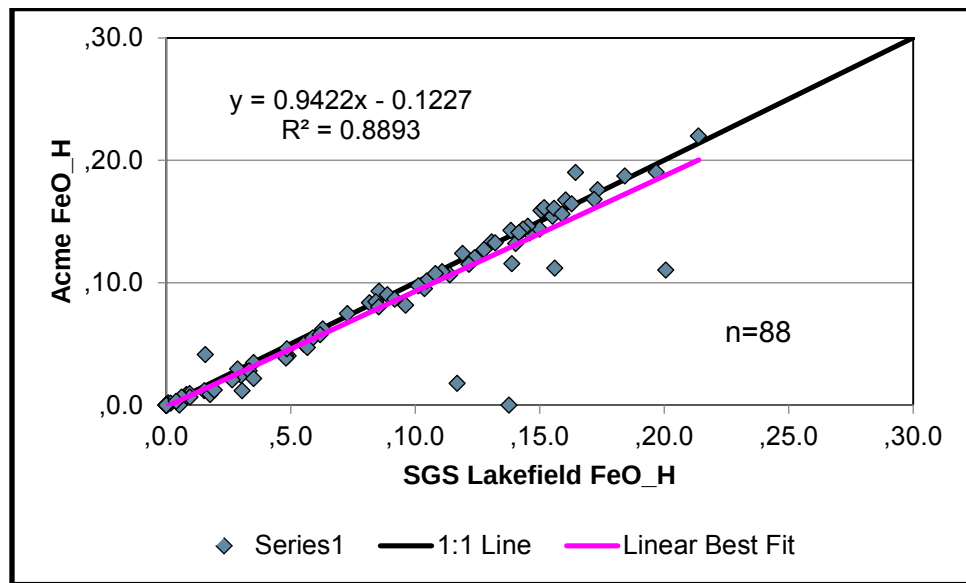


Figure 11-15: %FeO on Heads at AcmeLabs versus SGS Lakefield

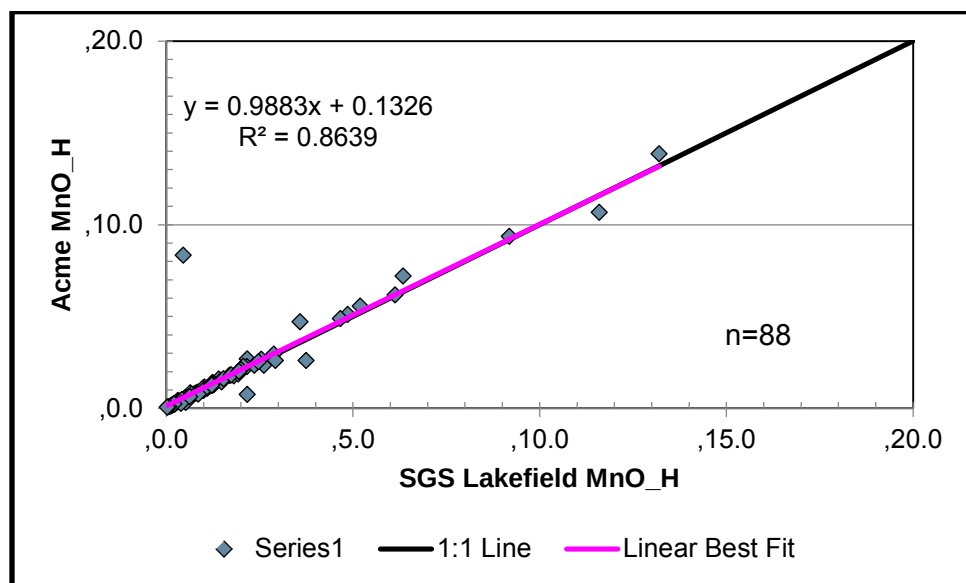


Figure 11-16: %MnO on Heads at AcmeLabs versus SGS Lakefield

The plots for the four parameters show high degrees of correlation between the two labs with no apparent bias, although the plot for MnO shows a number of scattered results. The indications are that the assays are generally accurate.

11.4 WGM's Comments on 2008 through 2012 Assaying

Alderon's 2010 and 2011 programs included credible sampling, assaying and QA/QC components that helped to assure quality exploration data. Its programs included the re-logging of Altius' 2008 core and the re-assaying of a selection of Altius' samples. QA/QC protocols for both Altius' and Alderon's programs included in-field insertion of Standards, Duplicates and Certified Reference Standards. In addition, Alderon supplemented its 2010 and 2011 through 2012 regular assaying with Secondary Laboratory Check assaying. Alderon maintained active monitoring of field-QA/QC results as they were received. A tracking table was used to track QA/QC issues.

Some errors and inconsistencies in logging, sampling and assaying are identifiable from results and WGM strongly believes Alderon should have applied a much more rigorous approach towards defining assay/sampling issues and re-assaying suspect samples during the assay program. WGM also, during its check of Alderon's Project database, identified some certificates of analysis not included in the database but understands this issue has now been rectified. There remain a significant number of assay/sample irregularities or sample/assay errors in the Project database that are unresolved. Despite the aforementioned issues, WGM has not identified any material errors that delegitimize logging, sampling and/or assaying results and believes program results are of sufficient quality to support the Mineral Resource estimate.

12. DATA VERIFICATION

WGM Senior Associate Geologist, Richard Risto, P.Geo., visited the Property twice in 2010 while Alderon's drilling program was in progress. The first visit was completed between August 3rd and August 6th and the second visit was completed between November 1st and November 3rd, 2010. This initial visit was to initiate the Project review process. Alderon's Chief Geologist at the time, Mr. Edward Lyons, P.Geo., (BC), géo (QC), P.Geo., (NL) and Doris Fox, P.Geo., Kami Project Manager at the time, EGM Exploration Group Management Corp., now King & Bay West Management Corp. (a Management Services Company associated with Alderon), were hosts for the visit. Mr. Risto reviewed drilling completed to date, proposed drilling strategy, deposit interpretation, logging and sampling procedures and visited the Property to see previous drilling sites and drilling in progress. Mr. Risto reviewed with the Project Manager the details of the planned work program, including the Company's analytical and testing protocols to facilitate the planned Mineral Resource estimate.

The November site visit was made as the completion of the drilling program was pending with approximately 3,000 m remaining to be drilled. The purpose of this site visit was to review new data and ongoing drilling plans and for the collection of independent samples. Alderon Chief Geologist, Mr. Edward Lyons was again host for the visit. Mr. Risto reviewed drilling completed to date, proposed drilling strategy for the remainder of the program, discussed deposit interpretation, collected independent drill core samples and again visited the Property to check drilling sites.

In October 2009, WGM Senior Geologist, David Power-Fardy, P.Geo., accompanied by EGM Representative, Mr. Stewart Wallis, P.Geo., and Altius Representative Ms. Carol Seymour, Geologist, completed a site visit on the Project. Drill core was reviewed at Altius' core storage facility in Wabush on October 6th and again on October 8th. Facilitated by helicopter, Mr. Power-Fardy, Mr. Wallis and Ms. Seymour visited the Property on October 7th. WGM independently collected fifteen samples from 2008 drillholes and these samples were sent to SGS Lakefield for analysis.

While checking the drill sites during their July 2010 site visit, WGM found that the drill collars were not labeled, therefore it was not possible to confirm individual drillhole identity.

WGM recommended that collars be labelled when the drills dismount, or very shortly thereafter. During its November 2010 site visit, WGM found that the collars were now labelled and capped. WGM validated drillhole locations in the field using a handheld GPS and checked casing inclinations. Mr. Risto found that his Eastings and Northings closely matched those in Alderon's database within a few metres, and dips closely matched database dips to within $\pm 3^\circ$. WGM also validated logging and sampling procedures. Check logging and checking sample locations in

core trays validated Alderon's logging and sampling. Part of the work plan regarding the Mineral Resource estimate was to have WGM check a random selection of assays, Alderon's database versus SGS Lakefield's analytical certificates. During this process, some omissions and errors were identified, which were communicated to Alderon and were subsequently corrected. Based on data provided by Alderon, assay Quality and Control was completed by WGM, independently of Alderon. WGM also independently completed the calculations leading to the estimates of %hmFe used in the Mineral Resource estimate and formulated the SG model.

Table 12-1 lists locations for WGM's eleven independent samples collected in 2010, as well as the samples collected from Altius' drill core during WGM's 2009 site visit.

Table 12-1: Summary of WGM Independent Second Half Core Sampling

WGM ID	Sample_ID	Drillhole_ID	From (m)	To (m)	Lith Code
KWGM-01	NL03634	K-10-83	306.60	310.00	HIF
KWGM-02	NL04545	K-10-83	592.00	595.00	MIF
KWGM-03	NL04231	K-10-85	230.00	233.00	MIF
KWGM-04	NL03537	K-10-85	44.00	47.00	QCIF
KWGM-05	NL04229	K-10-85	224.00	227.00	HIF
KWGM-06	NL04133	K-10-84	333.00	336.00	MIF
KWGM-07	NL04974	K-10-81A	308.00	310.00	MHIF
KWGM-08	NL01407	K-10-37A	591.00	594.00	SIF
KWGM-09	NL00530	K-10-27	652.00	655.00	MIF
KWGM-10	NL02404	K-10-63	14.00	16.00	MIF
KWGM-11	NL02965	K-10-46	42.50	44.60	HMIF
2663	2016	K-08-01	74.40	79.40	MHIF
2664	2148	K-08-07	33.00	36.40	MIF
2665	2372	K-08-13	75.10	78.00	MIF
2666	4510	K-08-19	69.23	71.64	MIF
2667	4592	K-08-21	36.91	39.60	MIF
2668	2440	K-08-16	306.75	311.66	MIF
2669	2121	K-08-06	117.00	122.00	MIF
2670	2078	K-08-02	85.65	90.65	MIF
2671	2383	K-08-15	115.23	116.23	MIF
2672	4614	K-08-24	247.50	249.62	MIF
2673	4534	K-08-20	216.95	221.95	MIF
2674	4580	K-08-20	400.27	402.89	MIF
2675	2139	K-08-08	88.95	93.95	MIF
2676	2003	K-08-01	14.20	16.60	MIF
2677	2495	K-08-18	286.32	291.32	HIF

Table 12-2 provides the analytical results for all of the 2008 and 2010 WGM independent samples and the corresponding Alderon and Altius assay results for the original samples. The Alderon and WGM 2010 samples represent different halves of the split core. WGM's 2009 samples were quarter core samples. Figure 12-1 to Figure 12-5 illustrate the results graphically.

Table 12-2: Comparison of Analytical Results - WGM Independent Sample Assays versus 2008 and 2010 Original Sample Assays

Sample ID	TFe (%)	magFe (%)	FeO (%)	SiO ₂ (%)	TiO ₂ (%)	Al ₂ O ₃ (%)	MgO (%)	CaO (%)	Na ₂ O (%)	K ₂ O (%)	Mn (%)	P ₂ O ₅ (%)	S (%)	SG
NL03634	32.17	0.05	0.72	32.20	0.01	0.03	1.46	2.46	1.98	0.01	9.14	0.04		
KWGM-01	31.89	0.10	0.77	32.80	0.01	0.07	1.54	2.46	2.10	0.01	9.37	0.04		3.92
NL04545	33.01	30.10	16.78	38.60	0.01	0.28	2.43	3.21	0.06	0.02	1.84	0.06		
KWGM-02	29.38	27.40	14.75	45.40	0.01	0.27	2.30	2.93	0.07	0.04	1.56	0.06		3.44
NL04231	33.08	27.40	18.96	45.30	0.01	0.15	3.55	1.50	0.01	0.03	0.94	0.05		
KWGM-03	32.45	27.80	18.60	46.20	0.01	0.15	3.61	1.27	0.02	0.03	0.92	0.05		3.58
NL03537	15.53	1.50	19.07	46.20	0.01	0.17	5.44	8.14	0.02	0.01	0.72	0.06		
KWGM-04	14.34	1.40	17.79	50.10	0.01	0.11	4.98	7.81	0.02	0.01	0.65	0.05		3.20
NL04229	36.79	0.60	1.18	36.30	0.02	0.12	1.82	2.36	0.05	0.09	2.08	0.03		
KWGM-05	36.23	1.20	1.26	36.60	0.01	0.09	1.75	2.28	0.07	0.09	1.98	0.03		3.75
NL04133	33.71	32.60	13.80	49.40	0.01	0.10	0.56	1.17	0.01	0.01	0.68	0.03		
KWGM-06	34.34	34.10	14.30	47.70	0.01	0.09	0.51	1.15	0.01	0.01	0.69	0.04		3.63
NL04974	29.94	12.20	5.97	48.60	0.01	0.16	2.04	2.20	0.03	0.02	0.59	0.03		
KWGM-07	28.47	11.90	5.98	51.10	0.01	0.16	2.10	2.22	0.02	0.01	0.58	0.03		3.36
NL01407	23.57	1.10		50.90	0.10	0.90	3.50	1.46	0.04	0.13	1.79	0.17		
KWGM-08	21.05	0.90	26.13	58.00	0.09	0.74	3.31	1.11	0.05	0.13	1.53	0.14		3.28
NL00530	28.96	23.50		42.60	0.01	0.05	1.78	5.58	0.01	0.01	1.61	0.02		
KWGM-09	28.89	23.10	11.11	43.90	0.01	0.01	1.65	5.15	0.02	0.01	1.46	0.02		3.52
NL02404	31.06	18.40	24.68	46.10	0.01	0.10	2.19	2.32	0.05	0.01	2.62	0.02		
KWGM-10	30.99	18.10	25.05	46.70	0.01	0.08	2.19	2.27	0.04	0.01	2.56	0.01		3.57
NL02965	18.26	2.20		58.20	0.04	0.11	0.41	5.47	0.04	0.01	2.88	0.02		

Sample ID	TFe (%)	magFe (%)	FeO (%)	SiO ₂ (%)	TiO ₂ (%)	Al ₂ O ₃ (%)	MgO (%)	CaO (%)	Na ₂ O (%)	K ₂ O (%)	Mn (%)	P ₂ O ₅ (%)	S (%)	SG
NL03634	32.17	0.05	0.72	32.20	0.01	0.03	1.46	2.46	1.98	0.01	9.14	0.04		
KWGM-11	17.56	2.40	1.47	60.80	0.03	0.04	0.32	4.62	0.06	0.01	2.54	0.02		3.20
02016	36.93	28.00	11.90	36.50	0.01	0.08	1.35	3.79	0.01	0.01	1.19	0.02		
2663	36.16	27.20	11.96	37.30	0.01	0.06	1.34	3.85	0.01	0.01	1.15	0.02	0.01	3.60
02148	29.10	15.00	25.30	42.80	0.03	0.27	4.00	3.59	0.03	0.04	1.12	0.06		
2664	32.17	22.50	22.99	42.40	0.02	0.26	2.66	2.60	0.03	0.03	1.05	0.05	0.01	3.51
02372	24.27	22.70	13.05	48.30	0.01	0.12	2.98	5.42	0.10	0.01	0.26	0.03		
2665	24.06	22.00	12.99	48.80	0.01	0.14	3.07	5.48	0.02	0.01	0.23	0.02	0.18	3.19
04510	25.81	21.90	10.48	48.60	0.01	0.02	2.81	5.27	0.01	0.01	0.22	0.01		
2666	26.65	21.40	10.70	46.60	0.01	0.01	2.81	5.62	0.10	0.01	0.22	0.01	0.01	3.30
04592	28.26	26.80	14.53	43.40	0.01	0.02	2.35	5.54	0.01	0.01	0.88	0.02		
2667	28.82	27.90	14.49	44.80	0.01	0.01	2.21	4.91	0.01	0.01	0.78	0.01	0.01	3.37
02440	40.15	40.30	17.73	37.90	0.01	0.18	1.63	1.96	0.07	0.03	0.39	0.04		
2668	40.99	41.10	18.61	35.80	0.01	0.37	1.79	2.20	0.02	0.03	0.42	0.03	0.01	3.70
02121	32.03	32.00	12.13	46.20	0.02	0.22	3.37	1.31	0.01	0.12	0.74	0.05		
2669	32.94	33.00	14.79	45.60	0.01	0.23	3.35	1.32	0.02	0.13	0.70	0.05	0.01	3.52
02078	28.40	27.00	14.58	45.60	0.10	1.96	3.61	2.38	0.43	0.48	0.53	0.07		
2670	28.75	27.00	14.67	46.40	0.08	1.71	3.52	2.39	0.34	0.42	0.52	0.08	0.04	3.37
02383	33.08	29.00	19.23	43.10	0.01	0.18	3.16	2.32	0.07	0.03	0.74	0.04		
2671	30.99	26.40	18.31	46.30	0.01	0.17	3.20	2.30	0.01	0.03	0.72	0.03	0.01	3.42
04614	32.31	25.90	17.64	40.70	0.06	0.97	1.61	4.19	0.01	0.02	0.72	0.06		
2672	30.92	26.40	15.70	44.80	0.02	0.31	1.50	4.18	0.01	0.01	0.63	0.05	1.77	3.38
04534	36.30	36.20	15.24	38.50	0.02	0.14	2.34	2.85	0.01	0.02	1.86	0.05		
2673	35.46	36.10	14.70	39.10	0.01	0.15	2.35	2.73	0.13	0.02	1.77	0.04	0.01	3.56
04580	33.57	31.60	15.87	45.90	0.02	0.26	2.85	1.26	0.01	0.05	0.87	0.05		
2674	32.24	30.80	15.26	46.60	0.02	0.29	2.86	1.30	0.01	0.05	0.81	0.05	0.01	3.39

Sample ID	TFe (%)	magFe (%)	FeO (%)	SiO ₂ (%)	TiO ₂ (%)	Al ₂ O ₃ (%)	MgO (%)	CaO (%)	Na ₂ O (%)	K ₂ O (%)	Mn (%)	P ₂ O ₅ (%)	S (%)	SG
NL03634	32.17	0.05	0.72	32.20	0.01	0.03	1.46	2.46	1.98	0.01	9.14	0.04		
02139	21.75	22.00	10.78	52.70	0.01	0.09	2.59	5.00	0.01	0.02	1.57	0.03		
2675	25.60	25.60	11.95	49.10	0.01	0.07	2.29	4.43	0.01	0.01	1.56	0.03	0.01	3.30
02003	31.41	31.00	15.02	41.40	0.01	0.14	3.40	0.50	0.01	0.01	4.9	0.04		
2676	32.17	31.90	15.42	41.40	0.01	0.12	3.33	0.50	0.01	0.01	4.57	0.03	0.02	3.59
02495	27.42	0.40	0.76	48.60	0.03	0.47	3.08	2.53	0.01	0.29	0.96	0.03		
2677	27.21	0.50	0.62	50.00	0.02	0.42	2.98	2.59	0.07	0.25	0.96	0.03	0.02	3.35

Notes: Alderon and Altius samples and results are shaded.
 WGM 2008 samples were quarter core; 2010 samples were half split core.

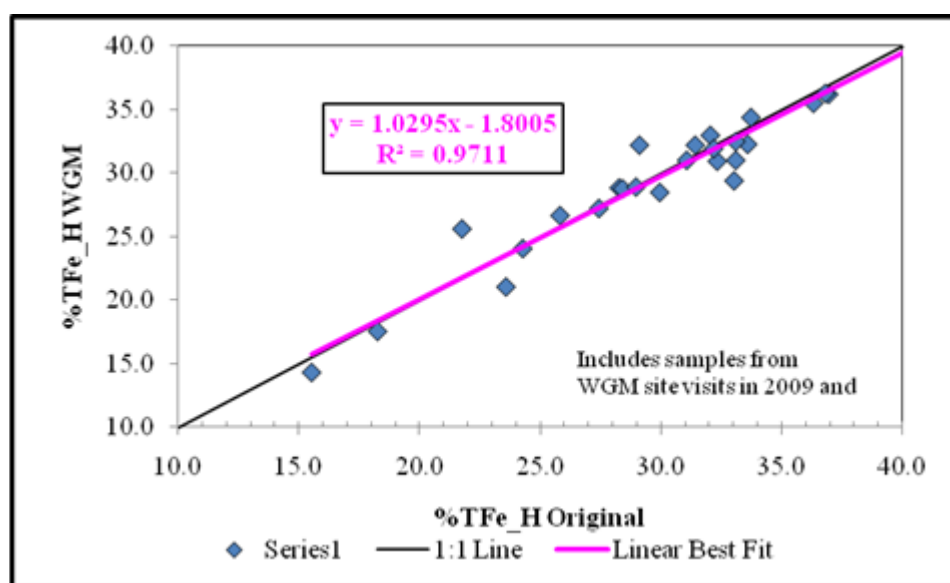


Figure 12-1: %TFe_H for WGM Independent Sample vs. Alderon or Altius Original Sample

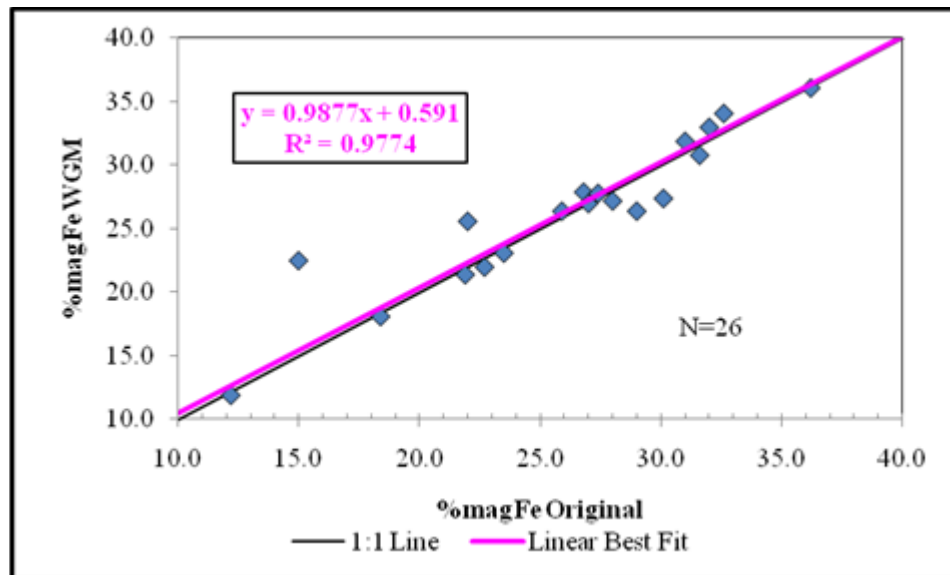


Figure 12-2: %magFe_H (Satmagan) for WGM Independent Sample vs. Alderon or Altius Original Sample

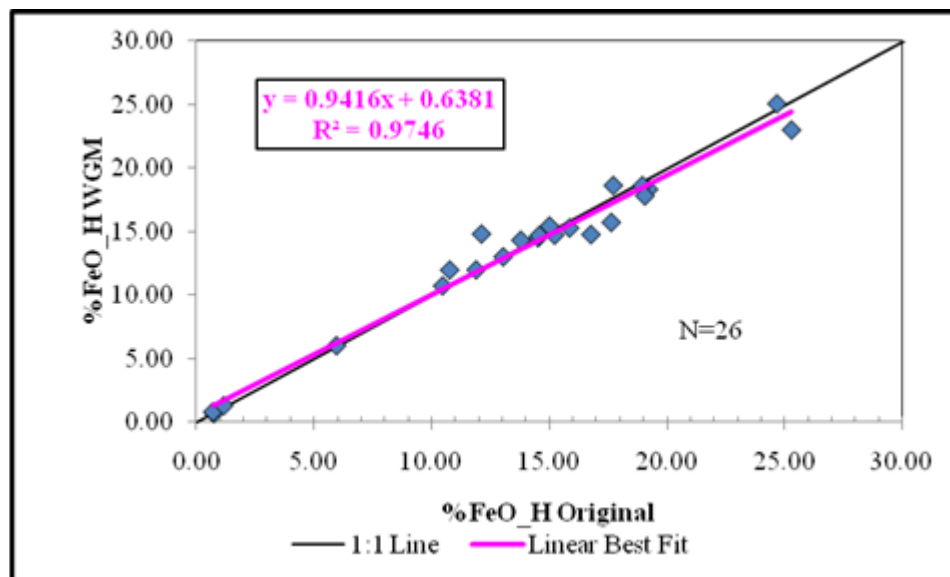


Figure 12-3: %FeO_H for WGM Independent Sample vs. Alderon or Altius Original Sample

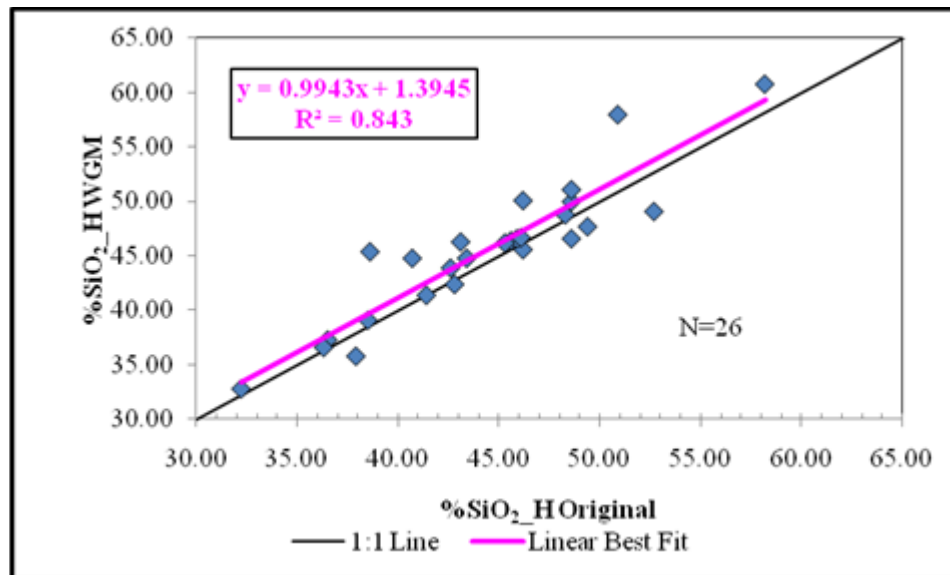
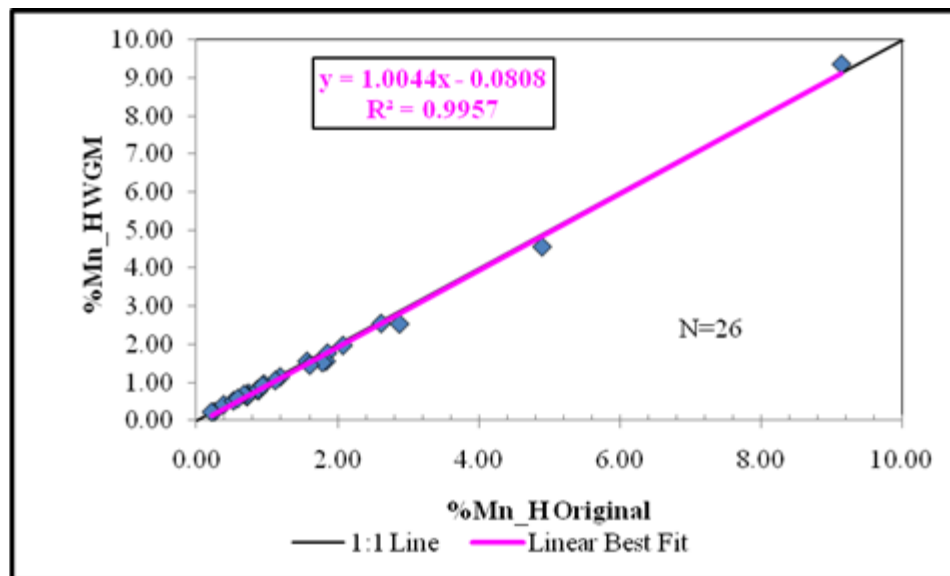
Figure 12-4: %SiO₂_H for WGM Independent Sample vs. Alderon or Altius Original Sample

Figure 12-5: %Mn_H for WGM Independent Sample vs. Alderon or Altius Original Sample

Assay results for WGM independent samples and corresponding Alderon samples are generally strongly related, indicating generally reliable and precise assays and the minimal probability of any sample mix-ups in the field or in the lab. Two samples, KWGM-02 and KWGM-08 reported SiO₂ assays that differ noticeably from Alderon's original values, however, assays for other components in these same two samples are generally within 1% to 2% of each other. Similarly, %magFeSat for WGM's 2009 sample 2664 and corresponding Altius sample 02148 shows more variance than might be expected, however, other assay components are within a close range. WGM concludes Alderon and Altius sampling and assaying as generally reliable.

Additional Data Verification Work

No site visits have been completed by WGM since the end of 2010. In 2012 WGM completed a number of supplemental data review tasks. These included:

1. Review of a random selection of Certificates of Analysis from SGS Lakefield. A number of the certificates reviewed were provided directly by SGS Lakefield; others were from Alderon's records. WGM found all assays in the database were traceable back to certificates and were correctly entered into Alderon's assay database. However, WGM did locate a certificate for which its assays were not in the database. Following this correction, and additional database issues defined during WGM's database review, Alderon revised the Project database. WGM understands that during this redesign, Alderon fixed this issue of assays from certificates not entered;
2. WGM reviewed collar and downhole survey data for the Project by comparing database entries with data in various survey contractor reports. This issue is described in Chapter 10 of this Report;
3. WGM completed a review of calculations concerning hmFe and the balance between TFe in Heads from XRF, magnetic iron from Davis Tube tests and Satmagan and Fe from FeO titration completed on Heads. The outcome of this was a list of samples in which various iron determinations were not in agreement and consequently some assay errors were suspected. Alderon ordered a re-assaying by the laboratory of many of these samples and indeed some assay errors were found; these new assays replaced original assays in the Project database. This process is described in Section 7.3 of this Report);
4. WGM completed a review of recent Project QA/QC assay data which is described in Section 11.3 of this Report. The outcome of this, together with the iron balance review described under Point 3 (above), was that Alderon should have been more proactive in completing more check assaying through the duration of the Project, as recommended by WGM in the 2011 PEA; and
5. WGM completed a review of sample density/SG data. This review led to WGM making additional recommendations for the determination of SG on 200 samples. These determinations were completed at SGS Lakefield and the results are described in Section 7.3 of this Report.

13. MINERAL PROCESSING AND METALLURGICAL TESTWORK

This updated Feasibility Study is largely based on the historical metallurgical testwork performed during the 2011 PEA and the 2012 FS. Results from this testwork were used to determine process performance parameters such as material throughput, Fe and weight recoveries, final concentrate grade (including key elements such as Fe, SiO₂, Mn) and particle size. The key process performance parameters were then used as the basis for establishing the mine plan, sizing of equipment and, ultimately, to estimate Project capital and operating costs which, in turn, were used for performing the Economic Analysis of the Project for the updated FS.

Alderon has indicated that some confirmatory metallurgical testwork and modeling was performed as part of detailed engineering which was used to confirm final plant design and equipment sizing. This work consisted of the following:

- Semi-pilot testing for the production of concentrate and tailings for customer requirements and equipment sizing. Details are presented in a report issued by SGS (Davies and Imeson, May 2014);
- Advanced IGS/CEET simulations and geometallurgical modeling for AG mill final sizing. Details are presented in a report issued by SGS (Bulled, Sept. 2014);
- Vendor testwork for spirals completed at Mineral Technologies in Australia for recovery confirmation and final spiral circuit sizing;
- Vendor testwork for pan and drum filter sizing (two vendors);
- Vendor testwork for thickener final sizing (three vendors);
- Sintering testwork in a laboratory in China to support product marketability. Details are presented within private and confidential reports titled “Technical Report About Sintering Experiment of Alderon Concentrate from Alderon Iron Ore Corp., Version for Company 1 and Version for Company 2” performed by School of Metallurgical and Ecological Engineering, University of Science and Technology, Beijing, June 2013.

This updated FS takes into consideration the aforementioned confirmatory metallurgical testwork as well as the advanced process plant design and equipment sizing from detailed engineering.

13.1 Mineralogical Characterization of the Kami Deposit

The mineralogical and metallurgical characteristics of the Kami deposit will ultimately determine process performance as well as final product specifications. The Kami mineral body can be classified into three general mineralization types; a hematite-rich component with a relatively small quantity of magnetite, a mixed hematite and magnetite component and a predominantly

magnetite-rich component. All three mineralization types have been observed in the Rose Central and the Rose North sectors, which make up the Rose deposit. Initially, it was thought that the mineralogy of both Rose Central and Rose North zones was similar, but geological observation and mineralogy analysis have revealed some notable differences during the course of the 2012 FS. While there is no indication of weathering in Rose Central, the Rose North limb shows the parallel profile overprinted by the Cretaceous-aged two-staged deep weathering. The first stage appears to be eH-Ph neutral to basic with low oxidation of the iron minerals. The second stage is more oxygen-rich and likely acidic with the formation of the iron hydroxides limonite, goethite, and occasionally red earthy hematite. As a result, the Kami mineral body is considered having six different rock types as described below:

- RC-1: Stratigraphic base of iron formation in the Rose Central part of the Rose deposit which consists mainly of hematite with manganese (Mn) in silicate gangue (rhodonite) and generally less than about 5% magnetite, except at the margins where it can be up to 25%;
- RC-2: Stratigraphic centre of iron formation in the Rose Central part of the Rose deposit which consists of a mixture of magnetite with variable amounts of hematite in interbedded layers. The amount of magnetite is greater than hematite. The amount of Mn in magnetite ranges between 0.7% to more than 3%. Mn also occurs as Mn-carbonate (rhodochrosite);
- RC-3: Stratigraphic top of iron formation in the Rose Central part of the Rose deposit which is composed of mainly magnetite with generally less than about 5% hematite. It contains some Mn in magnetite with the amount of up to 0.7% generally occurring as an interstitial element in the magnetite;
- RN-1: The first stage effect is that the specular hematite in the original metataconite becomes coarser hematite crystals and the gangue quartz is leached and porous, which leads to an increase in relative percent of hematite in the Rose North part of the Rose deposit. The Mn minerals are oxidized to psilomelane and rarely pyrolusite (MnO₂). This can be seen in several deeper holes where the residual equivalent of RC-1 was encountered from minimally to pervasively weathered. Stage 2 iron hydroxides overprint this Stage 1 oxidation as veins, patches, and larger cells;
- RN-2: This unit of the Rose North part of the Rose deposit consists of intermixed hematite and magnetite with the latter dominating. Mn frequently appears as powdery psilomelane and occasional crystalline pyrolusite in limonite-goethite cavities;
- RN-3: This unit of the Rose North part of the Rose deposit consists predominantly of fine-grained magnetite with minor hematite. It has undergone less intense Stage 2 weathering, likely due to the stability of magnetite, but the weathering still affects this unit.

13.2 Testwork Plan

13.2.1 Historical Testwork

In 2009, Altius Resources, former owner of the Property, conducted what can be considered to be a high-level metallurgical baseline characterization of the Rose Central part of the Rose deposit. A single composite sample made from two drill cores taken from the Rose Central part of the Rose deposit was sent to SGS Mineral Services (SGS) where testwork was performed with the following objectives. Details of the testwork are presented in a report issued by SGS (McKen and Wagner, 2009).

- To perform a preliminary evaluation of material grindability (Bond rod mill and Bond ball mill);
- To perform baseline beneficiation tests to evaluate the material's amenability to magnetic and gravity concentration;
- To recommend a conceptual flowsheet.

13.2.2 2011 PEA Study Metallurgical Testwork Plan

A metallurgical testwork program was developed at the early stages of the 2011 PEA Study, in order to characterize the Kami Property mineral deposit, specifically for the Rose Central part of the Rose deposit and the Mills deposit. At that time, no samples from the Rose North part of the Rose deposit were available. The objective of the testwork was to evaluate the mineral's amenability to be processed by gravity separation and/or by magnetic separation in order to produce a commercially acceptable concentrate that would allow for the economic development of the Kami Iron Ore Project. An important part of the testwork consisted of evaluating the Fe liberation size with the objective to achieve a concentrate particle size distribution as coarse as possible (while maintaining an acceptable Fe recovery and grade), in order to provide maximum suitability for sinter feed applications. It was determined from the early testwork results that the Mills deposit exhibited a very fine liberation size and, following consultation with Alderon, no further testwork on the Mills deposit was pursued.

Testwork results from the Rose Central deposit were used in defining a preliminary process flowsheet and assessing key process and metallurgical performance parameters. The test plan was developed, considering the historical testwork results, and the testwork was conducted as follows by SGS:

1. Sample selection was done by Alderon and BBA. The sample selection protocol and compositing procedures adopted assured that the samples were reasonably representative of the mineral body. Sample preparation and characterization was done by SGS for each of the mineral types in Rose Central (RC-1, RC-2 and RC-3).

2. For each sample and size fraction, the following tests were performed:
 - a. Heavy Liquid Separation (“HLS”);
 - b. Davis Tube (“DT”) test;
 - c. High Definition Mineralogical Analysis using QEMSCAN;
 - d. Optical microscopy;
 - e. Microprobe analysis.
3. Wilfley Table (“WT”) tests were performed on selected samples and size fractions. The WT concentrate, middling and tail were further subjected to DT tests and each of the DT products was subjected to QEMSCAN and microprobe analysis.
4. Grindability testwork for the 2011 PEA was performed on five samples from two HQ drill cores, including a sample from the Rose North part of the Rose deposit.
5. The results from the 2011 PEA testwork were used to develop the preliminary process flowsheet as well as preliminary mass and water balance, forming the basis of process design for the 2012 FS. Complete descriptions as well as detailed 2011 PEA testwork results are presented in two reports issued by SGS (Davies and Lascelles, 2011).

13.2.3 2012 Feasibility Study Metallurgical Testwork Plan

The 2012 FS detailed test program for the Rose deposit was defined with the objective of validating the process flowsheet as well as the metallurgical performance parameters derived in the 2011 PEA. The test plan was divided into three specific types of tests corresponding to the process steps of the flowsheet and included the material grindability test program, the gravity beneficiation test work and the magnetic plant test work. This test plan was complemented with testwork performed to validate key secondary process parameters related to solid-liquid separation for fine tailings thickening and gravity and mag plant concentrate filtering tests. Also, during the course of the test program, a semi-pilot scale test was performed to produce a representative final concentrate for subsequent sintering testwork.

The grinding test plan was based on Autogenous (“AG”) grinding with the following objectives:

- Characterize material hardness and Operating Work Index, (kWh/t) allowing for the estimation of the hourly feed throughput for the selected AG mill;
- Estimate the particle size distribution at the AG mill discharge;
- Assess if the material shows a tendency for circulating load buildup, which would require pebble milling or secondary crushing;
- Evaluate the variability of the hardness of the material within the deposit;
- Evaluate how material hardness varies within each of the six mineral types.

The grinding test plan was developed considering the very limited amount of samples available from the drill cores as well as the fact that a representative bulk sample would not be available to perform pilot scale grindability testwork. At a FS level, it is usually recommended that a pilot scale AG mill test be performed in order to develop grindability parameters to a higher degree of confidence. To mitigate this, it was decided to perform several types of standard grindability tests in order to compare results using more than one method. Table 13-1 shows the various tests performed as part of the grindability test plan as well as what each test is used for. Samples prepared for each of the tests have been colour coded and this colour code is used to track subsequent tests that were performed with product of the grindability tests. Sample preparation details are provided in the SGS report (Davies & Imeson, 2012).

Table 13-1: Grinding Test Plan Summary

Colour Code	Yellow Code	Orange Code	Green Code
Purpose of Test	Evaluate material hardness variability within the deposit. Determine the material specific grinding energy. Determine the feed throughput of the AG mill.	Determine the specific energy of selected samples. Compare with other test methods. Determine the energy requirements for mag plant regrind.	Predict the PSD of the AG mill product. Evaluate the need for pebble or secondary crushing. Produce ground material for beneficiation test.
Type of Test	SPI	Drop Weight (DWT) Crusher Work Index (CWI) BWI – 300 µm BWI – 150 µm SAG Design SMC SPI	MacPherson RWI BWI – 300 µm BWI – 150 µm SMC SPI
# of Tests (RC/RN)	49/50	9/10	3/3
Type of Sample	Full HQ core Single core, 3 m long 25 kg/sample	Full HQ core Single core; 15 m long 125 kg/sample	Full HQ core Composite samples (RC 36/RN 50) 300 kg/sample

Gravity beneficiation tests were performed using the Wilfley tables in bench tests or continuous semi-pilot testing. The gravity beneficiation test program was divided into three different steps as indicated in Table 13-2.

Table 13-2: Summary of Gravity Beneficiation Test Plan

	Function	Type of Test	Sample Source
Gravity, Bench Test by Size Fraction	Complete characterization of the gravity separation by size fraction. Complete tests initiated in the 2011 PEA.	Bench Wilfley Table. Two size fractions: -425/+212 -212/+75	Core reject material from 2011 PEA core. sample preparation: 10 kg/ sample. Rose Central only.
Gravity, Head Grade Sensitivity	Perform confirmatory tests on samples assaying different grade.	Bench Wilfley Table.	Individual Yellow Code sample: 10 kg/sample. Rose Central and Rose North.
Gravity, Grind Size Sensitivity (Variability Tests)	Evaluate the optimal grind size for the gravity circuit. Develop grade/recovery curves.	Bench Wilfley Table.	Composite of four Yellow Code samples for each mineral type.
China Sample	Produce a representative combined gravity mag plant final concentrate.	Continuous semi-pilot grinding, WT and tails cobbing. Regrind + Cleaning of cobber conc.	Blended of all RC and RN mineral types. Core reject material from 2011 PEA core sample preparation.

An important consideration in sample preparation consists of reproducing the targeted AG mill particle size distribution on a bench grinding unit without overgrinding the softest components of the material. It is therefore imperative that a controlled stage grinding procedure be adopted.

The magnetic plant circuit, as previously defined in the 2011 PEA, required validation and optimization through a more detailed testwork program. For the 2012 FS, the test plan objectives were to evaluate the performances of cobber LIMS, to determine the optimal regrind size and to better define the cleaning circuit. Table 13-3 summarizes the test plan.

Table 13-3: Summary of Magnetic Beneficiation Test Plan

	Function	Type of Test	Sample Source
Bench Test	Determine the cobber performance. Understand the mineralogy of the cobber concentrate. Define the optimal regrind size. Define the cleaning circuit.	Bench Cobber LIMS unit Davis Tube QEMSCAN	Wilfley Table tails from bench test RC-2 and RC-3 only
China Sample Mag Plant	Validate cleaning results from bench test	LIMS	China Sample Cobber Concentrate

The bench tests were performed only on RC-2 and RC-3. Since the Rose North samples were not available for this testwork, it was assumed that Rose North mineral types would perform similarly to the corresponding Rose Central mineral types. To confirm this, the aforementioned sinter test sample, containing Rose North mineral types, was tested and compared to the bench test results.

13.3 Mineralogical Characterization

13.3.1 Historical Mineralogical Analysis Results

Previous testwork performed by Altius on a single sample indicated the following. Details of the testwork results are presented in a report issued by SGS (McKen and Wagner, 2009).

- The sample was magnetite dominant assaying 31% Fe, 26% magnetite and 1.6% MnO;
- Quartz, followed by ankerite, were the main gangue elements;
- Iron based minerals were found to follow the particle size distribution while SiO₂ based minerals were coarser and MgO, MnO and CaO were concentrated in the finer fraction;
- Elemental deportment analysis indicated that 97% of the iron occurs as Fe-oxides.

13.3.2 2011 PEA Study Mineralogical Analysis Results

A QEMSCAN and microprobe analysis was performed on four size fractions of head samples for each mineral type within Rose Central. Details of the results of this testwork can be found in the 2011 PEA testwork SGS report (Davies and Lascelles, 2011). Table 13-4 shows the mineralogical components present in the three Rose Central mineral types. As can be observed, RC-1 and RC-2 are generally similar with the exception of the magnetite to hematite proportions. RC-3 has a lower Fe-oxide content and generally higher gangue, mainly in the form of silicates. This is consistent with the geological description of the mineral types. Fe deportment analysis indicates that for RC-1 and RC-2, Fe in Fe-oxides is in the order of 94% compared to 87% for RC-3, which has more Fe in the form of silicates and also with dolomite.

Table 13-4: Rose Central Modal Table

Sample		RC-1	RC-2	RC-3
Mineral Mass (%)	Fe-Oxides Total	46.4	46.2	40.1
	Magnetite	15.7	29.8	26.3
	Hematite	30.6	16.4	13.8
	Goethite	0.2	0.0	0.0
	Quartz	32.1	37.1	34.8
	Amphibole/Pyroxene	6.5	5.9	12.9
	Micas/Clays	0.4	0.2	0.8
	Other Silicates	1.0	0.4	0.5
	Ankerite (Low Mn, Mg, Fe)	6.1	4.7	1.8
	Dolomite (Fe)	0.7	0.7	6.6
	Mn-Fe-Ca Carbonates	5.5	4.4	1.3
	Calcite	0.1	0.2	0.4
	Other Carbonates	0.2	0.1	0.5
	Apatite	0.1	0.1	0.1
	Sulphides	0.1	0.0	0.2
	Other	0.3	0.1	0.1
	Total	100.0	100.0	100.0

Considering the presence of manganese (“Mn”) and its potential impact on final product analysis and product marketability, a manganese deportment analysis was performed. About 85% of the Mn in RC-1 and RC-2 is in the form of carbonates, compared to about 60% for RC-3. Furthermore, RC-3 has significantly more Mn in silicates than RC-1 and RC-2. Mn is also present and chemically bonded to magnetite. In RC-1, about 6% of the Mn is in magnetite, compared to about 13% for RC-2 and 23% for RC-3.

Fe-oxide liberation curves are shown in Figure 13-1. RC-1 and RC-2 are very similar up to the coarsest particle sizes whereas RC-3 exhibits inferior liberation at the coarser size. Liberation and association analyses done on other minerals showed that unliberated Fe-oxides are mainly associated with silicates. It was found that in general, carbonates liberate finer than Fe-oxides, except for RC-3, which has similar liberation size. Liberation size of silicates is coarser for all mineral types.

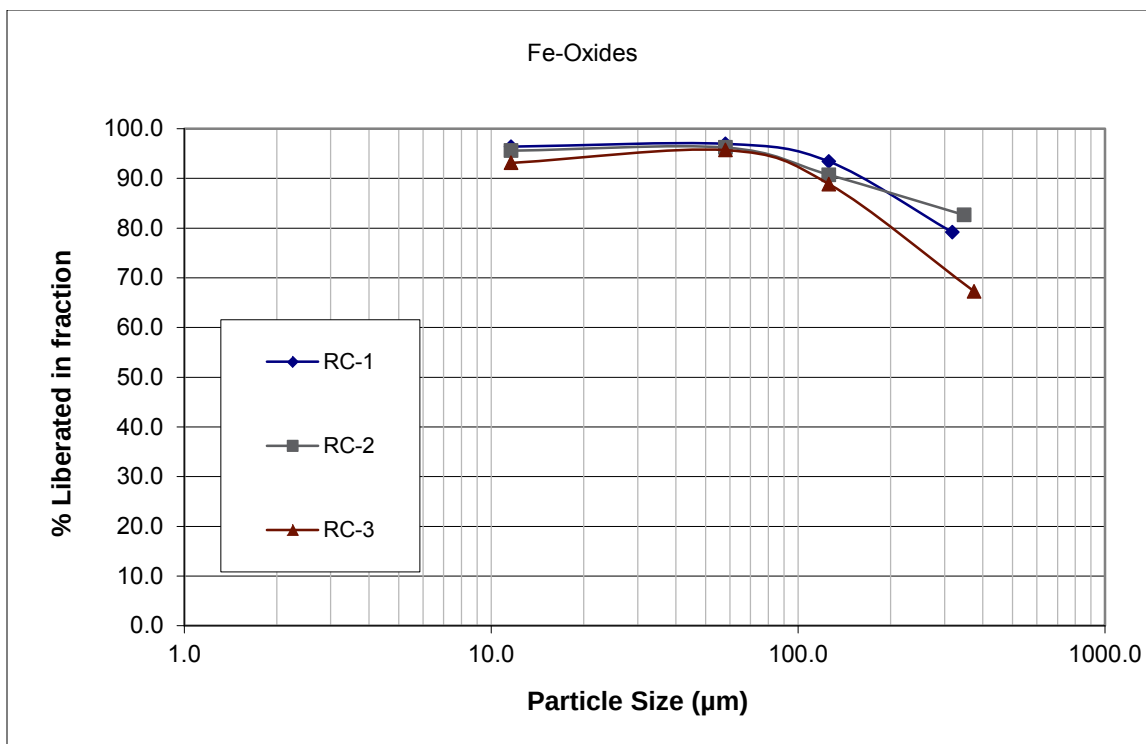


Figure 13-1: Fe-Oxide Liberation Curves for RC-1, RC-2 and RC-3

13.3.3 2012 Feasibility Study Mineralogical Analysis Results

In the 2012 FS, mineralogical analysis focused on the Rose North deposit. Head composite samples for each Rose North mineral type were prepared from Yellow Code samples having similar Fe grade. The composite samples were made using a small number of core samples, but it was deemed that this would be acceptable for the purpose of the testwork. The exception to this was with the RN-1 sample, which turned out to have a Mn content that was much higher than the average and was therefore considered not reasonably representative. The mineralogical analysis using QEMSCAN highlighted some important differences between Rose Central and Rose North. Table 13-5 presents the Rose North modal table.

Table 13-5: Rose North Modal Table

Sample		RN-1	RN-2	RN-3
Mineral Mass (%)	Fe-Oxides Total	58.2	45.5	36.6
	Magnetite	1.9	19.6	36.1
	Hematite	52.1	25.4	0.5
	Goethite	4.2	0.5	0.0
	Mn-Oxides	7.9	3.2	2.5
	Ilmenite	0.0	0.1	0.0
	Quartz	24.8	43.6	42.3
	Amphibole/Pyroxene	3.6	0.5	8.2
	Mn-Silicate	4.6	0.2	0.1
	Micas/Clays	0.0	1.2	0.2
	Other Silicates	0.4	1.0	0.4
	Ankerite (Low Mn, Mg, Fe)	0.0	0.9	0.1
	Dolomite (Fe)	0.0	0.7	6.9
	Mn-Fe-Ca Carbonates	0.3	2.4	0.3
	Other Carbonates	0.0	0.5	2.0
	Apatite	0.0	0.1	0.1
	Mn-Oxides	7.9	3.2	2.5
	Total	100.0	100.0	100.0

Fe deportment analysis indicates that for RN-1 and RN-2, Fe in Fe-oxides is in the order of 97% compared to 86% for RN-3. This is comparable to Rose Central mineral types. A notable difference between the Rose North and Rose Central deposits lies with the magnetite to hematite proportions. The RC-1 and RC-2 mineral types have a lower proportion of hematite compared to the corresponding mineral types RN-1 and RN-2, whereas RC-3 has a much higher hematite proportion than does RN-3. Also, for RN-1, a significant quantity of Fe is present as goethite. This high level may also be due to previously mentioned sample representativity issues.

Mn deportment analysis indicates that Rose North exhibits the presence of Mn-oxides which were not present in Rose Central. This is important because Mn-oxides are generally heavy minerals which will typically report to gravity concentrate in higher percentages than other Mn minerals. The main observations comparing the three Rose North mineral types are as follows:

- Mn as Mn-oxides is present in significant quantity in all three mineral types;
- Mn in magnetite is most significant in RN-3;
- In RN-1, Mn is mostly present in silicate form and to a lesser degree in carbonates;
- In RN-2 and RN-3, Mn is mostly present in carbonate form and to a lesser degree in silicates.

Figure 13-2 presents iron oxide mineral liberation curves. These indicate that the Rose North deposit is not expected to perform as well as Rose Central in the gravity circuit. This is especially true for RN-3 which is indicated to liberate at a much finer particle size.

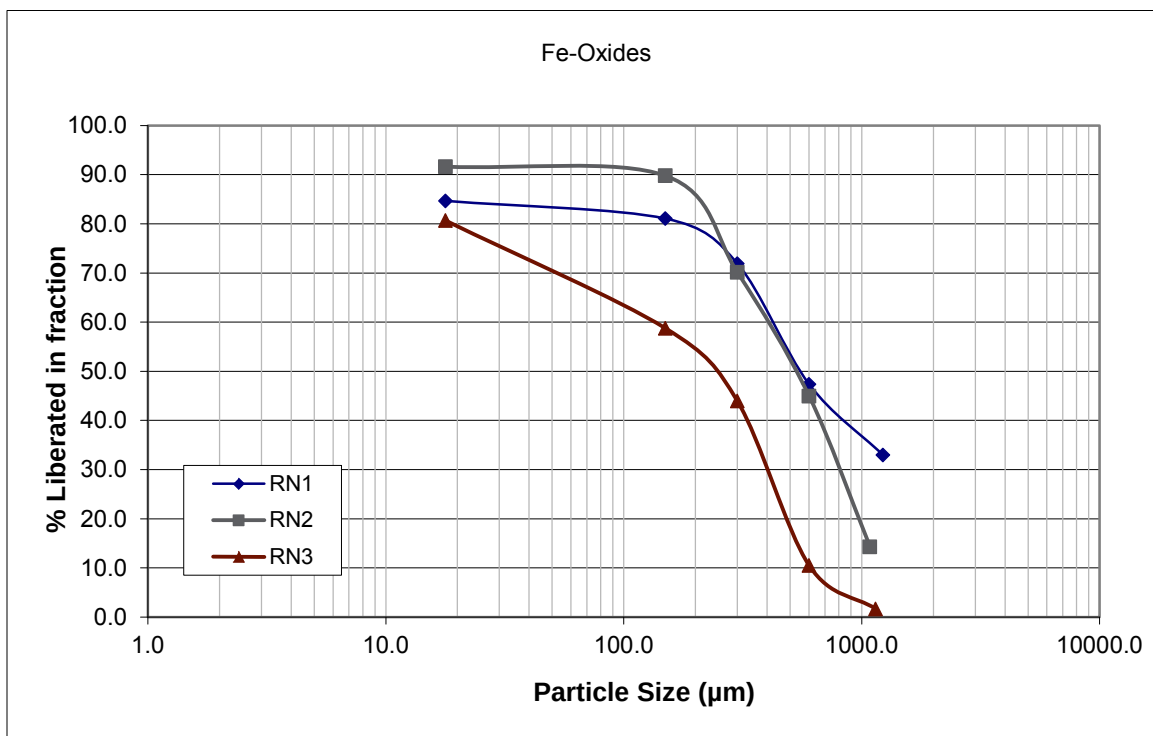


Figure 13-2: Fe-Oxide Liberation Curves for RN-1, RN-2 and RN-3

13.4 Beneficiation Testwork

13.4.1 Historical Beneficiation Test Result Summary

Even though the scope of the testwork performed by Altius was limited to a general baseline characterization of the amenability of the material to respond to gravity and magnetic concentration, the following general conclusions were derived from the beneficiation testwork:

- Concentrate Fe grade ranging from 63.7% to 68.7% and Fe recovery ranging from 73.3% to 86.0% were achieved with gravity separation at particle sizes between 250 µm and 74 µm;
- LIMS tests performed on the Head sample ground to P_{80} of 140 µm gave Fe grade ranging from 64.3% to 68.7. At a coarser grind (P_{80} of 256 µm), the Fe grade was low at 55.6%. Fe recovery was low at all grind sizes ranging from 57.3% to 65.4%;

- From the tails produced by the aforementioned LIMS tests, good gravity separation results were achieved without any regrind.

13.4.2 2011 PEA Beneficiation Test Result Summary

In the 2011 PEA Study, the beneficiation testwork consisted of a combination of Wilfley Table tests, Heavy Liquid Separation (“HLS”) tests and Davis Tube (“DT”) tests conducted on samples from the three mineral types in Rose Central. Information from the QEMSCAN testwork previously described supported the beneficiation testwork and helped in the understanding of how the mineralogy of the material affects its metallurgical behavior. In a first phase of the testwork, HLS and DT tests were done on Head samples of each mineral type at three particle size fractions, -425/+212 microns, -212/+75 microns and -75/+45 microns. Results of this testwork were used to define the Wilfley Table test plan, which consisted of a bench table test for each RC-1, RC-2 and RC-3 for the -425/+212 micron fraction, and for RC-3, a test was also performed on the -212/+75 micron fraction. Results from this testwork were used to define the gravity metallurgical performance parameters for the 2011 PEA.

In the 2011 PEA, no testwork was done on the magnetic separation plant other than DT tests on the Wilfley Table tails. Metallurgical performance parameters were only estimated based on experience from other operations.

The testwork results obtained during the 2011 PEA Study allowed for the estimation of the metallurgical performance parameters including Fe recovery, weight recovery, Fe and SiO₂ grade for the combined gravity and mag plant concentrate, normalized for expected concentrate PSD, targeted SiO₂ grade, mine plan Fe Head grade and mine plan expected proportions of the three mineral types for the life-of-mine. Scaling factors to reflect Wilfley Table versus spiral efficiency were also incorporated by assuming that all Fe in particles finer than 75 µm were not recovered by the spirals. The final 2011 PEA adjusted metallurgical performance parameters are shown in Table 13-6. They were then used in developing the 2011 PEA process and plant design basis which defined material throughput and concentrate production based on the LOM mineral type proportions. For the 2011 PEA Study, the spiral SiO₂ target was at relatively low levels because this spiral concentrate was blended with mag plant concentrate of much higher SiO₂ to produce an overall concentrate of 4.5% SiO₂. This was done to keep mag plant regrind as coarse as possible.

Table 13-6: 2011 PEA Metallurgical Performance Parameters Derived from Gravity Testwork

	RC-1	RC-2	RC-3
Wt Rec %	34.2	31.8	24.1
Fe Rec %	77.0	72.0	53.4
Fe Head Grade %	29.9	29.9	29.9
Concentrate Fe Grade %	67.3	67.8	66.3
Concentrate SiO ₂ Grade %	2.5	2.3	3.5

The cobber performance was based on DT test results performed on Wilfley Table tails for each of the three Rose Central mineral types. Mag plant regrind and liberation sizes were estimated based on mineralogy testwork results and magnetic cleaner performance was assumed based on reference projects. SiO₂ content was also assumed and calculated based on a total combined concentrate (spiral + mag plant) SiO₂ grade of 4.5%. Table 13-7 presents the 2011 PEA mag plant performance parameters.

Table 13-7: 2011 PEA Mag Plant Metallurgical Performance Parameters

	RC-1	RC-2	RC-3
Cobber Mag Rec %	98	100	99
Cobber Wt Rec %	14	27	28
Regrind P ₈₀ µm	106		
Cleaner LIMS Mag Rec %	90 (assumed)		
Cleaner LIMS Wt Rec %	30 (assumed)		
Mag Concentrate % SiO ₂	7.3		

The final metallurgical performance parameters and concentrate chemistry were calculated based on LOM Rose Central mineral type proportions. Table 13-8 shows the main elements of the 2011 PEA beneficiation parameters.

Table 13-8: 2011 PEA Final Concentrate

Weight Rec %	37.8%
Total Fe Rec %	82.8%
Fe Grade %	65.1%
SiO ₂ Grade %	4.5%

13.4.3 2012 Feasibility Study Wilfley Table Testwork Results

A series of tests were performed to validate the aforementioned gravity separation performances and to investigate the effect of grind size on metallurgical performance in the gravity circuit. This testwork included both Rose Central and Rose North and the tests were done on full particle size distributions and not on specific particle size fractions. A composite sample for each of the six mineral types was stage-ground to 1000 µm and to 600 µm top-size. For each mineral type, one composite sample was produced from four drill core samples selected among stored Yellow Code samples. Then, two portions of each composite sample were fed to a multi-stage Wilfley Table batch circuit producing a concentrate, five middling streams and a tails stream. This allowed for the development of multi-point grade-recovery curves for each mineral type and for each grind size in order to determine recovery of total Fe, magnetite and Mn at a target of 4.3% SiO₂ grade. Detailed results are available in the SGS report (Davies and Imeson, 2012).

The grade-recovery curves generated were used to estimate metallurgical performance and the results are presented in Table 13-9. It should be noted that P₈₀ for the -600 µm samples are generally coarser than the estimated AG mill particle size distribution of P₈₀ of 300 µm. A conservative assumption was made that performance would be similar for the two P₈₀'s. For most mineral types, overall Fe recoveries improve for the finer top size grind while maintaining concentrate grade. This confirms adequate liberation is achieved at P₈₀ in the order of 300 µm.

Table 13-9: Gravity Variability Test Results Normalized to 4.3% SiO₂

Zone	Grind Size (µm)	Feed P ₈₀ µm	Head Grade		Conc. Grade			Fe Recovery (%)	Magnetite Recovery (%)	Mn Recovery (%)
			Fe	Mag	Fe	SiO ₂	Mn			
			%	%	%	%	(%)			
RC-1	-1000	504	31.8	6.0	64.0	4.30	-	84.5	90.0	-
	-600	386	31.7	6.2	64.8	4.30	0.66	82.5	76.0	14.5
RC-2	-1000	409	33.1	27.4	64.4	4.30	-	62.9	-	-
	-600	333	31.9	27.2	65.0	4.30	1.01	71.0	76.0	22.5
RC-3	-1000	676	33.6	42.8	66.4	4.30	-	58.4	61.0	-
	-600	345	34.0	42.0	66.6	4.30	0.76	70.5	81.0	27
RN-1*	-1000	592	39.0	1.30	63.2	4.30	-	54.4	82.5	-
	-600	352	38.5	1.24	63.0	4.30	3.64	67.0	47.5	35
RN-2	-1000	687	31.1	17.4	65.1	4.30	-	71.2	72.0	-
	-600	311	32.7	18.2	64.7	4.30	0.86	78.0	80.0	34
RN-3	-1000	698	28.0	31.6	63.3	4.30	-	48.8	60.0	-
	-600	287	28.1	31.7	64.0	4.30	0.55	55.0	64.0	20

*RN-1 was deemed not representative due to the high Head Mn content.

As indicated previously, the RN-1 composite sample was not considered representative. It was therefore assumed that RN-1 performance was similar to RC-1.

Wilfley Table tests were performed on a limited number of samples in order to determine the effect of Head grade variability on gravity concentrate Fe recovery. It was concluded that Fe Head grade had no significant impact on Fe recovery and concentrate Fe grade, therefore Fe recovery only varies with mineral type.

Mn in the concentrate comes from two main sources consisting of Mn in gangue minerals and Mn in magnetite. Two methods for Mn gravity concentrate grade estimation were used. The first method consisted of estimating Mn gravity concentrate grade from the Mn recovery curves developed from the test results for the targeted 4.3% SiO₂ grade for each mineral type. This method assumed a constant Mn recovery at all Mn Head grades which is questionable since Mn recovery depends not only on total Mn Head grade, but also on the mineralogical Mn department. The second method was based on using the Mn concentrate grade from the test results, adjusted to the targeted 4.3% SiO₂ grade, for each mineral type. Since it was not clear from the test results as to which of the two methods predominates for each mineral type, it was assumed that the Mn grade in concentrate would be an average of the two methods. Table 13-10 presents the estimated Mn gravity concentrate grade for each mineral type, for the two methods as well as the average value used in this 2012 FS.

Table 13-10: Comparison of Mn Gravity Concentrate Grade Estimation

	RC-1	RC-2	RC-3	RN-1	RN-2	RN-3
Method 1 Mn Gravity Conc Grade (%)	1.05	1.10	0.67	1.27	0.70	0.45
Method 2 Mn Gravity Conc Grade (%)	0.66	0.99	0.76	0.66	0.85	0.55
Average Mn Gravity Conc Grade (%)	0.86	1.05	0.72	0.96	0.77	0.50

13.4.4 Detailed Engineering Gravity Testwork

During detailed engineering, vendor testwork for final design of spiral circuit was performed using a representative 2,500 kg sample sent to Mineral Technology laboratory in Australia. The testwork confirmed the spiral model and number of spirals as well as spiral operating parameters and metallurgical performance. BBA was not provided any reports on this testwork but Alderon confirmed that the testwork demonstrated that recoveries and grades were slightly more favorable than the results obtained in the 2012 FS testwork. For this updated FS the 2012 FS test results were used.

13.4.5 2012 Feasibility Magnetic Separation Test Results

The first step in the mag plant process consists of cobbing of the Wifley Table tails. The DT test results from the 2011 PEA were complemented by LIMS tests performed on only RC-2 and RC-3 material for particle sizes from -425 µm to +75 µm. The performances of both DT and LIMS are shown in Table 13-11. Considering that the mag plant is a magnetic concentration process, performance of the mag plant is assessed on magnetite recovery and not total Fe recovery. It can be observed that the Davis Tube magnetite recovery is generally higher than the LIMS, which depends highly on the way the test unit is operated. Based on the test results and on reference operations and assuming that magnetite recovery doesn't vary between the six mineral types, the cobbing magnetite recovery used in this 2012 FS study was conservatively estimated at 90%. Corresponding grade-recovery curves have been developed in order to perform the mass balance in the mag circuit. In order to minimize magnetite losses to the final tailings, it is assumed that the cobber LIMS operates at full intensity (1000 Gauss). Liberated gangue minerals that were rejected in the non-magnetic tails carried with them a significant amount of Mn as can be seen in the table from Mn recovery results.

Table 13-11: Grades and Recoveries after LIMS and DT Cobbing of Gravity Tailings

Sample	Device	Stream	Grade (%)			Recovery (%)			
			Fe	Mn	Mag	Wt	Fe	Mn	Mag
RC-3 Wilfley Midds and Tails	LIMS Test-1	Concentrate	26.0	0.47	30.0	27.3	54.8	20.4	84.9
		Head	13.3	0.63	9.4				
RC-3 Wilfley Midds and Tails	LIMS Test-2	Concentrate	27.0	0.50	31.8	28.2	53.2	20.5	87.0
		Head	14.3	0.68	10.3				
RC-2 Wilfley Tails	LIMS	Concentrate	18.7	1.12	19.7	28.3	54.0	23.9	77.9
		Head	9.8	1.32	7.1				
RC-3 Wilfley Midds and Tails	DT	Concentrate	26.4	0.66	30.4	36.3	60.2	30.7	99.1
		Head	15.9	0.78	11.2				
RC-2 Wilfley Tails	DT	Concentrate	15.1	1.17	19.8	28.0	58.4	18.0	92.9
		Head	7.2	1.82	6.0				
RC-1 Wilfley Tails	DT	Concentrate	16.1	1.77	18.8	13.6	31.2	7.0	95.0
		Head	7.0	3.45	2.7				

It is important to note that the cobber concentrate contains a notable quantity of very fine magnetite dispersed in relatively coarse SiO₂ particles. This is commonly referred to as “peppered silica”. This is illustrated in Figure 13-3. During the course of the testwork, strategies for rejecting these SiO₂ particles were investigated including lower magnetic field LIMS (down to 500 Gauss) as well as gravity methods.

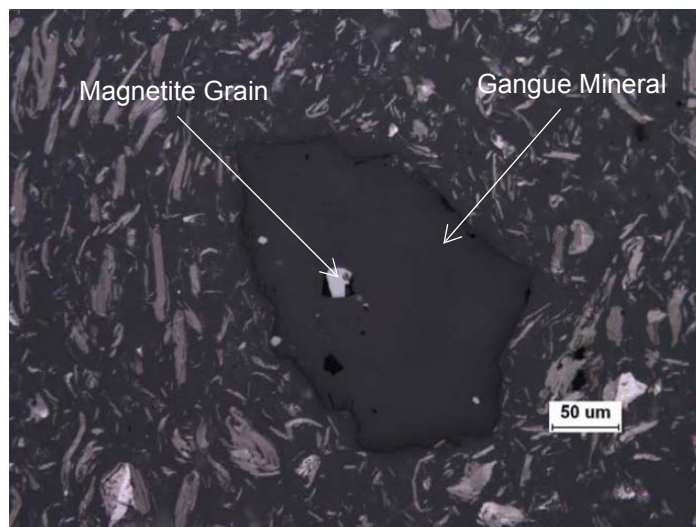


Figure 13-3: Very Fine Magnetite Locked in Gangue Mineral

Following the cobber stage, the cobber concentrate needs to be reground to an appropriate particle size to assure adequate liberation in order to achieve the targeted SiO_2 grade of maximum 4.3%. The regrind testwork is described later in this chapter.

In order to define the liberation size, some initial mineralogical characterization tests were performed. The results of this testwork helped to orient regrind/cleaning LIMS testwork and to better understand and interpret results. This work was followed by further testwork consisting of performing a DT cleaning test for a series of size fractions. This testwork was done only on RC-2 and RC-3 mineral types. The results are shown in Table 13-12. As can be observed, SiO_2 grade below the targeted SiO_2 level is only achieved at -45 μm for RC-2.

Table 13-12: Fe and SiO_2 Grades and Magnetite and Weight Recoveries by Size

Sample Source	Size Fraction (μm)	Fe Grade (%)	Magnetite Rec (%)	SiO_2 Grade (%)	Weight Rec (%)
RC-2 Cobber Con	-150/+106	29.4	94.3	55.8	41.3
RC-2 Cobber Con	-106/+75	45.5	97.2	33.2	36.0
RC-2 Cobber Con	-75/+45	55.7	97.6	18.1	35.8
RC-2 Cobber Con	M -45	65.2	96.4	5.9	26.8
RC-3 Cobber Con	-150/+106	41.4	99.5	39.7	85.2
RC-3 Cobber Con	-106/+75	46.4	98.6	32.8	61.7
RC-3 Cobber Con	-75/+45	61.7	98.6	13.1	46.5
RC-3 Cobber Con	-45	68.5	90.3	3.58	29.7

Based on these results, it was assumed that a P_{80} of 45 μm and a P_{100} of 75 μm would provide the required liberation to achieve the targeted SiO_2 grade. This may require using the strategy of incorporating within the cleaning circuit, a lower intensity LIMS to reject peppered SiO_2 . In order to validate this assumption, testwork was done on reground sinter test sample cobber concentrate containing material from all six mineral types, using a LIMS intensity of 500 Gauss. The size-by-size assays shown in Table 13-13 illustrate SiO_2 grade versus grind particle size fraction.

Table 13-13: Second Stage LIMS Cleaning Size-by-Size Assays

Stream	LIMS Assays %				Davis Tube Assays %	
	SiO_2	Fe	Sat	Mn	SiO_2	Mn
CONC +75	14.5	59.4	81.4	0.61	-	-
CONC +53	6.2	66.4	94.4	0.55	-	-
CONC +45	4.9	67.4	94.6	0.53	-	-
CONC +37	4.0	67.9	97.8	0.53	0.30	0.50
CONC - 37	6.5	66.0	93.8	0.56	0.64	0.52
Calc. Head	7.3	65.4	92.5	0.56	-	-

It can be observed that material coarser than 75 μm is unliberated. As a result, regrinding is suggested at P_{100} of 75 μm , thus confirming the previous assumption. The SiO_2 grade for the minus 37 μm fraction is higher than expected and contamination by SiO_2 slime entrainment was suspected. This was confirmed by DT test results performed on the last two size fractions. SiO_2 levels for these size fractions are expected to be below 1%, as shown previously in Table 13-13. This confirms that given the proper number of cleaning stages and LIMS intensity, a concentrate having less than 4.5% SiO_2 at a P_{80} of 45 μm can be achieved. With these parameters defined, other metallurgical performance parameters and chemical analysis need to be estimated, namely magnetite recovery, Fe grade and Mn grade, for the final mag plant concentrate.

The magnetite recovery (cobber concentrate to final mag plant concentrate) was estimated to be in the order of 93%. This was based on indications from the sinter test sample LIMS test results, which included a two-stage (1000/500 Gauss) cleaning LIMS as well as from reference operating plants. The Fe grade for the mag plant concentrate was estimated at 66% based on test results at the targeted SiO_2 concentration. The Mn grade for the mag plant concentrate was estimated at 0.56% Mn. These aforementioned parameters are all assumed to be constant for the six mineral types. In the 2012 FS, it was recommended that more detailed testwork on the mag plant circuit be performed prior to final design.

13.4.6 Detailed Engineering Confirmatory Semi-Pilot Beneficiation Testwork

During detailed engineering, semi-pilot testing for the production of concentrate and tailings for customer requirements and equipment sizing was performed at SGS (Davies and Imeson, May 2014). A 2,350 kg composite sample was prepared from drill core coarse rejects, blended in proportion to the rock type of the 2012 FS mine plan and stage ground to represent a spiral feed. Wilfley Table tests were performed to produce a tail and a gravity concentrate. The tails were sent for magnetic separation and regrind. The final combined concentrate graded 67.2% Fe, 4.1% SiO₂ and 0.62% Mn. After blending to a proportion of 81.5% gravity concentrate and 18.5% magnetic concentrate, proportions representing the 2012 FS mass balance, the final adjusted concentrate graded 65.6% Fe, 4.31% SiO₂ and 0.74% Mn with a P₈₀ of 273 µm. This compares favorably with the final concentrate specification presented later in this chapter. It should be noted that this pilot testwork led to a significant redesign of the mag plant compared to the 2012 FS. A higher mag plant circulating load around the ball mill was predicted and equipment was adjusted accordingly. For this FS, mag plant design and equipment sizing was maintained as per detailed engineering however the mass balance (tonnage and grade for cobbing and magnetic separation) was based on the 2012 FS testwork results.

13.5 Grindability Testwork

13.5.1 Historical Grindability Tests Results

The testwork performed by Altius was limited in scope and served only for baseline classification of the material hardness. The Rod Mill Work Index classified the material as a very soft material (1st percentile based on SGS database curve). On the other hand, the ball mill Work Index, calculated from a F₈₀ = 1 652 µm to P₈₀ = 61 µm, was determined to be 18.5 kWh/t, which was categorized as a hard material (84 percentile based on SGS database curve). As a result, grindability tests indicate that Kami iron material was classified to be in the soft range for coarse grinding but is hard for fine grinding.

13.5.2 2011 PEA Grindability Tests Results

The grinding tests done in the 2011 PEA Study, consisting of Drop Weight, SMC, CWI, RWI and BWI, confirmed that the tested samples were classified as relatively soft for autogenous grinding (AG) and relatively hard for fine grinding. The AG mill throughput was also estimated using the Morrell calculation method, however, the conclusions that were drawn were preliminary and needed to be confirmed by more detailed testwork performed in the 2012 FS. The nominal operating Work Index calculated for the AG mill was estimated to be 3.7 kWh/t and design was based on 4.0 kWh/t, which represented the 75th percentile of the hardness values.

The Bond Ball Mill Work Index was measured at three different regrind sizes: P_{80} at 300 μm , 150 μm and 45 μm . The Work Index increases exponentially with finer grind size. For the 2011 PEA, the mag plant regrind ball mill was sized assuming a BWI of 18.5 KWh/t.

13.5.3 2012 FS Grindability Results Using the SPI and IGS Methodology

For the 2012 FS, the specific energy required for AG grinding to the required particle size and an estimate of the AG mill throughput were determined primarily using the SAG Power Index (“SPI”) test complemented by Integrated Geometallurgical Simulator (“IGS”) simulations. This methodology was used because it is used by other iron ore operations in the region and the model offers improved calibrations when compared to other grindability models available, particularly in this hardness range. The data from the SPI tests, along with material specific design parameters is analyzed using the IGS modelling tool (formerly CEET), which was developed by SGS and consists of an empirical model, calibrated using actual plant data. IGS basically uses SPI data to derive the material specific grinding energy and mill throughput. Detailed descriptions of the test procedures as well as testwork and simulation results are presented in the report issued by SGS (Lee, 2012).

Table 13-14 presents a summary of the results of the SPI testwork performed on 118 samples from the Rose deposit for each mineral type. From the data, it can be concluded that, on average, the Rose North deposit is slightly softer than Rose Central. Also, RC-1, RC-2, RN-1 and RN-2 exhibit similar profiles, however, RC-3 and RN-3 on average, are considerably harder. This suggests that AG mill throughput will be highly dependent on the proportion of RC-3 and RN-3 processed. Furthermore, no relationship was found between SPI values and Head Fe or magnetite Head grade, sample location or any other variable.

Table 13-14: Summary of SPI Test Results

SPI Test Results (Minutes)	Avg. RC	Avg. RN	RC-1	RC-2	RC-3	RN-1	RN-2	RN-3
Average	18.9	16.4	13.4	16.0	24.9	12.9	13.4	26.3
Standard Deviation	15.0	13.4	9.2	11.3	18.4	11.1	7.5	17.5
90 th Percentile	38.4	31.5	26.6	33.7	51.2	24.8	22.5	44.4
75 th Percentile	24.6	21.9	17.3	21.0	29.3	15.4	19.3	32.7
50 th Percentile	14.3	11.9	10.4	12.9	21.1	8.3	9.9	22.0
Number of Samples	58	60	14	21	23	26	19	15
Minimum	2.0	2.0	2.0	3.3	2.1	2.0	2.6	5.6
Maximum	73.9	73.9	33.8	44.2	73.9	53.8	31.5	73.9

The SPI data for the six mineral types generated by the testwork was then analyzed by SGS using the IGS tool. For the 2012 FS, the following parameters and design criteria were used by IGS as inputs to the simulation model. It should be noted that AG mill power draw, unless stated otherwise, is defined as power draw at the mill shell.

- Autogenous (AG) mill at dia. x length (flange to flange) of 10.97 m x 6.55 m (36' x 21.5'). The mill drive is dual-pinion, low speed motor with variable frequency electric drive;
- Nominal mill power draw at shell (nominal conditions defined as 75% Critical Speed and 30% load) of 12,180 kW. Maximum power draw at shell (maximum conditions defined as 78% Critical Speed and 35% load) of 13,174 kW. These power draws were calculated by SGS using Morrell method and were validated against equipment vendor power charts;
- For the AG mill, $F_{80} = 150$ mm and $P_{80} = 300$ μ m, which was determined from beneficiation testwork as previously described;
- Material specific gravity of 3.4 and AG grinding is done at 70% solids;
- Design feed rate was assumed at 3,145 t/h based on 2012 FS design basis.

Further to these input parameters, the IGS model is based on a standard circuit design, which requires certain correction and calibration factors which are applied to take into account material specific parameters. Detailed explanations on correction factors and effect of parameters are well described in the SGS report "IGS Forecast Study for the Kami Iron Ore Project" (Lee, 2012).

Therefore, a maximum power draw for the 21.5' long AG mill of 13,174 kW could be achieved at maximal operating limits. At nominal operating conditions, the power draw is lower, at 12,180 kW. Figure 13-4 shows the relation between throughput and material specific energy for the selected AG mill size at maximum power draw and assuming a maximum throughput of 3,145 t/h.

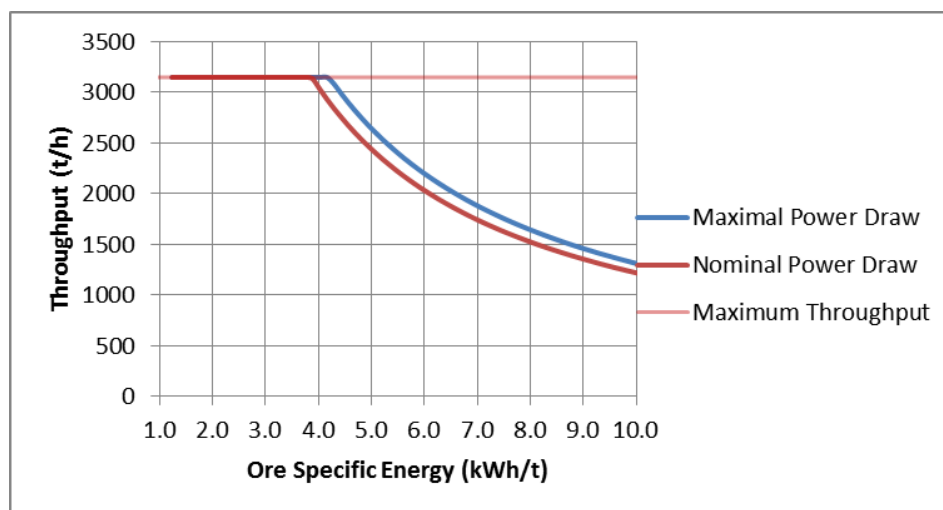


Figure 13-4: Throughput Sensitivity on Material Specific Energy

When the specific energy is over 4.2 kWh/t, power is limited and throughput must be reduced to levels below 3,145 t/h. On the other hand, when the specific energy is below 4.2 kWh/t, the throughput is limited to the tonnage of 3,145 t/h due to downstream capacity constraints. In this case, the AG mill operation is not benefiting from the available power because it is operating below its maximum power.

Table 13-15 presents a summary of results that converts SPI values, presented previously, to specific energy for each mineral type. The weighted LOM average specific energy for the Rose deposit is 4.33 kWh/t. It should be noted that the LOM proportions of each mineral type in the 2012 FS is very close to that of the current updated FS and results would not be materially impacted.

Table 13-15: Specific Energy by Mineralization Estimated with IGS

Specific Energy (kWh/t)	RC-1	RC-2	RC-3	RN-1	RN-2	RN-3	Weighted to 2012 FS Mine Plan
Average	3.71	4.13	5.34	3.66	3.74	5.57	4.33
Standard Deviation	1.36	1.61	2.51	1.60	1.11	2.37	1.75
90 th Percentile	5.55	6.67	8.95	5.34	4.96	8.07	6.60
75 th Percentile	4.33	4.81	6.05	4.19	4.63	6.53	5.05
50 th Percentile	3.50	3.73	4.80	3.12	3.34	4.99	3.87
Minimum	1.67	2.03	1.71	1.70	1.88	2.57	1.67
Maximum	6.68	8.05	11.83	9.29	6.29	11.84	11.84

For the 2012 FS, in order to optimize AG mill power usage, a blending strategy was developed whereby, when hard material is encountered, it is temporarily stockpiled and blended with softer material when the plant throughput limited downstream. Following analysis and interpretation of the data, it was decided that the SPI cut-off (in minutes) for hard material should be at 38 minutes. This material would be blended with softer material represented by SPI values of less than 16 minutes, which was determined to be the cut-off limit where the mill throughput would not be impacted by blending hard material. Based on the 2012 FS LOM mineral type proportions, it was estimated that 9.5% of the material will require blending.

As a final step, as shown in the Table 13-16, specific energy values calculated from IGS simulations were converted to throughput. The positive effect that blending has in optimizing AG mill power utilization is highlighted. Without this blending strategy, the targeted throughput indicated in the Project design basis in Chapter 17 would not be achieved.

Table 13-16: Calculated Throughput by Mineralization Limited at 3,145 t/h

Calculated Throughput (t/h)	RC Avg	RN Avg	RC-1	RC-2	RC-3	RN-1	RN-2	RN-3	Weighted to Mine Plan
Average (no blending)	2,763	2,839	2,911	2,738	2,301	2,859	2,952	2,235	2,690
Average (with blending cut-off at >38 min)	2,876	2,885	2,911	2,926	2,799	2,982	2,952	2,616	2,886

13.5.4 Final AG Mill Sizing Performed During Detailed Engineering

During the course of detailed engineering, the IGS simulation exercise was repeated by SGS (Bulled, Sept. 2014), using the same dataset as in the 2012 FS but with a longer AG mill, at dia. x length (flange to flange) of 10.97 m x 7.0 m (36' x 23.0'). This increased maximum power draw of the AG mill to 14,593 kW and the downstream limit was increased to 3,289 t/h of fresh feed. Even with the longer mill, the targeted nominal throughput of 2,886 t/h, as indicated in Chapter 17, could not be attained without a blending strategy.

Whereas in the 2012 FS a blending technique to eliminate extremes in SPI values was developed, in this more recent analysis, SGS used a geostatistical model for smoothing extremes. This technique, which incorporates hardness values directly into the block model, applies well to bulk mining and is deemed to be more representative of actual operations and would minimize stockpiling for blending (and associated costs). Using blending of random pairs of samples, SGS conducted five simulations and showed that with the longer mill, nominal throughput is increased to 2,898 t/h. This confirmed that the longer AG mill would provide the required nominal and design throughput. As such, final design and AG mill dimensions were based on this work. SGS recommended that more SPI data be collected and incorporated into the geological model and simulations be conducted for the early years of the mine plan in order to further optimize throughput.

13.5.5 Particle Size Distribution Testwork Results

In the absence of pilot scale grindability testwork with a representative bulk sample, the particle size distribution of product from the AG mill was estimated by performing MacPherson tests for each mineral type during the 2012 FS. A detailed description of this test, as well as results and interpretation, are given by SGS in their report (Davies and Imeson, 2012). Based on MacPherson testwork results and interpretation by SGS, it was determined that, although there was a slight buildup of coarse rocks in the mill charge, there was no critical buildup.

13.5.6 Other Grindability Test Work Performed during the 2012 FS

The SPI test complemented by IGS simulations was the selected methodology for determining material specific grinding energy and operating Work Index. This in turn allowed for sizing of the AG mill for estimating throughput. As part of the test plan, it was decided to perform other standard grindability tests in order to develop various material hardness characterization parameters as well as to compare results of the various tests available to the results of the SPI/IGS. The BWI test was used to estimate the mag plant regrind ball mill size and power. As previously described in the test plan, the Orange Code composite samples were used for these

tests. All of the following tests were done by SGS with the exception of the SAG Design tests, which were done by Starkey & Associates.

- Crusher Work Index Test (“CWI”);
- SAG Mill Comminution Test (“SMC”);
- Bond Rod Mill (“RWI”);
- Bond Low Energy (CWI);
- SAG Design;
- SPI;
- Bond Ball Mill (“BWI”).

Crusher Work Index

Detailed engineering and final crusher selection and design were based on a CWI nominal value of 11.2 kWh/t and design value of 12.8 kWh/t. These values were used to estimate gyratory crusher power requirements for final design.

Regrind Ball Mill Work Index

BWI data was generated during the 2012 FS testwork on head samples and an operating work index was estimated. Detailed engineering was based on a nominal Bond work index of 12.4 kWh/t and a design value of 14.2 kWh/t. These values were obtained during subsequent pilot plant testwork on cobber concentrate and were used to better estimate power requirements and ball mill size. A dual pinion Ball Mill measuring (inside diameter X EGL) 6.7 m X 12.3 m with installed power of 15,000 kW, similar to the AG mill (for common motor spares) was selected. This FS is based on the operating work index values from detailed engineering.

AG Mill Operating Work Index Validation

As discussed earlier, AG Mill selection was based on SPI/IGS test method but compared to other tests. Tests were conducted for each of the mineral types. Table 13-17 summarizes the results of arithmetic averages of the six rock types.

Table 13-17: SPI Comparison to Other Tests

	RWI	SAG Design	SPI	SMC
	(kWh/t)	(kWh/t)	(kWh/t)	(kWh/t)
Average	4.6	5.0	4.1	4.4

13.6 Solid-Liquid Separation

Concentrate Filter Tests

In the 2012 FS, based on expected particle size distribution for the spiral concentrate and for the mag plant concentrate and following discussions with filtering equipment vendors, the flowsheet assumed that the gravity concentrate would be filtered using horizontal pan filters and the finer magnetic concentrate would be filtered using drum filters. Both types of filters would be fitted with steam hoods to reduce moisture content to the specified levels. Representative samples were sent to a vendor for filtering tests. The 2012 FS recommended that further filtration testwork be done prior to final design.

During detailed engineering, gravity concentrate and magnetic plant concentrate filtering tests were conducted by two vendors in their respective laboratories. This allowed for the determination of final equipment sizing. Pan filters for the gravity concentrate were sized and designed to provide a final cake moisture of 3.5% in the summer and 2.5% in the winter with steam injection. Drum filters were designed to produce a magnetic plant concentrate at 7% humidity, requiring year-round injection of steam.

Tailings Thickening Tests

The 2012 FS process flowsheet was based on thickening of fine tailings generated mainly from the gravity middling dewatering cyclones and from the LIMS tailings dewatering cyclones. This concept was changed during detailed engineering as the LIMS tailings were sent directly to the thickener without prior cyclone dewatering. As such, coarse and fine tailings were no longer separated and were combined in the thickener.

During detailed engineering, thickener testing was conducted in the laboratories of three vendors for final thickener sizing and design as well as for estimation of reagent consumption. Design was based on having a thicker overflow water quality having <200 ppm of suspended solids and a thickener underflow solids density of 60% for tailings final disposition to the TMF.

For the current FS, the tailings deposition plan requires that coarse tailings and fine tailings be pumped separately to the TMF. As such, cycloning of the LIMS tailings will be required and the process flowsheet design is being reverted back to the 2012 FS concept.

13.7 Projected Final Concentrate Specifications

The testwork performed in support of the Kami Project development provides the basis for estimating the final product specification. The estimation is based on the projected particle size distribution curves for the spiral concentrate and for the mag plant concentrate at a proportion of 82.5%/17.5% respectively. The moisture content represents an annual average, which includes steam injection during the winter months for the gravity concentrate and year-round steam injection in the mag plant concentrate. This is presented in Table 13-18 and Table 13-19. This specification is in line with what was confirmed during detailed engineering.

Table 13-18: Projected Kami Concentrate Analysis (%)

Fe	Mag	SiO ₂	MgO	CaO	Al ₂ O ₃	Na ₂ O	K ₂ O	TiO ₂
65.2	57.9	4.3	0.6	0.6	0.1	<0.03	<0.01	0.02
Mn	Cr	V	P	S	C	LOI	Moisture	
0.81	<0.01	<0.005	<0.007	0.013	0.4	0.3	4.7	

Table 13-19: Projected Kami Concentrate PSD Analysis

Estimated PSD	
P ₈₀	267 µm
% +450 µm	2.5
% -150 µm	52.6

13.8 Sintering Testwork

During the course of detailed engineering, sinter pot testing was conducted in the technical centre at Qinhuangdao ShouQin Metallic Material Co., Ltd. Details are presented in private reports titled “Technical Report About Sintering Experiment of Alderon Concentrate from Alderon Iron Ore Company, Version for Company 1 and Version for Company 2” performed by School of Metallurgical and Ecological Engineering, University of Science and Technology, Beijing, June 2013. The purpose of these tests was to confirm Kami product marketability by evaluating its impact when blended at various proportions with sinter feeds from other sources typically used by selected steel companies in China. The following provides a summary of the test results. When blended in proportions of 10 to 15%, the following preliminary conclusions were reached:

- Pros:
 - o High Fe grade with low Al_2O_3 , S and P contents;
 - o Reduction of anthracite or coke breeze consumption (sintering energy reduction);
 - o Higher softening index due to Mn content contributing to improved drum index (sinter strength);
 - o Improved reducibility;
 - o Narrower softening range;
 - o Improved sinter iron grade and basicity;
 - o Potential improvement of the blast furnace index.
- Cons:
 - o Poor granulating effect due to fine particle size and of scaly shape;
 - o Reduced sintering speed and productivity;
 - o Potential increase of the reduction degradation index (“RDI”);
 - o Potential permeability reduction of blast furnace burden.

14. MINERAL RESOURCE ESTIMATE

14.1 Mineral Resource Estimate Statement

Following a successful drilling campaign in the winter and spring of 2012, Alderon prepared a Mineral Resource estimate for the Rose Central zone, Rose North zone and Mills Lake to update the total resources for all potentially economic zones for the Project. WGM was retained by Alderon to audit this in-house estimate. Mineral Resource estimates for Mills Lake and the Rose Central zone were previously completed by WGM and were contained in an NI 43-101 Report dated May 21, 2011 and updated once during late 2011, with additional drilling only on the Rose North zone. Additional confirmation and infill drilling, which commenced in early 2012 on Rose Central and Rose North, led to the compilation of this data and the subsequent drilling density allowed for the upgrading of all the Mineral Resource estimates for the Project. No additional exploration drilling has been completed since 2012.

For Rose Central and Rose North, the current Mineral Resources are categorized as Measured, Indicated and Inferred. Resources are interpolated out to a maximum of about 600 m on the ends/edges and at depth, when supporting information from adjacent cross sections was available. Mills Lake was also updated and upgraded to Measured, Indicated and Inferred categories.

All the estimates for Rose Central and Rose North are reported above zero (0.0 m) elevation level (about 575 m from surface) based on BBA's new economic pit outline.

A summary of the Mineral Resources is provided in Table 14-1 and Table 14-2.

Table 14-1: Categorized Mineral Resource Estimate for Rose Central and Rose North (Cut-Off of 15% TFe) (Effective Date as at December 17, 2012)

Category	Zone	Tonnes (Million)	Density	TFe%	magFe%	hmFe%	Mn%
Measured	Rose Central Zone – RC-1	36.9	3.49	30.7	8.7	19.9	2.93
	Rose Central Zone – RC-2	152.5	3.47	29.6	18.7	7.1	1.62
	Rose Central Zone – RC-3	<u>60.5</u>	<u>3.44</u>	<u>28.3</u>	<u>20.0</u>	<u>3.6</u>	<u>0.74</u>
	Total Measured Rose Central Zone	249.9	3.46	29.4	17.6	8.1	1.60
Indicated	Rose Central Zone – RC-1	39.3	3.50	31.2	11.7	16.8	2.28
	Rose Central Zone – R-C2	161.8	3.45	28.8	18.3	5.4	1.43
	Rose Central Zone – RC-3	<u>93.3</u>	<u>3.41</u>	<u>26.8</u>	<u>19.1</u>	<u>2.3</u>	<u>0.58</u>
	Total Indicated Rose Central Zone	294.5	3.44	28.5	17.7	5.9	1.28
Inferred	Rose Central Zone – RC-1	12.4	3.50	31.1	8.2	19.7	2.27
	Rose Central Zone – RC-2	120.4	3.46	29.3	17.3	7.0	1.59
	Rose Central Zone – RC-3	<u>27.8</u>	<u>3.39</u>	<u>26.1</u>	<u>19.0</u>	<u>1.8</u>	<u>0.45</u>
	Total Inferred Rose Central Zone	160.7	3.45	28.9	16.9	7.1	1.44
Measured	Rose North Zone – NR-1	101.5	3.55	33.1	6.0	26.6	1.12
	Rose North Zone – NR-2	85.3	3.46	29.3	19.3	6.7	0.79
	Rose North Zone – NR-3	<u>49.4</u>	<u>3.39</u>	<u>26.1</u>	<u>16.7</u>	<u>4.1</u>	<u>0.50</u>
	Total Measured Rose North Zone	236.3	3.48	30.3	13.0	14.7	0.87
Indicated	Rose North Zone – NR-1	166.5	3.54	32.8	6.5	25.8	1.27
	Rose North Zone – NR-2	66.6	3.46	29.3	16.0	11.4	0.63
	Rose North Zone – NR-3	<u>79.5</u>	<u>3.40</u>	<u>26.5</u>	<u>19.1</u>	<u>3.5</u>	<u>0.58</u>
	Total Indicated Rose North Zone	312.5	3.49	30.5	11.8	17.1	0.96
Inferred	Rose North Zone – NR-1	118.6	3.53	32.2	6.0	25.8	0.91
	Rose North Zone – NR-2	61.0	3.47	29.7	17.9	10.5	0.68
	Rose North Zone – NR-3	79.0	3.41	26.9	20.6	2.1	0.69
	Rose North Zone – Limonite	<u>28.5</u>	<u>3.00</u>	<u>28.0</u>	<u>6.0</u>	<u>20.0</u>	<u>0.53</u>
	Total Inferred Rose North Zone	287.1	3.42	29.8	12.5	15.5	0.76

Table 14-2: Categorized Mineral Resource Estimate for Mills Lake (Cut-Off of 15% TFe) (Effective Date as at December 17, 2012)

Category	Zone	Tonnes (Million)	Density	TFe%	magFe%	hmFe%	Mn%
Measured	Hematite-rich	5.9	3.67	33.9	5.0	28.0	4.41
	Magnetite-rich	<u>44.8</u>	<u>3.57</u>	<u>30.1</u>	<u>23.7</u>	<u>4.2</u>	<u>0.51</u>
	Total Measured Mills Lake Zone	50.7	3.58	30.5	21.5	7.0	0.97
Indicated	Hematite-rich	6.5	3.67	33.8	5.1	27.7	4.74
	Magnetite-rich	<u>124.1</u>	<u>3.54</u>	<u>29.3</u>	<u>21.7</u>	<u>2.6</u>	<u>0.59</u>
	Total Indicated Mills Lake Zone	130.6	3.55	29.5	20.9	3.9	0.80
Inferred	Hematite-rich	1.3	3.72	35.3	3.8	30.4	4.67
	Magnetite-rich	<u>73.5</u>	<u>3.54</u>	<u>29.2</u>	<u>20.6</u>	<u>2.2</u>	<u>0.60</u>
	Total Inferred Mills Lake Zone	74.8	3.55	29.3	20.3	2.7	0.67

Subsequent to the 2012 Mineral Resource estimate being completed, the Project database was updated to account for additional Check assays, specific gravity analyses and other minor revisions. None of these changes were deemed to be material. No additional geological interpretation or drilling has been conducted since 2012 therefore WGM considers the Mineral Resource estimate as stated in this Report to be current and valid.

The classification of Mineral Resources used in this Report conforms to the definitions provided in the final version of the NI 43-101, which came into effect on February 1, 2001, and was revised on June 30, 2011. WGM further confirms that, in arriving at our classification, we have followed the guidelines adopted by the Council of the Canadian Institute of Mining Metallurgy and Petroleum ("CIM") Standards. The relevant definitions for the CIM Standards/NI 43-101 are as follows:

A **Mineral Resource** is a concentration or occurrence of diamonds, natural, solid, inorganic or 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.

An **Inferred Mineral Resource** is that part of a Mineral Resource for which quantity and grade or quality can be estimated on the basis of geological evidence and limited sampling and reasonably assumed, but not verified, geological and grade continuity. The estimate is based on limited information and sampling gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drillholes.

An **Indicated Mineral Resource** is that part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics can be estimated with a level of confidence sufficient to allow the appropriate application of technical and economic parameters, to support mine planning and evaluation of the economic viability of the deposit. The estimate is based on detailed and reliable exploration and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drillholes that are spaced closely enough for geological and grade continuity to be reasonably assumed.

A **Measured Mineral Resource** is that part of a Mineral Resource for which quantity, grade or quality, densities, shape, physical characteristics are so well established that they can be estimated with confidence sufficient to allow the appropriate application of technical and economic parameters, to support production planning and evaluation of the economic viability of the deposit. The estimate is based on detailed and reliable exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches,

pits, workings and drillholes that are spaced closely enough to confirm both geological and grade continuity.

A **Mineral Reserve** is the economically mineable part of a Measured or Indicated Mineral Resource demonstrated by at least a Preliminary Feasibility Study. This Study must include adequate information on mining, processing, metallurgical, and economic and other relevant factors that demonstrate, at the time of reporting, that economic extraction can be justified. A Mineral Reserve includes diluting materials and allowances for losses that may occur when the material is mined.

A **Probable Mineral Reserve** is the economically mineable part of an Indicated, and in some circumstances a Measured Mineral Resource demonstrated by at least a Preliminary Feasibility Study. This Study must include adequate information on mining, processing, metallurgical, economic, and other relevant factors that demonstrate, at the time of reporting, that economic extraction can be justified.

A **Proven Mineral Reserve** is the economically mineable part of a Measured Mineral Resource demonstrated by at least a Preliminary Feasibility Study. This Study must include adequate information on mining, processing, metallurgical, economic, and other relevant factors that demonstrate, at the time of reporting, that economic extraction is justified.

Mineral Resource classification is based on certainty and continuity of geology and grades. In most deposits, there are areas where the uncertainty is greater than in others. The majority of the time, this is directly related to the drilling density. Areas more densely drilled are usually better known and understood than areas with sparser drilling. Mineral Resources that are not Mineral Reserves, do not have demonstrated economic viability.

14.2 General Mineral Resource Estimation Procedures

Alderon's block model Mineral Resource estimate procedure included:

- Validation of digital data in Gemcom Software International Inc.'s ("GemcomTM") geological software package – the data was transferred to WGM from Alderon in GemcomTM format for our audit and was validated both within MS Access and GemcomTM;
- Generation of cross sections to be used for geological interpretations;
- Basic statistical analyses to assess cut-off grades, compositing and cutting (capping) factors, if required;
- Development of 3-D wireframe models for the Rose North zone, Rose Central zone and Mills Lake with sufficient continuity of geology/mineralization, using available geochemical assays for each drillhole sample interval; and

- Generation of block models for the Mineral Resource estimates and categorizing the results according to NI 43-101 and CIM definitions.

14.3 Database

14.3.1 Drillhole Data

Data used to update the Mineral Resource estimates for Rose North, Rose Central and Mills Lake originated from a dataset generated by Alderon technical personnel and supplied to WGM for our audit. Gemcom™ Software was utilized to hold all the requisite data to be used for any manipulations necessary and for completion of the geological and grade modelling for the Mineral Resource estimate.

The Gemcom™ drillhole database consisted of 237 diamond drillholes; including “duplicated” hole numbers designated with an additional “alpha” nomenclature, meaning the hole was re-drilled in whole or in part, due to lost core/bad recovery. The Mineral Resource estimate for the Project is based on results from 209 diamond drillholes at Rose Central and Rose North (170 holes) and Mills Lake (39 holes) zones totaling 62,247 m. These holes were fairly regularly dispersed in the iron mineralization along approximately 2,000 m of strike length and a range of 200 to 400 m of width for Rose Central and Rose North. The remaining drillholes in the database were located outside the mineralized area of Rose Central, Rose North and Mills Lake or located in the vicinity of them but didn’t penetrate the iron formation horizons of interest. The current database has adequate drillhole density to better understand the structure, geology and mineralization in these areas and therefore, the categorization of the Mineral Resources could be upgraded from the previous resource estimates.

The drillholes contained geological codes and short descriptions for each unit and subunit and assay data for Head analyses. The raw sample intervals totaled 4,846 for Rose Central and 3,838 for Rose North within the mineralized zone (including internal waste) and ranged from 0.1 m to 7.6 m, averaging 3.0 m. The raw sample intervals totaled 1,119 for Mills Lake within the mineralized zone (including internal waste) and ranged from 0.7 m to 8.2 m, averaging 3.1 m.

Additional information, including copies of the geological logs, summary reports and internal geological interpretations were supplied to WGM digitally or as hard copies.

14.3.2 Data Validation

Upon receipt of the data, WGM performed the following validation steps:

- Checking survey records for collar locations and downhole surveys by checking against results provided by survey contractors;

- Checking minimum and maximum values for each quality value field and confirming/modifying those outside of expected ranges;
- Checking for inconsistency in lithological unit terminology and/or gaps in the lithological code;
- Spot checking original assay certificates with information entered in the database; and
- Checking gaps, overlaps and out of sequence intervals for both assays and lithology tables.

The database tables, as originally supplied, contained some minor sample/assay errors discovered by WGM during its analysis of the data. Suspected errors identified by WGM were communicated to Alderon. Alderon consequently requested a number of sample re-assays from SGS Lakefield. Some of the samples could not be located and only the most obvious errors were selected for check assaying. The re-assaying confirmed many of these errors and these were corrected and confirmed in the database by the Client before proceeding with the audit of the Mineral Resource estimate. During the course of the audit, some mineralized intervals defined by Alderon were adjusted by WGM in the hematite-rich zone and re-compositing and re-interpolation of the grades was completed by Alderon using the new intervals. Also, WGM supplied Alderon with new iron values in hematite based on our calculations and this was used for the re-interpolated grades (see Section 7.2, Mineralization, for description).

In general, WGM found the database to be in good order. After the errors that WGM identified were corrected, there were no additional database issues that would have a material impact on the Mineral Resource estimate. Therefore, WGM proceeded to audit the re-interpolated model supplied by Alderon. As aforementioned, the database is a work in progress and will be updated as new information becomes available to be used for future Mineral Resource estimates. Testwork, as described in Chapter 13, has helped to better understand iron deportment differences within the various mineralogical components of the Rose deposit.

14.3.3 Database Management

The drillhole data were stored in a Gemcom™ multi-tabled workspace specifically designed to manage collar and interval data. The line work for the geological interpretations and the resultant 3-D wireframes were also stored within the Gemcom™ Project. The Project database stored cross section and level plan definitions and the block models, such that all data pertaining to the Project are contained within the same Project database.

14.4 Geological Modelling Procedures

14.4.1 Cross Section Definition

Twenty-two vertical cross sections were defined for Rose North and Rose Central zones and eleven sections for Mills Lake for the purpose of Mineral Resource estimation. The holes were drilled on section lines which were spaced 100 m apart for both deposits in the main area of mineralization. The cross sections were oriented perpendicular to the general strike of the deposits. Drillholes on cross sections were variably spaced with variable dips leading to separation of mineralized intersections anywhere from less than 50 m to more than 200 m apart from each other for the near-surface mineralization (down to a vertical depth of about 200 m) due to the current density of drilling. This is due to crisscrossing of holes, drilling many holes in a scissor or fan pattern from the same setup, or just the general sparseness of drilling, especially at depth. Most cross sections contained at least two holes and some had as many as ten holes passing through the mineralized zone due to the variable drilling pattern. See Figure 7-3 for the locations of the drillholes in the Mineral Resource area and the cross section orientations.

14.4.2 Geological Interpretation and 3-D Wireframe Creation

Alderon's geologists manually interpreted the boundaries of the mineralized zones and internal waste zones on the cross sections. Scans of the interpreted cross sections were geo-referenced in 3-D space within Leapfrog Mining Software and geologic contacts were digitized as polylines and appropriately labelled. The digitized lines were 'snapped' to drillhole intervals to ensure that the resulting wireframes honoured the 3-D position of the drillhole interval. The interpretations were reviewed by WGM and the geological modelling was agreed upon with Alderon technical personnel before finalizing the interpretation to be used for the Mineral Resource estimate.

For the modelling, 3-D bounding boxes defining the maximum extents of the Rose and Mills Lake deposit areas were created. The boxes extend approximately 200 m along strike from the outermost drillholes in each area. The upper elevations of the models were limited to the bedrock-overburden contact and maximum depths were limited to 180 m relative to sea level (RSL) at Mills Lake and -106 m RSL at Rose, based on maximum depths of drilling. Mineralized boundaries extended up to a maximum of about 400 m on the ends of the zones and at depth where there was no or little drillhole information, but only if the interpretation was supported by drillhole information on adjacent cross sections or solid geological inference.

The Rose Central, Rose North and Mills Lake deposits are Lake Superior-type iron formations consisting of banded sedimentary rocks composed principally of bands of iron oxides, magnetite and hematite within quartz (chert)-rich rock. The 3-D wireframes were created using the digitized footwall and hanging wall contacts for the mineralized zones. The wireframes for each mineralized zone were enclosed at the bedrock surface, at fault boundaries and to the maximum depth and strike boundaries.

For the Mills Lake deposit, three separate zones were interpreted and wireframed based on drillhole data on vertical sections: a basal magnetite zone; a hematitic interlayer within the magnetite zone; and an upper magnetite zone. In the Mills Lake deposit, the hematite-rich unit was located near the middle of the deposit.

Rose North and Rose Central zones were each divided into three metallurgical/mineralogical domains (see Section 7.3.2 for detailed description of these interpreted zones); NR-1, NR-2, and NR-3 and RC-1, RC-2 and RC-3, respectively. The zoning of the Rose deposit was based on recent metallurgical/mineralogical testing of the mineralization plus logging and results in the assay database. The Rose deposit is also influenced by major listric and normal faults, which relocate some of the mineralized zones at depths up to 100 m distances (see Section 7.3.2).

Alteration products in the form of limonite and goethite are dominant features in the Rose North deposit, at least at shallower depths and near surfaces based on drillhole logging. These alteration products were not part of the original metallurgical/mineralogical zoning of the deposits, therefore for this most recent Mineral Resource estimate, a 3-D solid was created incorporating these alteration zones, which is named the “Limonite zone”. The Limonite zone only occurs in Rose North, appears to be primarily limited to surface weathering and does not appear to have any obvious relationship with major fault zones in the area. This zone was modelled on 50 m spaced sections and shows similar strike and dip to the Rose North mineralization. The Limonite zone 3-D wireframe was used to overprint the other wireframes in the Gemcom model and was incorporated for geological and interpolation purposes.

The continuity of the mineralization as a whole appeared to be quite good based on the existing drilling, so WGM had confidence to extend the interpretation beyond a 300 m distance in some cases, based on our previous experience. The 3-D model for Rose North and Rose Central was continued at depth by Alderon as long as there was drillhole information and supporting data from adjacent sections. Since the drilling density was lower in the deeper parts of the deposits, the drillhole spacing was taken into consideration when classifying the Mineral Resources and these areas were given a lower confidence category. Even though the wireframe continued to a maximum depth of -106 m (approximately 700 m vertically below surface and extending 100 m past the deepest drilling), at this time, no Mineral Resources were defined/considered below 0 m elevation for Rose North and Rose Central. The Mills Lake wireframes extended to 180 m in elevation or about 400 m below surface.

Figure 14-1 and Figure 14-2 show the 3-D geological models that illustrate the relationships in Rose North and Rose Central and Figure 14-4 to Figure 14-7 show typical cross sections through the deposits illustrating the zone/unit boundaries and TFe% block model and Mineral Resource categorization (see Section 14.6 for a detailed explanation). Figure 14-3 shows the 3-D geological model for Mills Lake and Figure 14-8 and Figure 14-9 show a typical cross section through the deposit illustrating the zone/unit boundaries and TFe% block model and Mineral Resource categorization (see Section 14.6 for a detailed explanation).

14.4.3 Topographic Surface Creation

A wireframed surface or triangulated irregular network ("TIN") was generated by Alderon for the topography surface and overburden contacts. The topography wireframe was derived from bare earth elevation data collected during a 2011 LIDAR survey. The topography wireframe was offset to drillhole overburden/bedrock contacts using Leapfrog3-D software to create the overburden wireframe and to ensure the overburden did not cross the topography surface where no drillhole information existed.

WGM checked the overburden surface created by Alderon against the drillhole information and found it to be properly created. These surfaces were used to limit the upper boundary of the geological block model, i.e., the Mineral Resources were defined up to the surface representing the bottom of the overburden. Alderon ensured that the Mineral Resource estimate stayed below this overburden surface.

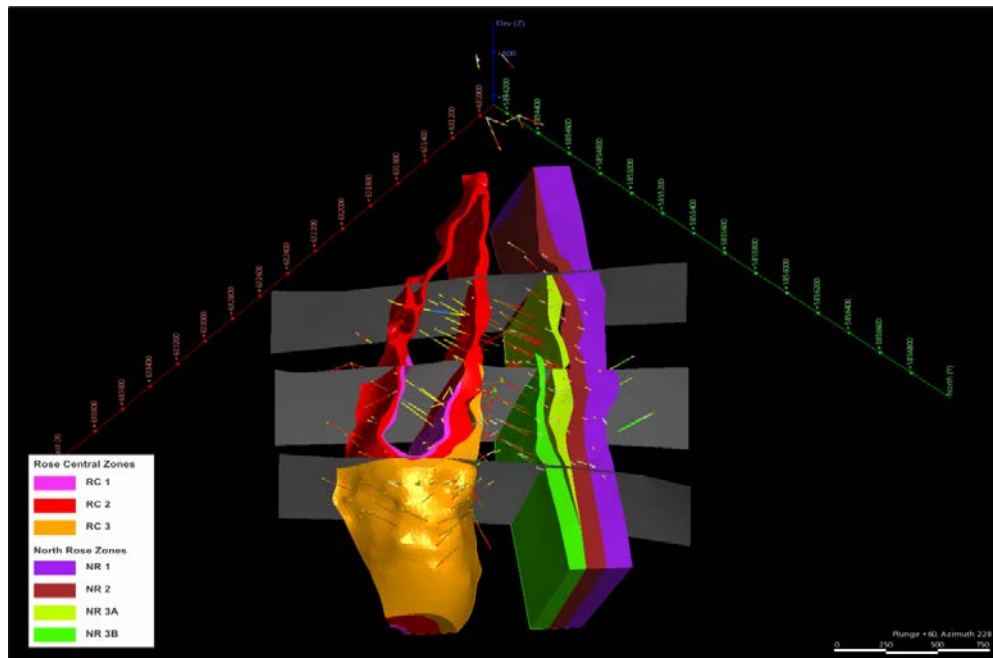


Figure 14-1: Rose North and Rose Central 3-D Geological Model (Looking SW)

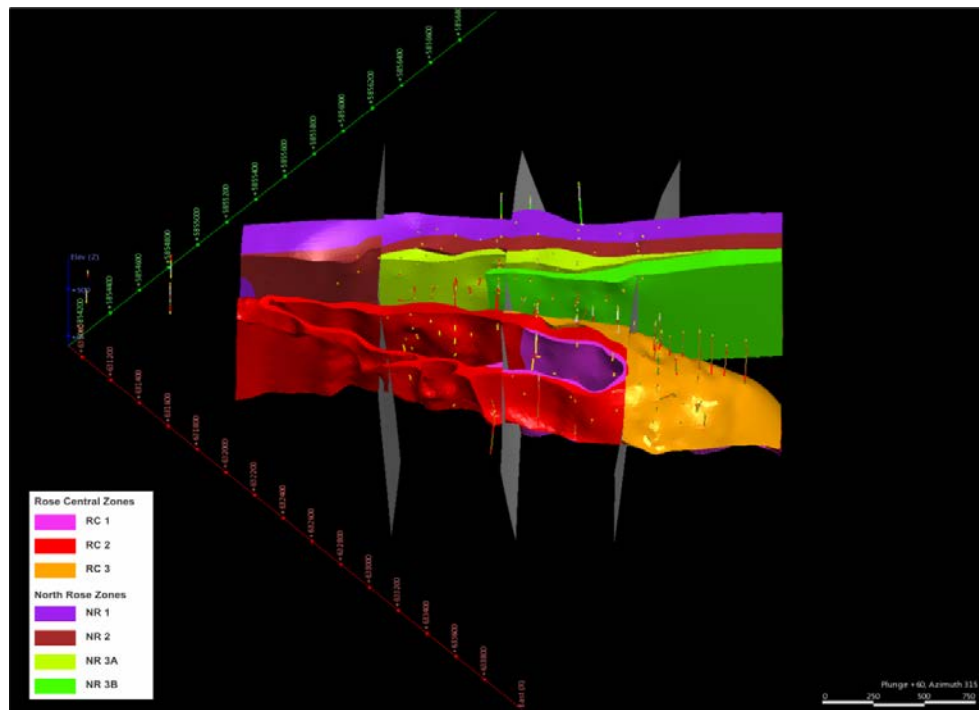


Figure 14-2: Rose North and Rose Central 3-D Geological Model (Looking NW)

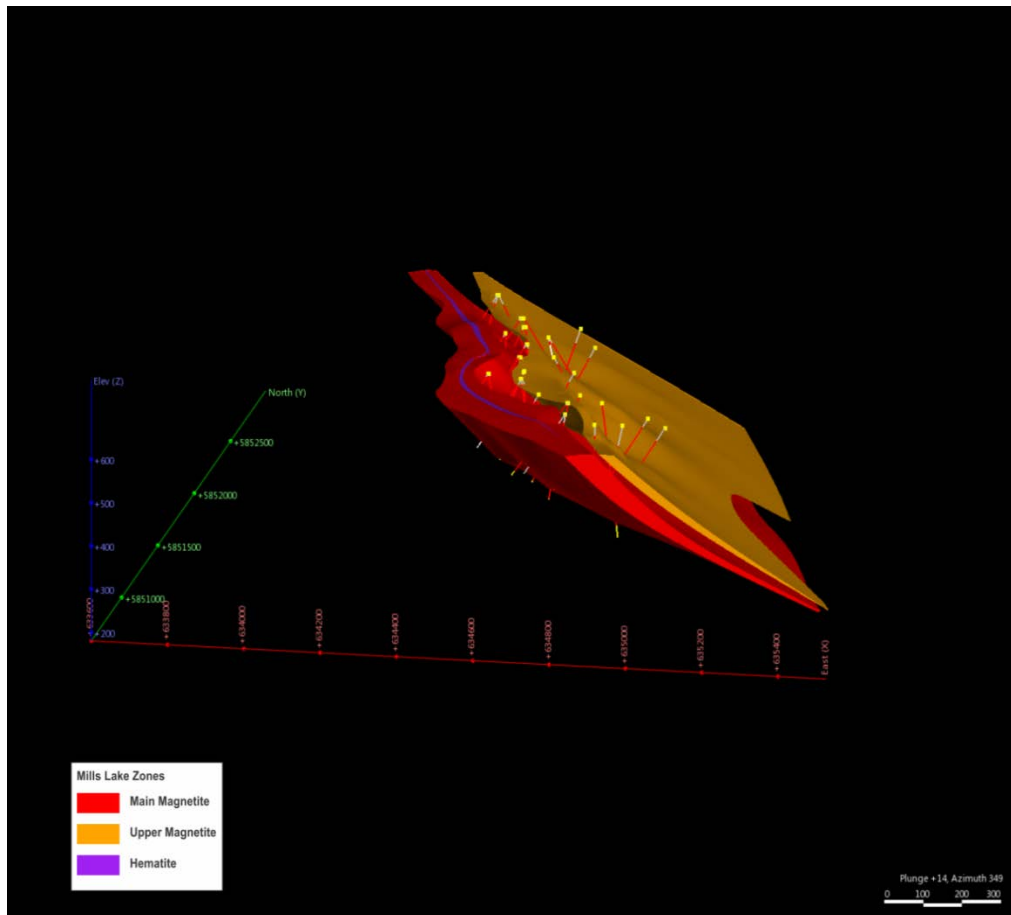


Figure 14-3: Mills Lake 3-D Geological Model (Looking NW)

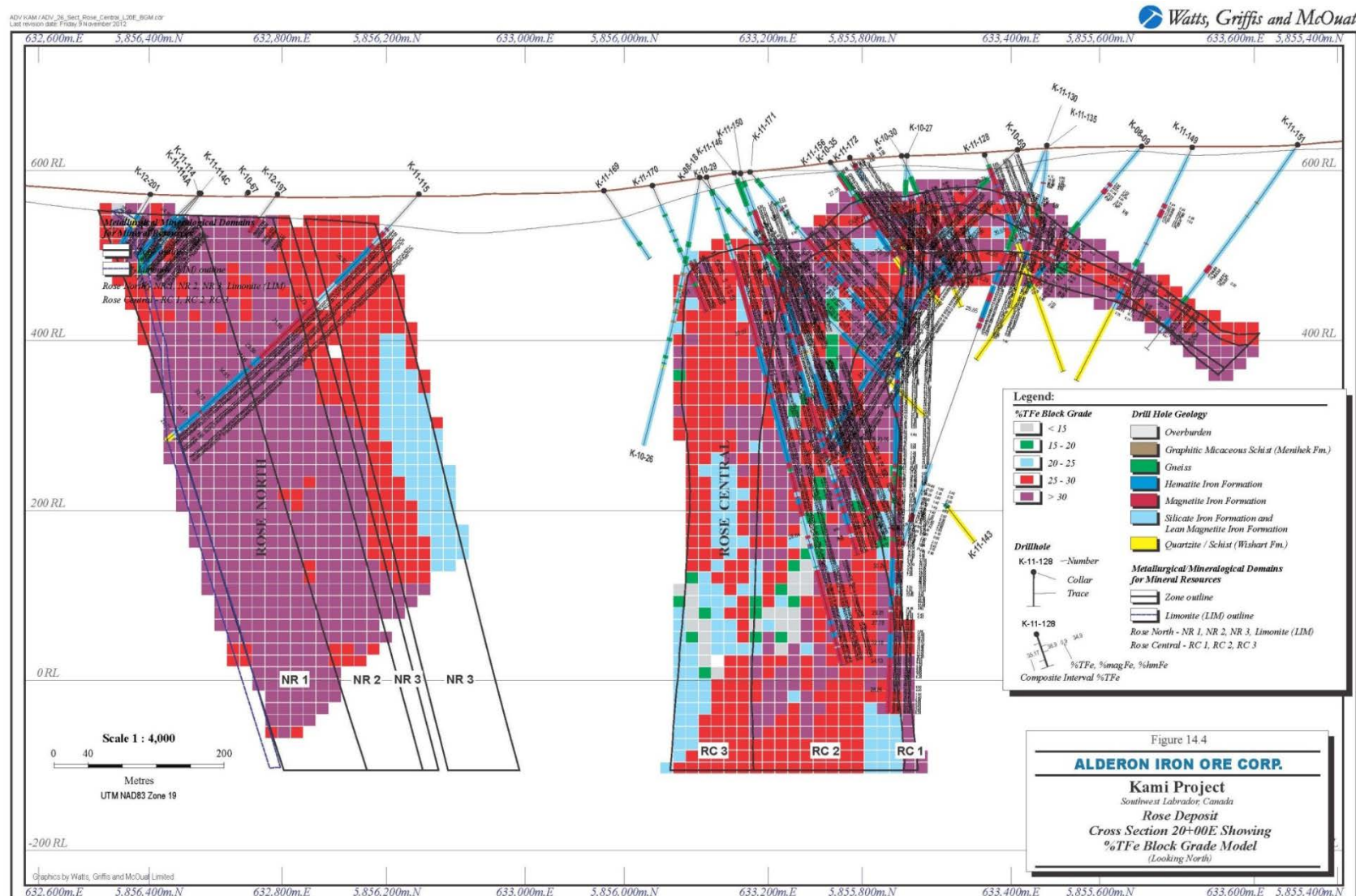


Figure 14-4: Rose Deposit Cross Section 20+00E Showing %TFe Block Grade Model

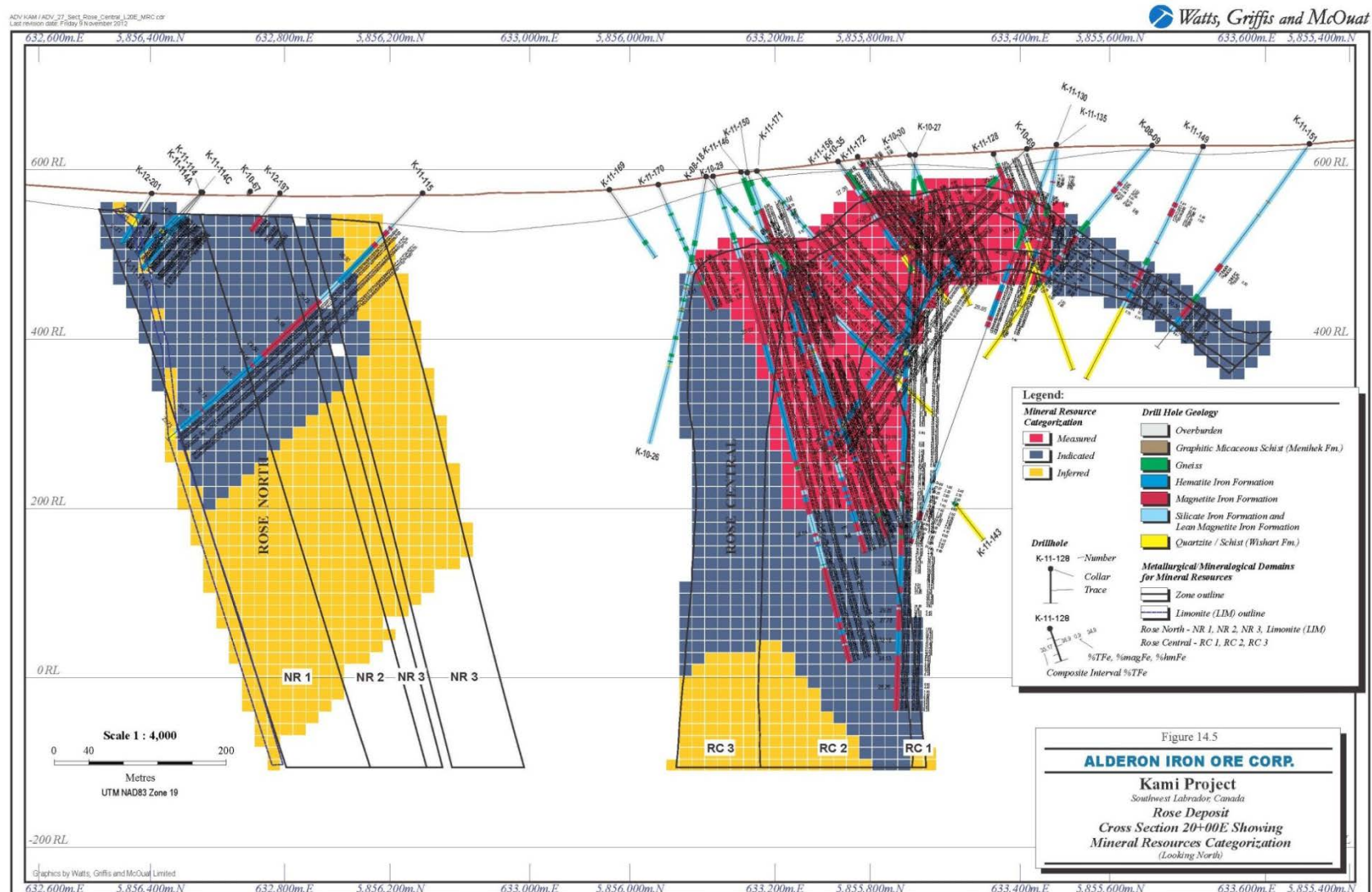


Figure 14-5: Rose Deposit Cross Section 20+00E Showing Mineral Resource Categorization

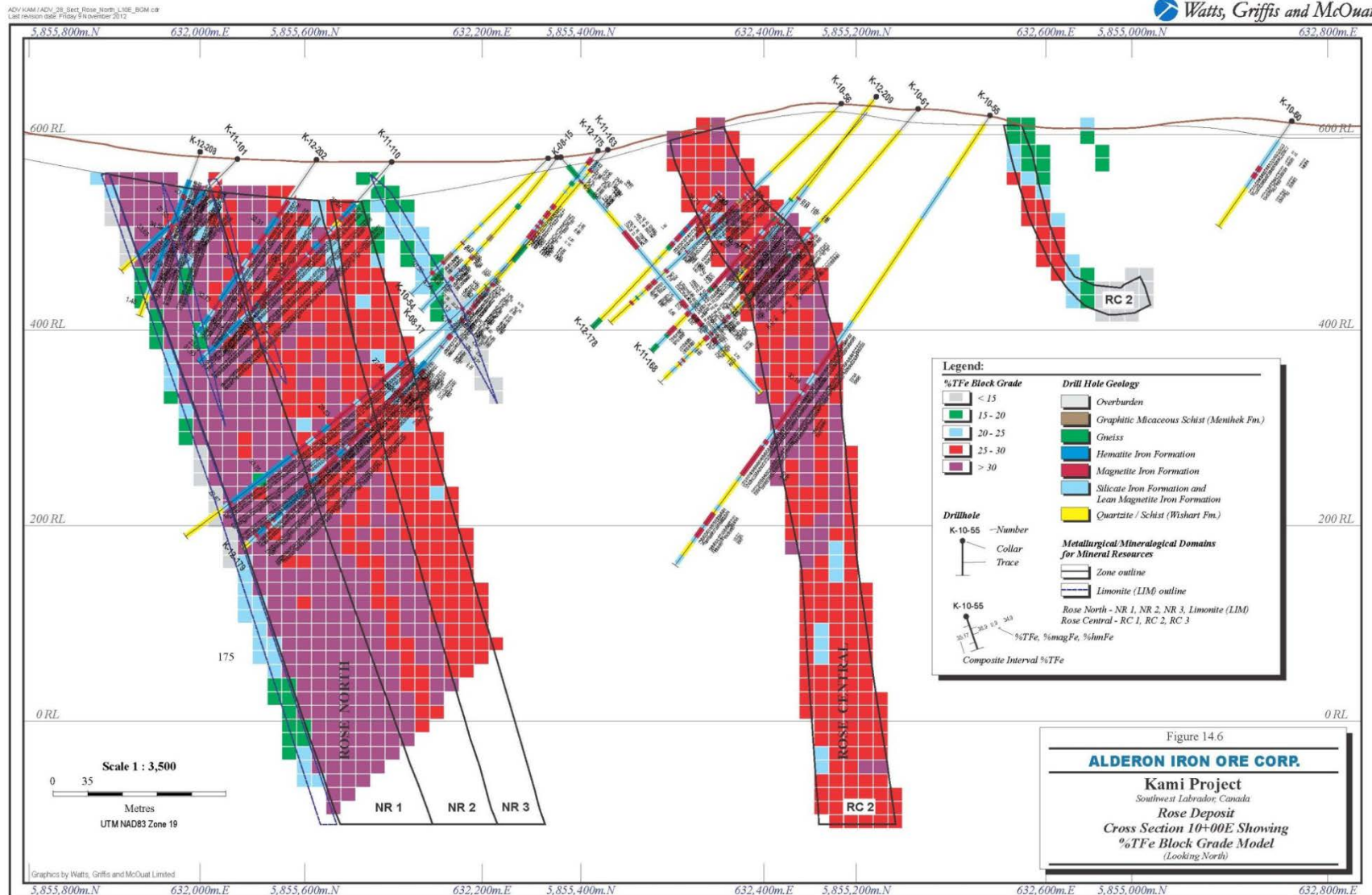


Figure 14-6: Rose Deposit Cross Section 10+00E Showing %TFe Block Grade Model



Figure 14-7: Rose Deposit Cross Section 10+00E Showing Mineral Resource Categorization

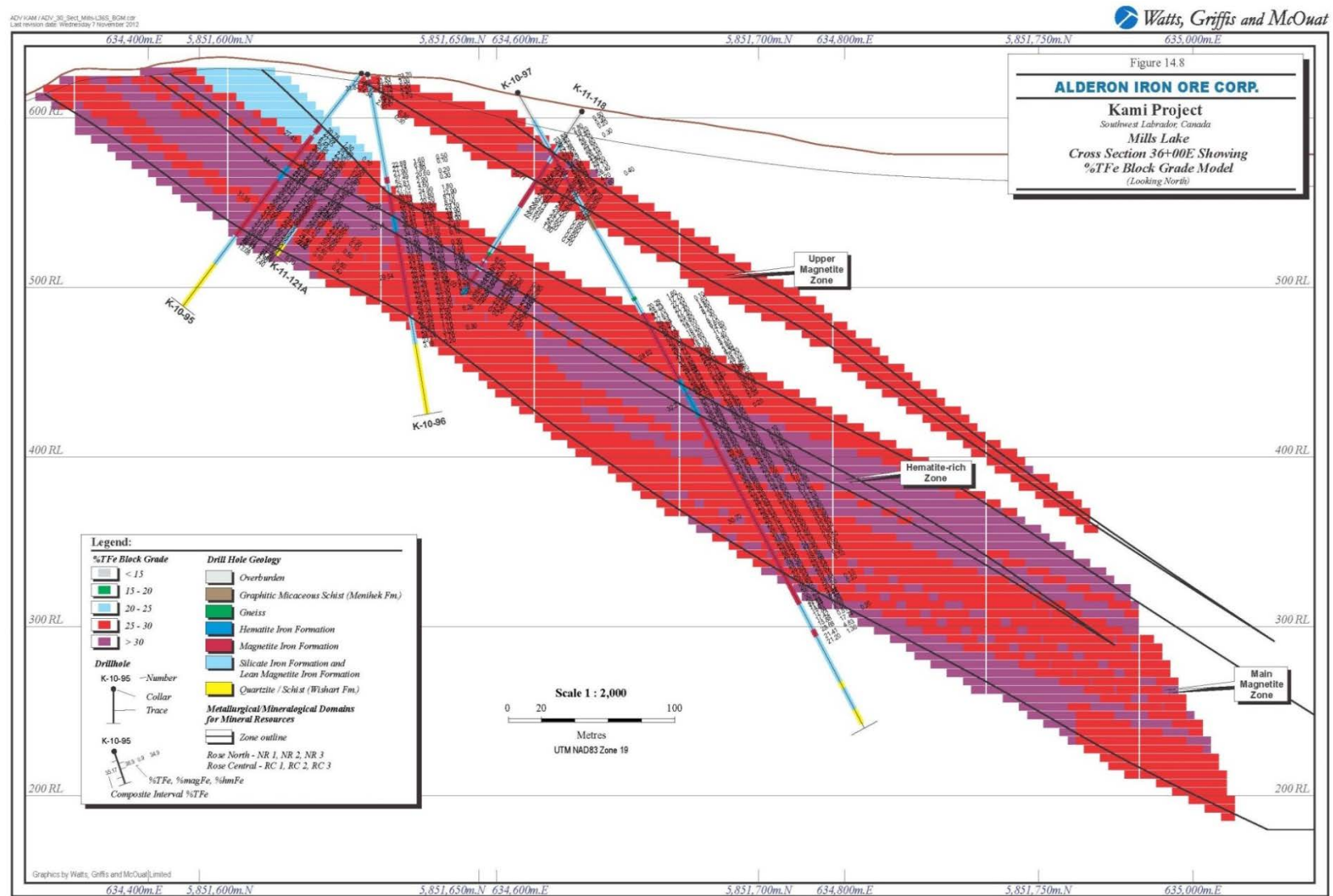


Figure 14-8: Mills Lake Deposit Cross Section 36+00E Showing %TFe Block Grade Model

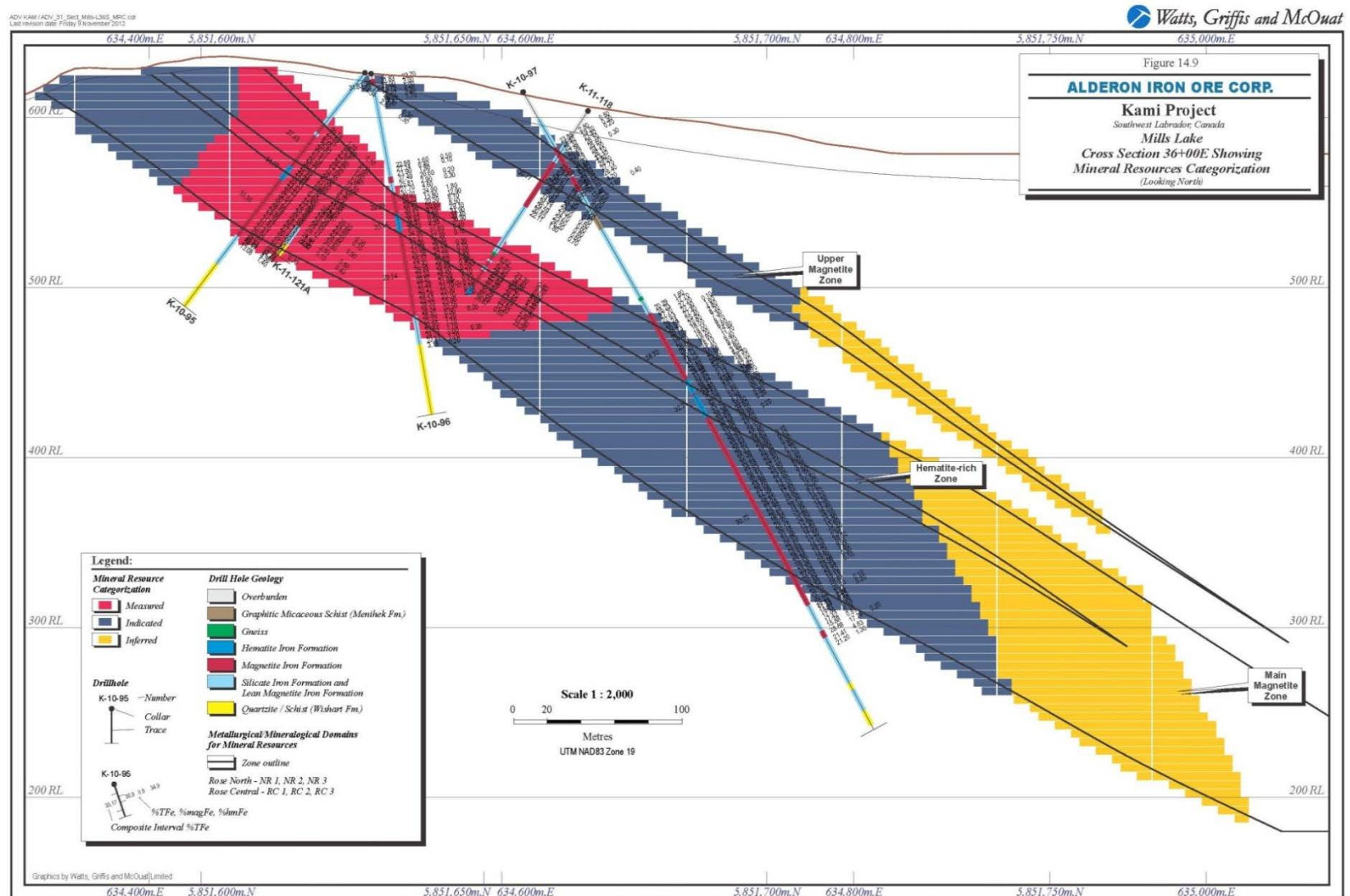


Figure 14-9: Mills Lake Deposit Cross Section 36+00E Showing Mineral Resource Categorization

14.5 Statistical Analysis, Compositing, Capping and Specific Gravity

14.5.1 Back-Coding of Rock Code Field

The 3-D wireframes/solids that represented the interpreted mineralized zones were used to back-code a rock code field into the drillhole workspace, and these were checked against the logs and the final geological interpretation. Each interval in the original assay table and the composite table was assigned a rock code value based on the rock type wireframe that the interval midpoint fell within.

14.5.2 Statistical Analysis and Compositing

In order to carry out the Mineral Resource grade interpolation, a set of equal length composites of 3 m was generated from the raw drillhole intervals, as the original assay intervals were different lengths and required normalization to a consistent length. A 3 m composite length was chosen to ensure that more than one composite would be used for grade interpolation for each block in the model and 3 m is also the average length of the raw assay intervals for the zones. Regular down-the-drillhole compositing was used. All composites with lengths less than 0.3 m were removed from the final dataset and were not used in the grade interpolation.

Table 14-3 summarizes the statistics of the 3 m composites inside the defined Mills Lake, Rose Central and Rose North geological wireframes for %TFeHead, %magFeHead and %hmFeHead and Figure 14-10 to Figure 14-17 show the histograms for the %TFeHead for the magnetite-rich and hematite-rich zones, respectively.

Table 14-3: Basic Statistics of 3 m Composites

Element	Number	Minimum	Maximum	Average	C.O.V.
Mills Lake - %TFe_H (Magnetite ¹)	1,033	12.7	43.4	29.4	0.11
Mills Lake - %TFe_H (Hematite)	117	22.2	39.8	33.6	0.07
Mills Lake - %magFe_H (Magnetite ¹)	1,033	0.4	37.5	22.2	0.32
Mills Lake - %magFe_H (Hematite)	117	0	30.8	5.8	1.09
Mills Lake - %hmFe_H (Magnetite ¹)	1,033	0	35.2	3.3	1.04
Mills Lake - %hmFe_H (Hematite)	117	0	38.7	26.8	0.28
Rose Central - %TFe_H (RC-1)	850	0	44.1	30.6	0.15
Rose Central - %TFe_H (RC-2)	2,772	0	52.7	28.8	0.26
Rose Central - %TFe_H (RC-3)	1,369	0	48.9	27.4	0.22
Rose Central - %magFe_H (RC-1)	850	0	38.5	8.3	1.06
Rose Central - %magFe_H (RC-2)	2,772	0	47.9	18.3	0.51
Rose Central - %magFe_H (RC-3)	1,369	0	48.7	19.3	0.43
Rose Central - %hmFe_H (RC-1)	850	0	42.7	20.2	0.59
Rose Central - %hmFe_H (RC-2)	2,772	0	38.2	6.8	1.07
Rose Central - %hmFe_H (RC-3)	1,369	0	31.8	3.2	1.52
Rose North - %TFe_H (NR-1)	1,559	5.9	57.9	33.2	0.19
Rose North - %TFe_H (NR-2)	878	3.3	42.8	29.5	0.15
Rose North - %TFe_H (NR-3)	798	7.5	46.3	26.3	0.16
Rose North - %TFe_H (Limonite)	632	0	48.3	21.9	0.54
Rose North - %magFe_H (NR-1)	1,559	0	36.2	5.6	1.13
Rose North - %magFe_H (NR-2)	878	0.2	35.0	18.4	0.37
Rose North - %magFe_H (NR-3)	798	0	35.2	17.2	0.45
Rose North - %magFe_H (Limonite)	632	0	31.6	5.8	1.14
Rose North - %hmFe_H (NR-1)	1,559	0	51.8	27.1	0.35
Rose North - %hmFe_H (NR-2)	878	0	35.8	8.2	0.88
Rose North - %hmFe_H (NR-3)	798	0	38.5	4.5	1.23
Rose North - %hmFe_H (Limonite)	632	0	45.4	13.9	0.82

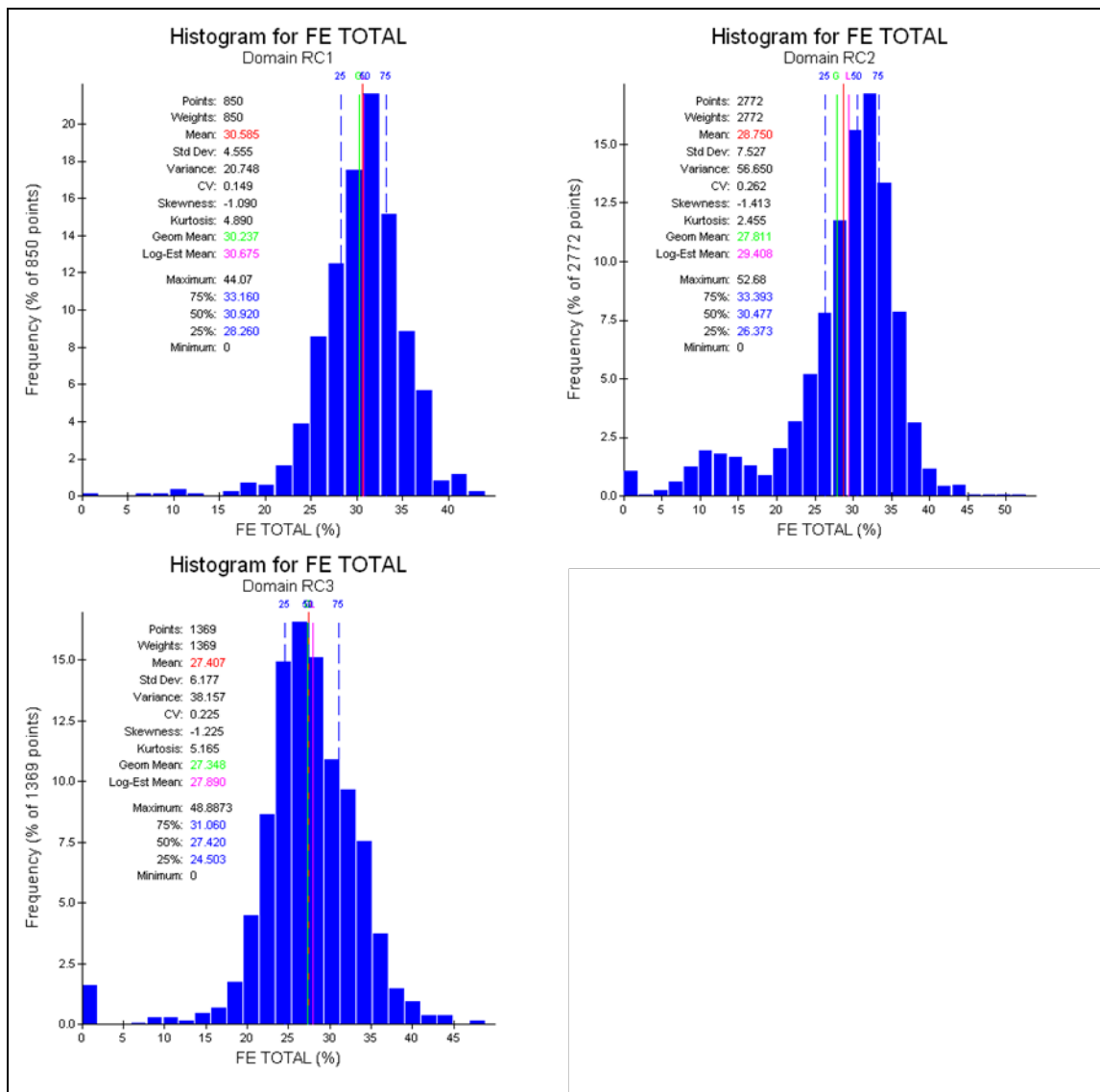


Figure 14-10: Normal Histogram, %TFeHead – Rose Central 3 m Composites (RC-1, RC-2 and RC-3 Domains)

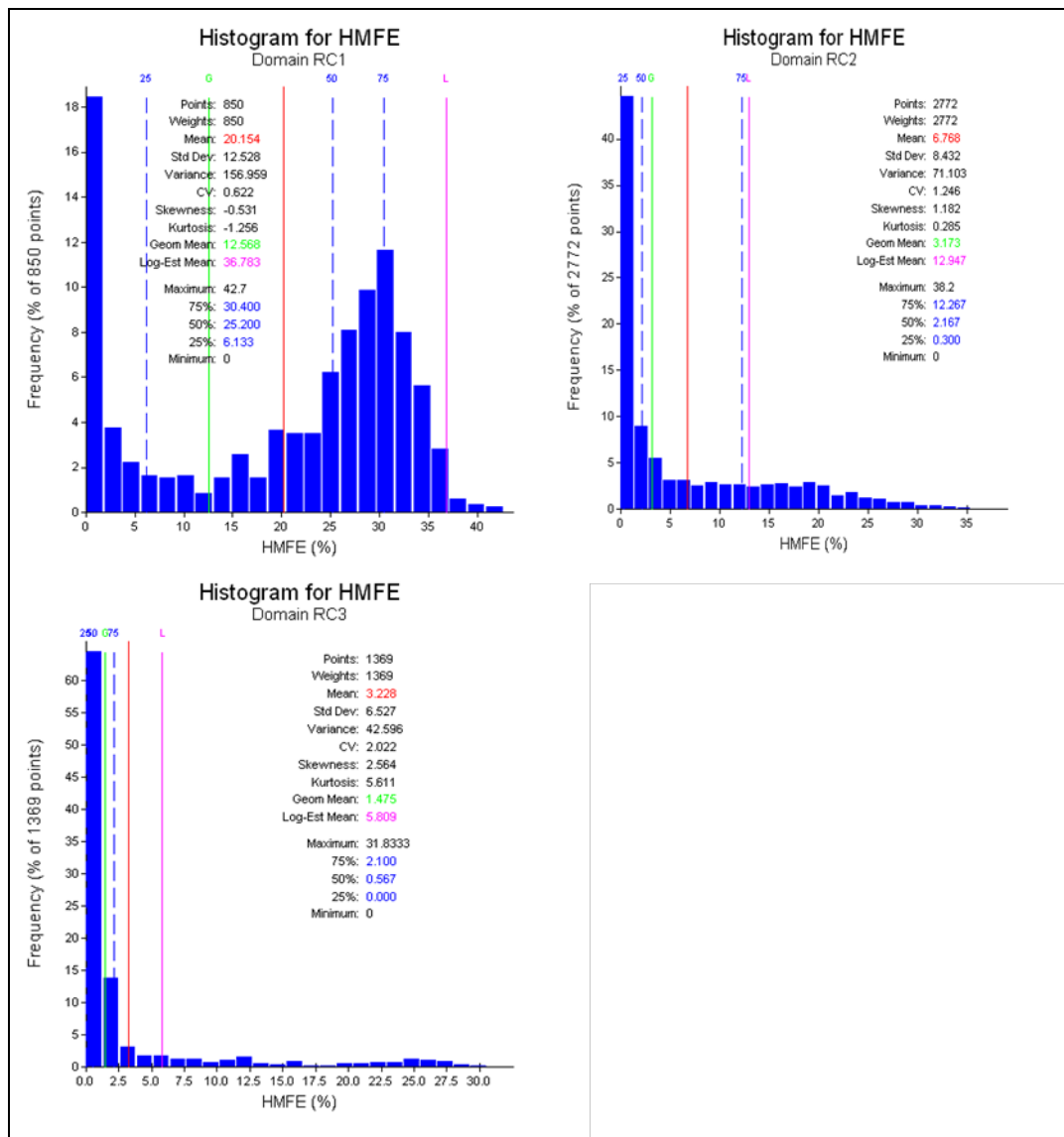


Figure 14-11: Normal Histogram, %hmFeHead – Rose Central 3 m Composites (RC-1, RC-2 and RC-3 Domains)

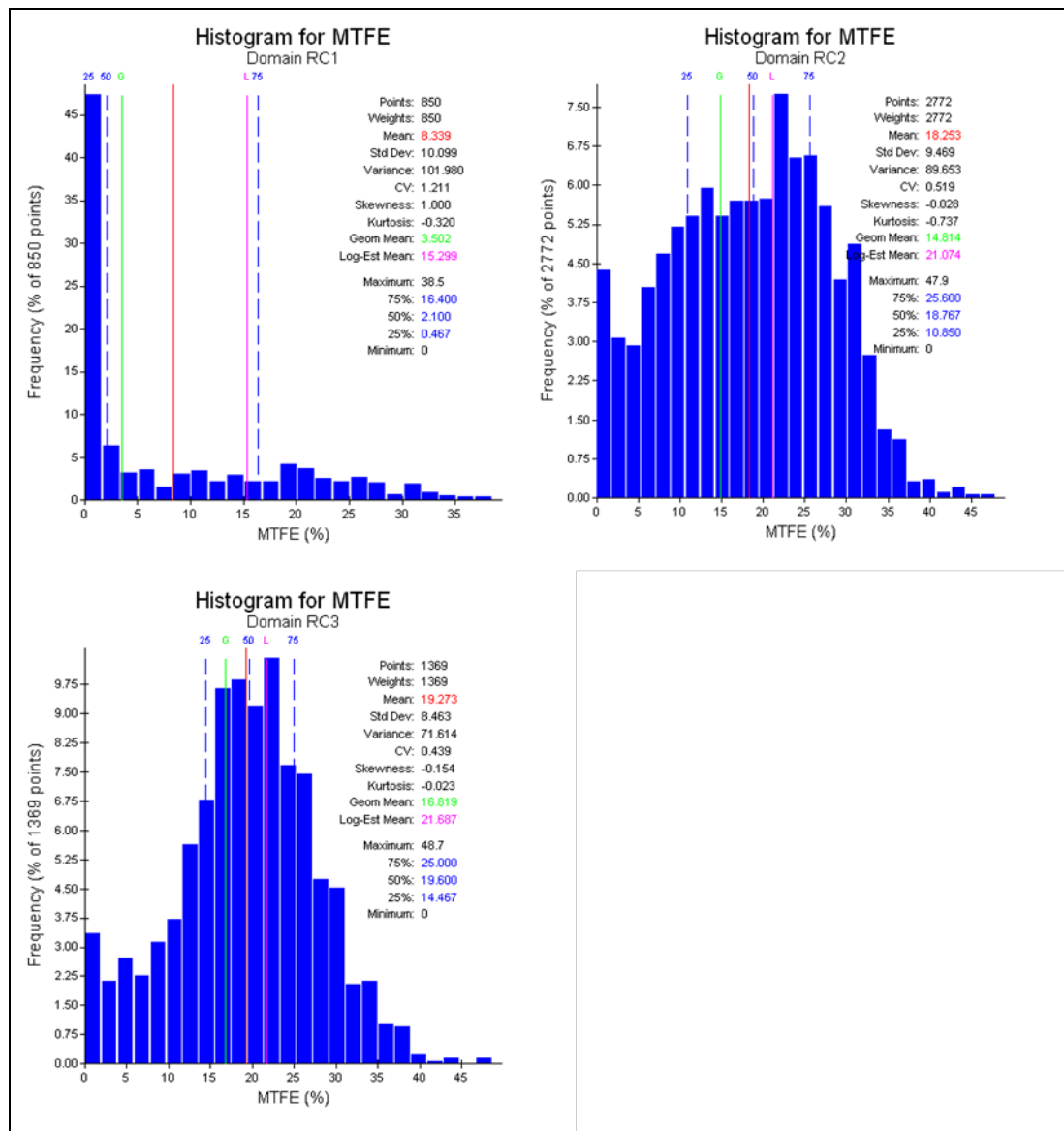


Figure 14-12: Normal Histogram, %magFeHead – Rose Central 3 m Composites (RC-1, RC-2 and RC-3 Domains)

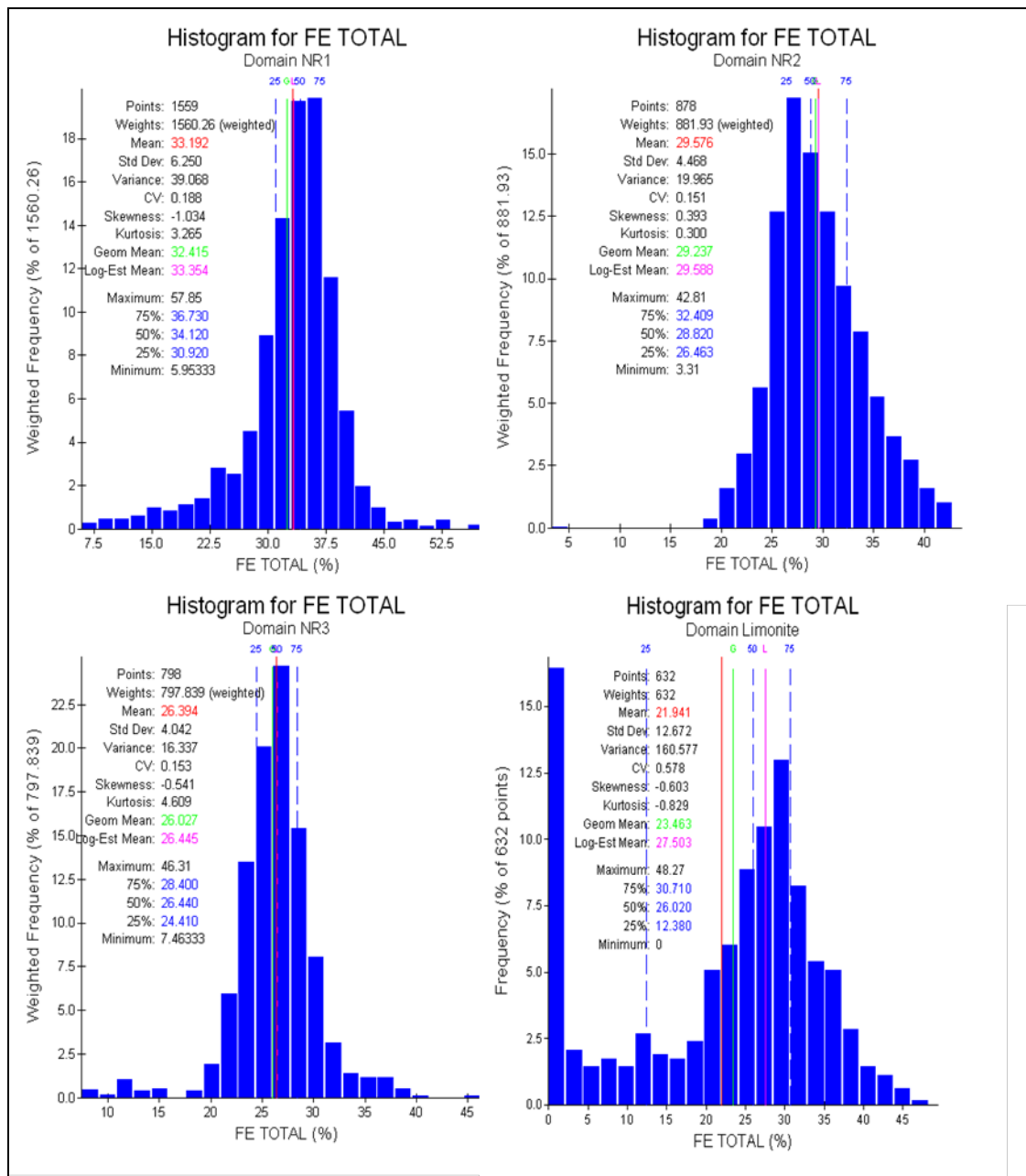


Figure 14-13: Normal Histogram, %TFeHead – Rose North 3 m Composites (NR-1, NR-2, NR-3 and Limonite Domains)

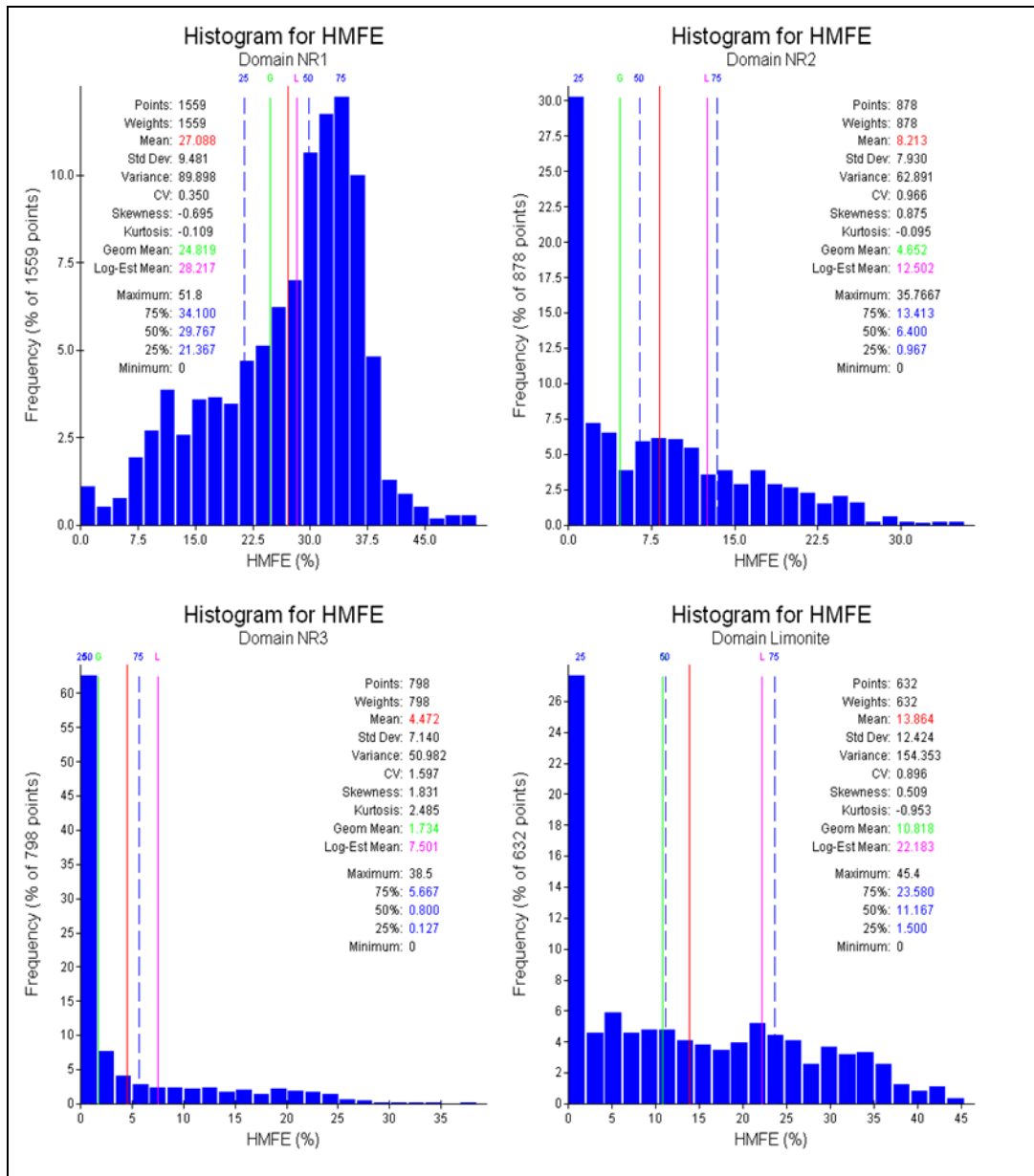


Figure 14-14: Normal Histogram, %hmFeHead – Rose North 3 m Composites (NR-1, NR-2, NR-3 and Limonite Domains)

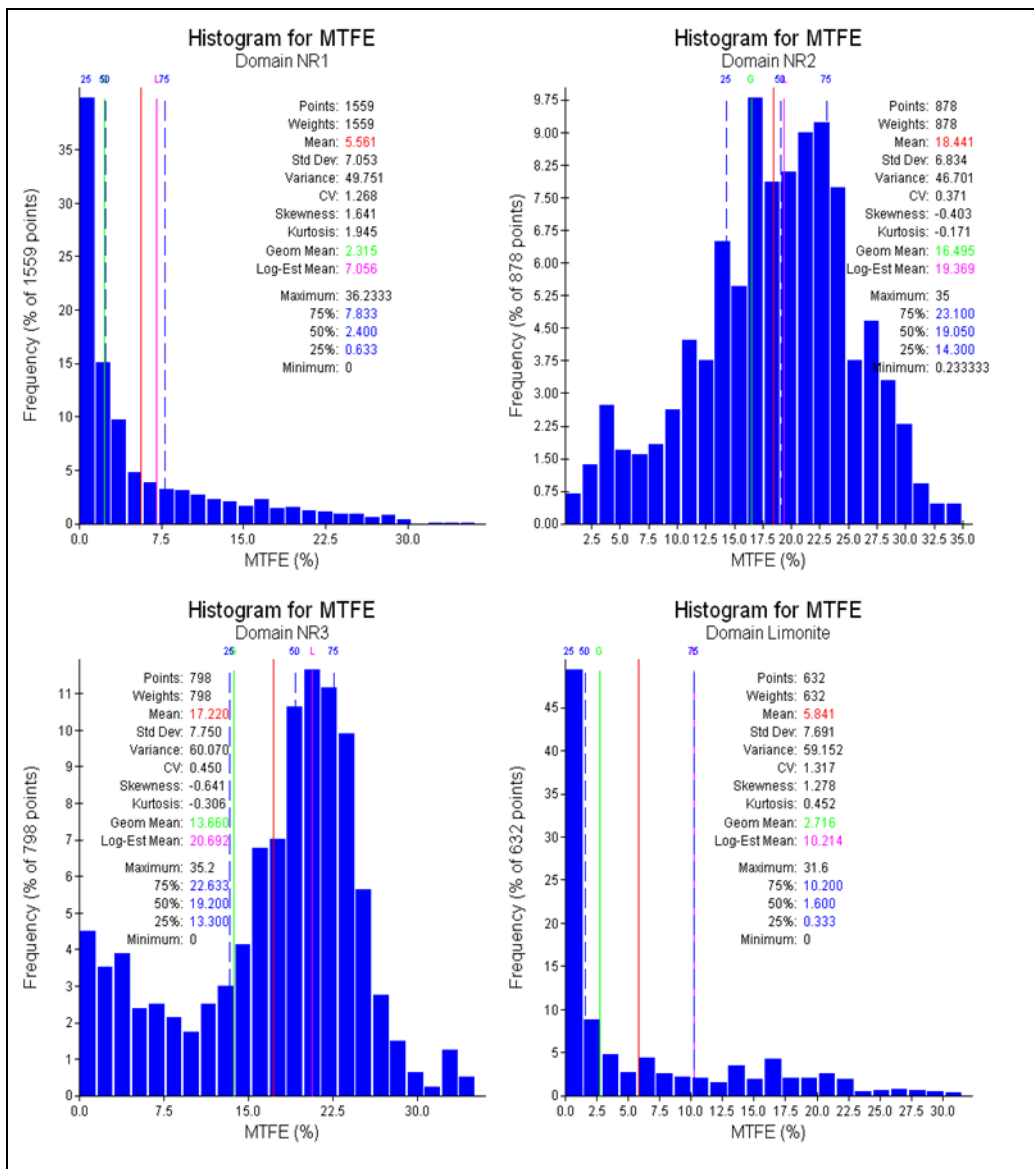


Figure 14-15: Normal Histogram, %magFeHead – Rose North 3 m Composites (NR-1, NR-2, NR-3 and Limonite Domains)

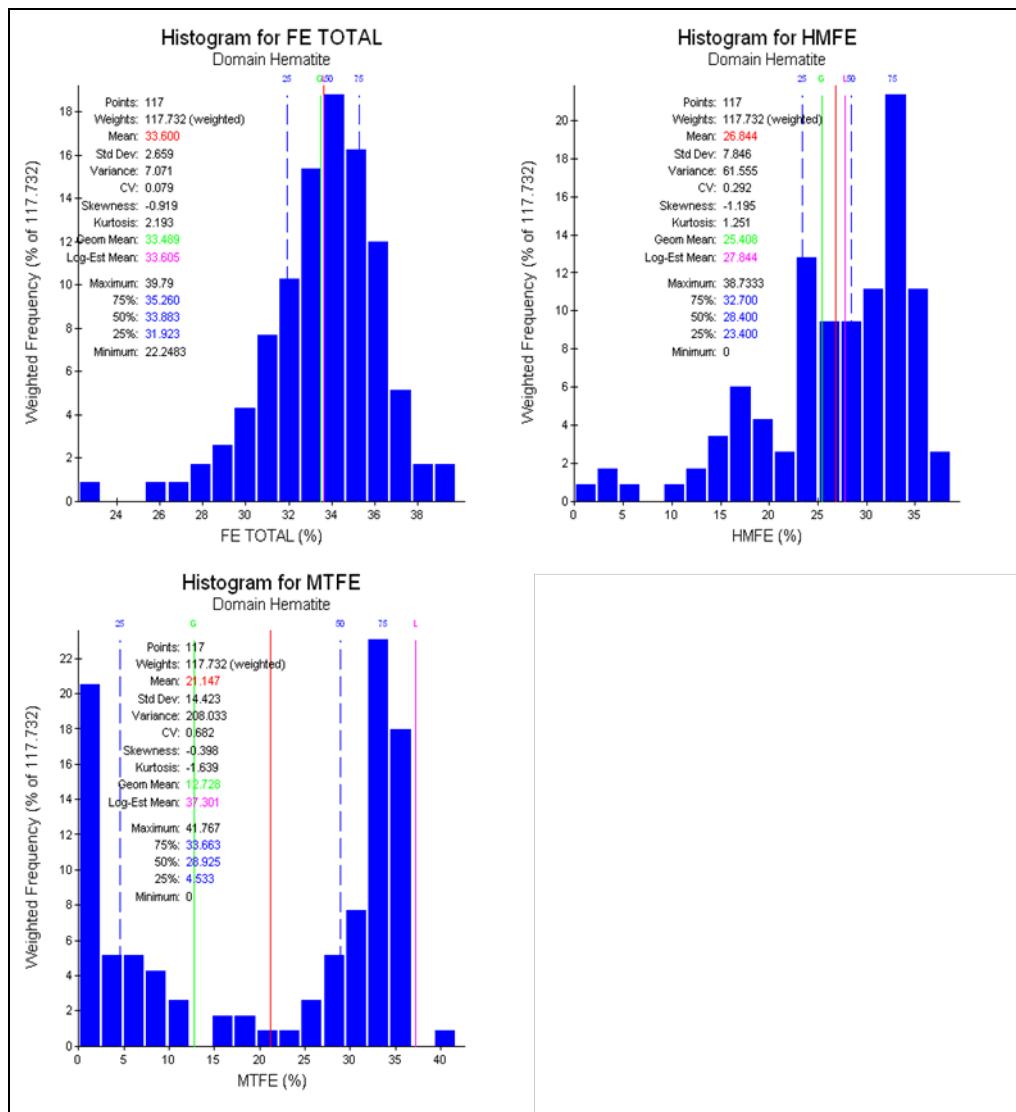


Figure 14-16: Normal Histogram, %TFeHead, %hmFeHead, %magFeHead – Mills Lake 3 m Composites (Hematite Zone)

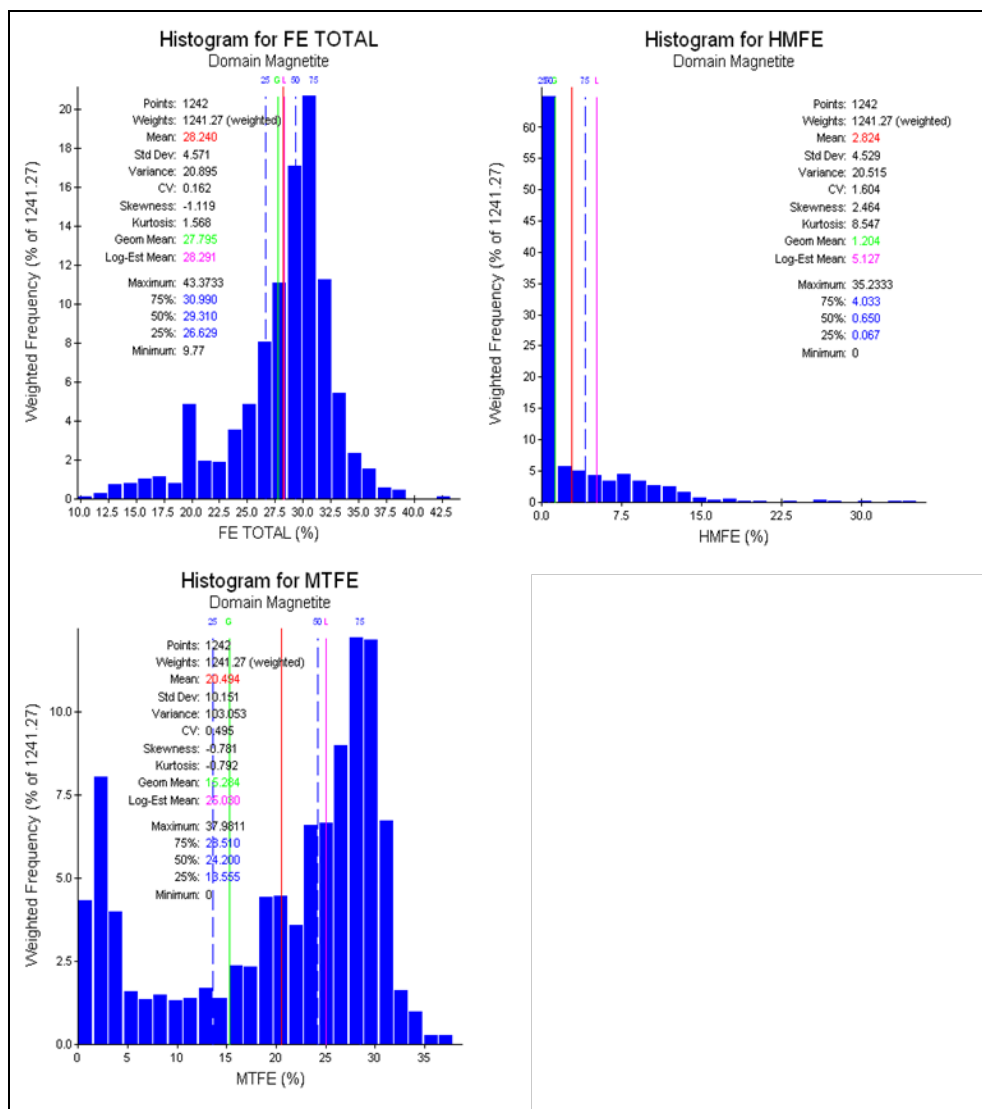


Figure 14-17: Normal Histogram, %TFeHead, %hmFeHead, %magFeHead – Mills Lake 3 m Composites (Magnetite Zone)

14.5.3 Grade Capping

The statistical distribution of the %TFe samples showed good normal distributions in all zones. Grade capping, also sometimes referred to as top cutting, is commonly used in the Mineral Resource estimation process to limit the effect (risk) associated with extremely high assay values, but considering the nature of the mineralization and the continuity of the zones, Alderon determined that capping was not required for the Rose Central, Rose North and Mills Lake deposits and WGM agrees with this assessment.

14.5.4 Density/Specific Gravity

Specific gravity is previously discussed in detail in the Mineralization Section 7.3.4 of this Report. In previous Mineral Resource estimates for Mills Lake, Rose Central and Rose North, WGM created a variable density model to relate the SGs with the iron grades. SG vs %TFe for the Kami samples was plotted using the helium gas comparison pycnometer method on sample pulps. Most of the iron formation consists of a mix of magnetite and hematite, however, there are sections that contain very little hematite and are mostly magnetite and vice versa.

For the current Mineral Resource estimates, Alderon used a DGI probe for each hole that was drilled since 2011 and recorded major physical properties, including density. This method proved to be slightly different than WGM's method and resulted in a very similar relationship to WGM's. The plot shows that SG by pycnometer results correlate strongly with %TFe on samples. It also illustrates that the DGI probe determined densities averaged over the same sample intervals similarly correlate strongly with %TFe.

Since we are of the opinion that there is insignificant difference between the WGM method and the Alderon method, a best fit correlation line based on DGI data to obtain the density of each block in the model was used: $\%TFe \times 0.0223 + 2.8103$. This formula also reflects WGM's experience with other iron ore deposits that we have modelled and we have found that SG shows excellent correlation with %TFe, as is typical with these types of deposits. Using WGM's variable density model, a 30% TFe gives a SG of approximately 3.48.

Since using the DGI method proves to be on the lower side and slightly more conservative, WGM agreed to use best fit line based on the DGI data instead of pycnometer, although WGM reiterates that the DGI data needs to be validated for a limited number of samples against pycnometer data.

Mineralization for Rose North is more hematite-rich than that at Rose Central and the near surface mineralization is also more weathered and oxidized. Alteration products such as limonite/goethite and secondary manganese hydroxides have developed from the oxide iron and manganese minerals; however, the extent of these secondary iron hydroxides is currently not well understood, particularly at depth. This leads to some uncertainty regarding the determination of density for the Mineral Resource tonnage estimate. To overcome this uncertainty in grade and density of the altered mineralization in Rose North, Alderon used a visual observation of altered recovered core and logged it in the database under a "Table of Weathering" to develop a hard boundary for altered mineralization. All density data within the limonitic wireframes (altered zones) were assigned a SG of 3.0. The secondary iron and manganese hydroxides will also have some impact on potential iron recovery and this requires further evaluation and testwork.

14.6 Block Model Parameters, Grade Interpolation and Categorization of Mineral Resources

14.6.1 General

The previous Kami Project Mineral Resource estimates were completed using a block modelling method and the grades were interpolated using an Inverse Distance ("ID") estimation technique. ID belongs to a distance-weighted interpolation class of methods, similar to Kriging, where the grade of a block is interpolated from several composites within a defined distance range of that block. ID uses the inverse of the distance (to the selected power) between a composite and the block as the weighting factor.

Alderon used an ID² interpolation method and for comparison and cross checking purposes, WGM used ID and ID¹⁰ methods, which closely resembles a Nearest Neighbour ("NN") technique. In the NN method, the grade of a block is estimated by assigning only the grade of the nearest composite to the block. In WGM's experience, all interpolation methods usually give similar results, as long as the grades are well constrained within the wireframes. The results of the interpolation approximated the average grade of all the composites used for the estimate. WGM's experience with similar types of deposits showed that geostatistical methods like Kriging give very similar results when compared to ID interpolation. Therefore, WGM is of the opinion that ID interpolation is appropriate and accepted Alderon's grade interpolation as supplied.

14.6.2 Block Model Setup/Parameters

The block model was created using the Gemcom™ software package to create a grid of regular blocks to estimate tonnes and grades. Originally, three block models were set-up for the Kami Project Mineral Resource estimates; one for Mills Lake and one each for Rose Central and Rose North, as Mills Lake and the Rose deposits were oriented in different directions along the main strike direction. Rose North is believed to be the NW limb of the same syncline as Rose Central and has the same section definitions and orientations as Rose Central, so for this most recent Mineral Resource update, Rose North was just added into an expanded block model setup for Rose Central. The parameters used for the block modelling are summarized below.

For Mills Lake, the block sizes used were: Width of columns, Width of rows, Height of blocks = 5 m X 20 m X 5 m, respectively.

For Rose Central and Rose North, the block sizes used were: Width of columns, Width of rows, Height of blocks = 15 m X 15 m X 14 m respectively.

The specific parameters for the Mills Lake block model are as follows:

- Easting coordinate of model bottom left hand corner: 634659.71
- Northing coordinate of model bottom left hand corner: 5850345.00
- Datum elevation of top of model: 650.00 m
- Model rotation (anti-clockwise around Origin): -45.00
- Number of columns in model: 300
- Number of rows in model: 115
- Number of levels: 100

The specific parameters for the Rose Central and Rose North block model are as follows:

- Easting coordinate of model bottom left hand corner: 630790.38
- Northing coordinate of model bottom left hand corner: 5855176.35
- Datum elevation of top of model: 730.00 m
- Model rotation (anti-clockwise around Origin): -45.00
- Number of columns in model: 150
- Number of rows in model: 200
- Number of levels: 70

14.6.3 Grade Interpolation

Both the Rose Central and Rose North deposits are divided into three subzones based on the amount of magnetite versus hematite, as well as manganese contents and other metallurgical differences (Please see Section 7.3.2 of this Report for detailed metallurgical/mineralogical descriptions of all six subzones in Rose Central and Rose North). The interpretation and “geo-metallurgical” 3-D wireframes were established based on these three subzones for each of the Rose deposits. The oxide iron formation at Kami is mostly magnetite-rich, but hematite (specularite) appears to be more prominent in the Rose North mineralization than at Rose Central, even though they are believed to be part of the same syncline. All zones contain mixtures of magnetite and hematite. Deeply weathered iron formation in Rose North also contains concentrations of secondary manganese oxides which add to its complexity. The altered mineralization in the form of limonite and goethite was used to overprint the Rose North hematic unit (NR-1). Mills Lake is simply divided to two zones (magnetite-rich and hematite-rich units). According to BBA’s assessment of the PEA testwork, it would appear that the Mills Lake mineralization would require a different processing route. Since Mills Lake does not contribute to the current Feasibility Study due to Alderon’s decision to focus effort on the Rose deposit, no further zoning based on metallurgical and mineralogical characteristics has been established for this deposit. The coding of each zone in the block model is shown in Table 14-4.

Table 14-4: Block Model Coding of Kami Project Deposits

Deposit	Zone	Domain
Rose Central	RC-1	1001,1002,1003
	RC-2	2001,2002,2003
	RC-3	3001,3002,3003
Rose North	NR-1	12
	NR-2	13
	NR-3	14
	Limonite	15
Mills Lake	Hematite	10
	Magnetite	20

Based on the current knowledge gained during more detailed exploration and definition drilling, the gross overall mineralization controls appear to be fairly simple from a structural perspective, therefore the search ellipse size and orientation for the grade interpolation for Rose North and Mills Lake was kept simple. However, for Rose Central, a “domaining” technique was chosen to define structural or mineralogical zones and to better control grade distribution. Three subdomains were defined within the Rose Central anticline/antiform. These three subdomains cover the west limb (1003, 2003 and 3003), hinge zone (1002, 2002 and 3002) and east limb (1001, 2001 and 3001) orientation of the folded strata in the deposit.

A three-step search ellipsoid approach was established based on results of variography of %TFeHead grade for Rose Central, Rose North and Mills Lake: the first search was based on 2/3 of the range of the variograms; the second search was based on the range of the variograms; and the third search was based on three times the range of the variograms. These ranges were established for all interpolated domains in the three deposits. This three-step approach was used in order to inform all the blocks in the block model with grade, however, the classification of the Mineral Resources (see below) was based on drillhole density (or drilling pattern), geological knowledge/interpretation of the geology and some other constraints, such as the presence of alteration (limonite/goethite). The %TFeHead grade (interpolated from 3 m composites) was used for the Mineral Resource estimate, however, %Mn, %SiO₂, %magFe and %hmFe (calculated) were also interpolated into the grade block model.

The Project general grade interpolation parameters are shown in Table 14-5 to Table 14-7.

Table 14-5: ID² Interpolation Parameters, First Search Ellipsoid (2/3 Sill Range)

Domain	Z	Y	Z	Intermediate Continuity (m, Y)	Maximum Continuity (m, X)	Minimum Continuity (m, Z)	Max. No. Per Hole	Min. No. Samples	Max. No. Samples
1001	175	-50	180	70	90	25	4	6	12
1002	45	0	-50	70	90	25	4	6	12
1003	175	90	-180	70	90	25	4	6	12
2001	175	-50	180	70	90	25	4	6	12
2002	45	0	-50	70	90	25	4	6	12
2003	175	90	-180	70	90	25	4	6	12
3001	175	-50	180	70	90	25	4	6	12
3002	45	0	-50	70	90	25	4	6	12
3003	175	90	-180	70	90	25	4	6	12
12	180	-75	180	100	100	30	2	5	10
13	180	-75	180	100	100	30	2	5	10
14	180	-75	180	100	100	30	2	5	10
15	180	-75	180	100	100	30	2	5	10
10	-180	-30	0	90	100	30	2	5	10
20	-180	-30	0	90	100	30	2	5	10

Table 14-6: ID² Interpolation Parameters, Second Search Ellipsoid (Sill Range)

Domain	Z	Y	Z	Intermediate Continuity (m, Y)	Maximum Continuity (m, X)	Minimum Continuity (m, Z)	Max. No. Per Hole	Min. No. Samples	Max. No. Samples
1001	175	-50	180	140	180	50	2	3	10
1002	45	0	-50	140	180	50	2	3	10
1003	175	90	-180	140	180	50	2	3	10
2001	175	-50	180	140	180	50	2	3	10
2002	45	0	-50	140	180	50	2	3	10
2003	175	90	-180	140	180	50	2	3	10
3001	175	-50	180	140	180	50	2	3	10
3002	45	0	-50	140	180	50	2	3	10
3003	175	90	-180	140	180	50	2	3	10
12	180	-75	180	150	135	60	2	3	10
13	180	-75	180	150	135	60	2	3	10
14	180	-75	180	150	135	60	2	3	10
15	180	-75	180	150	135	60	2	3	10
10	-180	-30	0	180	200	60	2	2	10
20	-180	-30	0	180	200	60	2	2	10

Table 14-7: ID² Interpolation Parameters, Third Search Ellipsoid

Domain	Z	Y	Z	Intermediate Continuity (m, Y)	Maximum Continuity (m, X)	Minimum Continuity (m, Z)	Max. No. Per Hole	Min. No. Samples	Max. No. Samples
1001	175	-50	180	400	400	150	-	3	10
1002	45	0	-50	400	400	150	-	3	10
1003	175	90	-180	400	400	150	-	3	10
2001	175	-50	180	400	400	150	-	3	10
2002	45	0	-50	400	400	150	-	3	10
2003	175	90	-180	400	400	150	-	3	10
3001	175	-50	180	400	400	150	-	3	10
3002	45	0	-50	400	400	150	-	3	10
3003	175	90	-180	400	400	150	-	3	10
12	180	-75	180	300	300	120	-	3	10
13	180	-75	180	300	300	120	-	3	10
14	180	-75	180	300	300	120	-	3	10
15	180	-75	180	300	300	120	-	3	10
10	-180	-30	0	270	300	90	-	2	10
20	-180	-30	0	270	300	90	-	2	10

The mineralization of economic interest on the Project is oxide facies iron formation, consisting mainly of semi-massive bands, or layers, and disseminations of magnetite and/or specular hematite (specularite) in recrystallized chert and interlayered with bands (beds) of chert with minor carbonate and iron silicates. The oxide iron formation is mostly magnetite-rich, but some submembers contain increased amounts of hematite, either inter-mixed with magnetite or as more discrete bands/beds/layers. Some Davis Tube testwork was also completed on some samples, giving WGM some comparative numbers to our calculated iron in hematite values. Section 7.3.4 (Mineralization) in this Report gives a full description of the methods that WGM used to calculate %hmFe from %TFe, FeO, Satmagan and Davis Tube results. The final WGM calculated %hmFe values were used in the grade interpolation in the block model.

GemcomTM does not use the sub-blocking method for determining the proportion and spatial location of a block that falls partially within a wireframed object. Instead, the system makes use of a percent or partial block model (if it is important to track the different rock type's proportions in the block – usually if there is more than one important type) or uses a "needling technology" that is similar in concept, but offers greater flexibility and granularity for accurate volumetric calculations. For the previous Mineral Resource estimates, WGM/Alderon decided to use smaller blocks (20 m x 5 m x 5 m) than would be typical for this drillhole spacing and envisioned

a mining method (large open pit). However, for the purpose of this more advanced study and to aid in mine design and have a more realistic block size as would benefit a large open pit operation, BBA requested that Alderon use a bigger block geometry (15 m x 15 m x 14 m height) for Rose Central and Rose North. Since the new zoning of the Rose deposits are broader in nature, the concept of using larger blocks has merit and does not detrimentally affect the resolution of grade interpolations. The block geometry was kept the same as previous Mineral Resource estimates for Mills Lake due to the narrow hematite zone within the deposit, i.e., the blocks were kept smaller in all dimensions so that the narrower hematite-rich zones would not lose resolution.

14.6.4 Mineral Resource Categorization

Mineral Resource classification is based on certainty and continuity of geology and grades, and this is almost always directly related to the drilling density. Areas more densely drilled are usually better known and understood than areas with sparser drilling, which would be considered to have greater uncertainty, and hence lower confidence.

WGM has abundant experience with similar types of mineralization to the Project; therefore, we used this knowledge to assist Alderon with the categorization of the Mineral Resources. The planned definition drilling program in 2011-2012 was completed by a fairly regular drillhole spacing pattern, and some holes were also drilled at optimum angles to compensate for some shortfalls of the previous drilling programs (as recommended by WGM). The mineralization was further extended on the fringes/edges and at depth, particularly in the Rose Central and Rose North zones. The continuity of the mineralization in general was quite good; however, internally the continuity of some of the zones and some waste units is poorly understood due to folding/geometric complexity. WGM was of the opinion that extending the geological interpretation beyond the more densely drilled parts of the deposit (particularly at Rose Central) was appropriate, as long as there was supporting data from adjacent sections. This extension was taken into consideration when classifying the Mineral Resources, and these areas were given a lower confidence category. In general, this represented the deeper mineralization. Variograms were also generated along strike and across the deposit in support of these distances. Alderon classified Mills Lake, Rose Central and Rose North mineralization as Measured, Indicated and Inferred categories.

For the purpose of the current Mineral Resource estimates, Alderon adapted a multi-stage process to classify the resources in Rose Central, Rose North and Mills Lake. Because the search ellipses were large enough to ensure that all the blocks in the 3-D model were interpolated with grade, Alderon generated a Distance Model (distance from actual data point in the drillhole to the block centroid) and reported the estimated Mineral Resources by distances which represented the category or classification.

For each category, a wireframe was established around blocks which fell within specific distances, and then, the aforementioned wireframe was adjusted by visually assessing the drillhole density and by the three-step search ellipsoid approach to grade interpolation. Generally, the first pass search ellipsoid was chosen to be the “blueprint” for the Measured category and then this first pass was compared with the Distance Model and drillhole density pattern on each cross section. The results of these comparisons were then digitized as bounding polylines. The same process was carried out for the Indicated category, where the second pass (the extended ellipsoid) was used as a guide to create polylines based on the Distance Model. A set of 3-D wireframes were created from these polylines for Measured and Indicated categories.

For the categorization, Alderon chose to use the blocks within the wireframes that had a distance of 100 m or less to be Measured, 100 m to 150 m to be Indicated and greater than 150 m as Inferred. Inferred Mineral Resources were interpolated out to a maximum of about 400 m for Rose Central and 300 m for Rose North and Mills Lake on the ends/edges and at depth when supporting information from adjacent cross sections was available. The average distance for the total Measured, Indicated and Inferred Mineral Resources at Mills Lake was approximately 44 m, 82 m and 220 m, respectively. For Rose Central, the corresponding distances were 60 m, 93 m and 178 m, respectively, and for Rose North, the corresponding distances were 47 m, 85 m and 186 m, respectively. The majority of the deeper mineralization is categorized as Inferred due to the sparse drillhole information below about 300 m from surface, and the maximum depth that the mineralization was taken to is 0 m elevation (approximately 575 m vertically from surface).

There were some exceptions for the general resource categorization, where a combination of the Distance Model and the search ellipsoid pass were intentionally not used for category definition, especially in the Rose North and Rose Central zones. These cases are as follows:

- All altered mineralization in Rose North, which was logged as limonitic, is tagged as Inferred category, no matter what the proximity of these zones is to existing drillholes. This altered material is considered as “sub-ore” at this stage until further metallurgical tests are conducted confirming their economic viability. These altered zones often have low recovery or lost cores;
- A basal manganese-rich zone was also identified in the hematite-rich ore (NR-1) in North Rose and was also categorized as Inferred;
- No Measured category exists where three sets of cross-cutting faults appear to be going through both the Rose North and Rose Central deposits; and
- In a few cases, especially in North Rose, the lack of DGI probe data leads to downgrading of the Measured category to Indicated.

WGM worked with Alderon extensively on this categorization and endorses it. We are also in further discussions with Alderon on how to mitigate the remaining concerns.

Figure 14-18 shows the zone outlines and interpolated %TFe blocks and Figure 14-19 shows the Mineral Resource categorization on Level Plan 450 m for Rose North. Figure 14-5, Figure 14-7 and Figure 14-9, previously shown, illustrate the resource categorization on typical cross sections through the Rose deposit and Mills Lake.

For the Mineral Resource estimate, a cut-off of 15% TFeHead was determined to be appropriate at this stage of the Project. This cut-off was chosen, based on a preliminary review of the parameters that would likely determine the economic viability of a large open pit operation and compares well to similar projects and to projects that are currently at a more advanced stage of study. This is also the resultant internal cut-off used by BBA for its current pit design (see Section 15 of this Report).

Table 14-8 and Table 14-9 show the Mineral Resource estimates at various cut-offs for comparison purposes. Mineral Resources that are not Mineral Reserves, do not have demonstrated economic viability.

Due to the uncertainty that may be attached to Inferred Mineral Resources, it cannot be assumed that all or any part of an Inferred Mineral Resource will be upgraded to an Indicated or Measured Mineral Resource as a result of continued exploration.

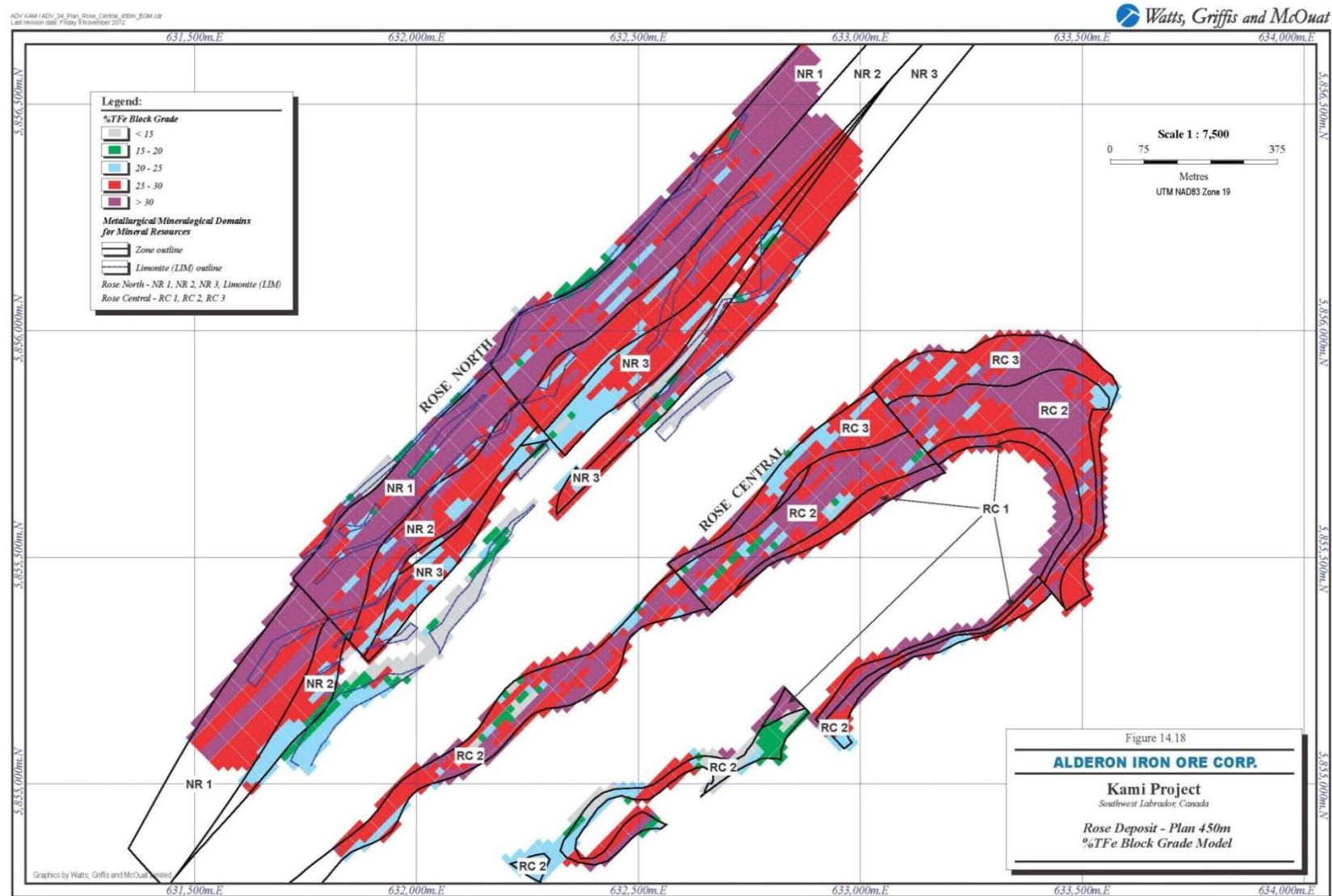


Figure 14-18: Rose Deposit, Level Plan 450 m - %TFe Block Model and Geological Outlines

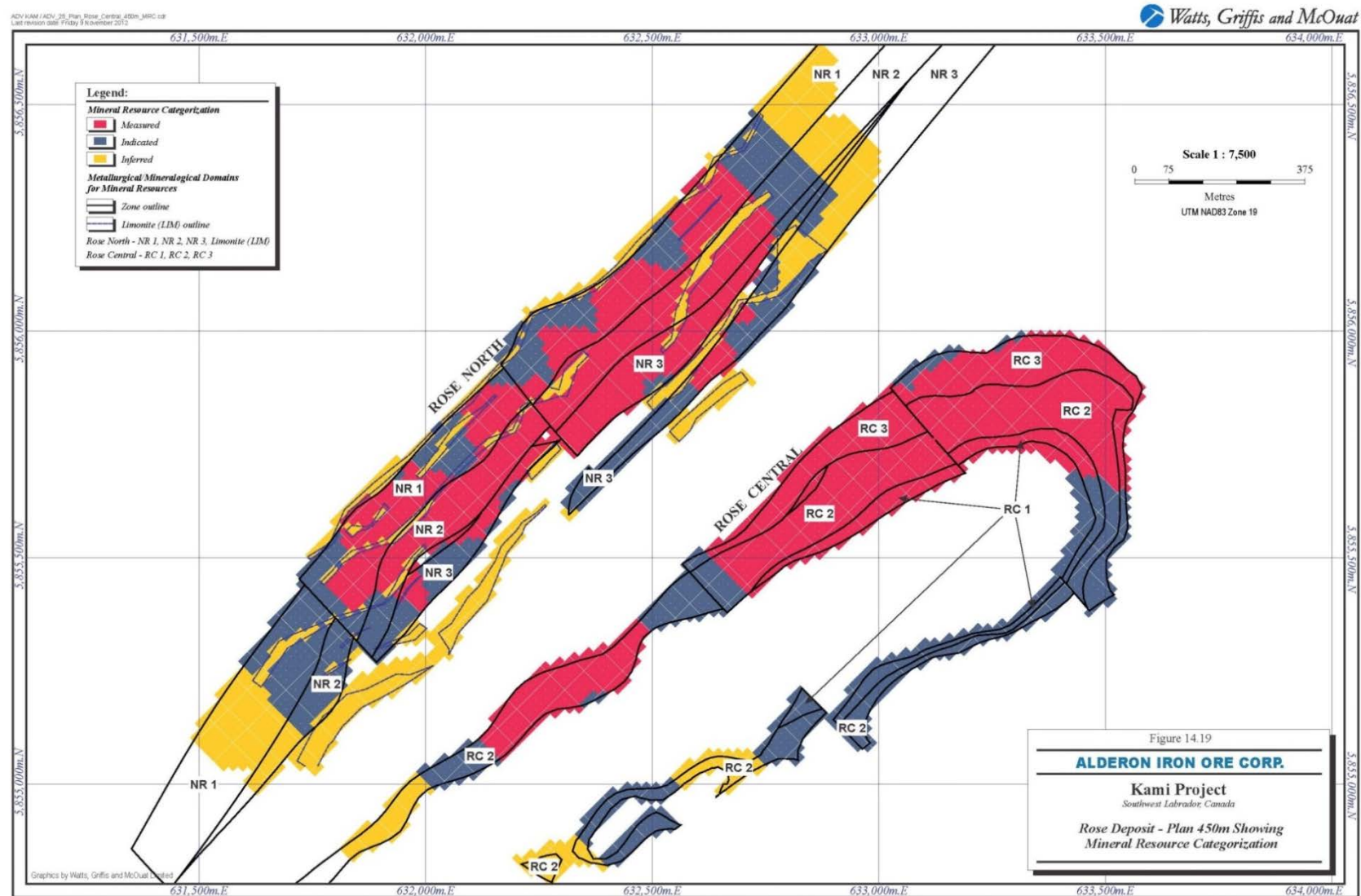


Figure 14-19: Rose Deposit, Level Plan 450 m showing Mineral Resource Categorization

Table 14-8: Categorized Mineral Resources by %TFe_H Cut-Off for Mills Lake (Effective Date as at December 17, 2012)

Cut-Off%	Tonnes (Million)	TFe%	magFe%	hmFe%	Mn%
Measured Resources					
25.0	49.9	30.6	21.6	7.1	0.98
22.5	50.5	30.6	21.6	7.0	0.97
20.0	50.7	30.5	21.5	7.0	0.97
17.5	50.7	30.5	21.5	7.0	0.97
15.0	50.7	30.5	21.5	7.0	0.97
Indicated Resources					
25.0	124.0	29.8	21.5	4.0	0.80
22.5	128.3	29.6	21.2	3.9	0.80
20.0	129.6	29.5	21.0	3.9	0.80
17.5	130.6	29.5	20.9	3.9	0.80
15.0	130.6	29.5	20.9	3.9	0.80
Inferred Resources					
25.0	71.1	29.6	21.0	2.8	0.67
22.5	73.7	29.4	20.5	2.7	0.67
20.0	74.1	29.4	20.4	2.7	0.67
17.5	74.8	29.3	20.3	2.7	0.67
15.0	74.8	29.3	20.3	2.7	0.67

Table 14-9: Categorized Mineral Resources by %TFe_H Cut-Off for Rose Central and Rose North (Effective Date as at December 17, 2012)

Cut-Off%	Tonnes (Million)	TFe%	magFe%	hmFe%	Mn%
Rose Central Measured Resources					
25.0	222.4	30.3	18.0	8.7	1.66
22.5	238.0	29.9	17.8	8.4	1.62
20.0	244.4	29.7	17.7	8.2	1.61
17.5	247.7	29.5	17.6	8.2	1.60
15.0	249.9	29.4	17.6	8.1	1.60
Rose Central Indicated Resources					
25.0	242.0	29.8	18.3	6.7	1.40
22.5	275.8	29.1	18.1	6.1	1.31
20.0	284.5	28.8	18.0	6.0	1.29
17.5	288.8	28.7	17.8	6.0	1.29
15.0	294.5	28.5	17.7	5.9	1.28

Cut-Off%	Tonnes (Million)	TFe%	magFe%	hmFe%	Mn%
Rose Central Inferred Resources					
25.0	139.3	29.8	17.2	7.9	1.56
22.5	154.3	29.2	17.1	7.3	1.47
20.0	158.8	29.0	17.0	7.2	1.45
17.5	160.1	28.9	16.9	7.1	1.45
15.0	160.7	28.9	16.9	7.1	1.44
Rose North Measured Resources					
25.0	215.3	31.0	13.1	15.6	0.90
22.5	231.9	30.5	13.1	14.8	0.87
20.0	235.0	30.4	13.1	14.7	0.87
17.5	235.8	30.3	13.0	14.7	0.87
15.0	236.3	30.3	13.0	14.7	0.87
Rose North Indicated Resources					
25.0	287.0	31.1	11.6	18.1	1.00
22.5	307.6	30.6	11.8	17.2	0.96
20.0	311.0	30.5	11.8	17.1	0.96
17.5	312.1	30.5	11.8	17.1	0.96
15.0	312.5	30.5	11.8	17.1	0.96
Rose North Inferred Resources					
25.0	260.6	30.5	12.6	16.3	0.80
22.5	279.6	30.0	12.7	15.6	0.77
20.0	284.4	29.9	12.6	15.5	0.77
17.5	286.0	29.8	12.6	15.5	0.77
15.0	287.1	29.8	12.5	15.5	0.76

14.7 Block Model Validation

The validation of the Mineral Resource estimate on Mills Lake and Rose Lake deposits was carried out separately in two steps. For the first step, block grades (TFe%, magFe%, hmFe% and Mn%) were compared visually against drillhole assay data and composite data for each section and on plan views. The global validation of the block model results against the grade of the assay and composite intervals were confirmed using this visual comparison. For the second step, the average of the block grades were reported at 0 TFe% cut-off with blocks in all classifications summed. This average is the average grade of all blocks within the mineralized domain. The values of the interpolated grades for the block model were compared to the average grade of Head assays and average grade of composites of all samples from within the domain (Table 14-10 to Table 14-12).

Table 14-10: Comparison of Average Grade of Assays and Composites with Total Block Model Average Grades for Rose Central

Cut-Off%	TFe%	magFe%	hmFe%	Mn%
Assays	28.9	17.0	8.1	1.56
Composites	28.7	16.9	8.1	1.54
Blocks	28.5	17.1	7.0	1.44

Table 14-11: Comparison of Average Grade of Assays and Composites with Total Block Model Average Grades for Rose North

Cut-Off%	TFe%	magFe%	hmFe%	Mn%
Assays	29.9	11.4	16.5	0.86
Composites	29.2	11.0	16.0	0.84
Blocks	30.0	12.2	15.9	0.84

Table 14-12: Comparison of Average Grade of Assays and Composites with Total Block Model Average Grades for Mills Lake

Cut-Off%	TFe%	magFe%	hmFe%	Mn%
Assays	30.0	20.8	5.9	0.94
Composites	28.7	20.6	4.9	0.90
Blocks	29.6	20.8	4.1	0.79

The comparisons above show the average grade of all the blocks in the constraining domains to be in close proximity of the average of all assays and composites used for grade estimation, and any variances observed were not considered to be material. As mentioned previously, subsequent to the 2012 Mineral Resource estimate being completed, the Project database had some minor revisions that are deemed to be immaterial to the resource estimate. No additional geological interpretation or drilling has been conducted therefore WGM considers the 2012 Mineral Resource estimate to be current and valid.

15. MINERAL RESERVE ESTIMATE

The following chapter of this report presents the estimation of the Mineral Reserves for the Kami Project. The estimation was carried out by Jeffrey Cassoff, P. Eng., a Qualified Person according to NI 43-101 guidelines. The mine design work was done using Hexagon's MineSight Software Version 13.0.

15.1 Resource Block Model

The block model for the Rose deposit was prepared by Alderon and audited by Watts, Griffis and McOuat Ltd. ("WGM"). The block model was provided to BBA as a Comma Separated Value ("CSV") file on June 26, 2012 for the initial Feasibility Study. The model covers the Rose deposit, which is divided into the Rose Central ("RC") region and the North Rose ("NR") region.

The items included in the block model are presented in Table 15-1. The model includes the rock type, which is subdivided into specific iron formations for the RC and for the NR regions (i.e. RC-1, RC-2 and RC-3, and NR-1, NR-2 and NR-3), as well as limonitic mineralization (Rock Type = 15). All of the mineralized rock types are classified as Measured, Indicated or Inferred Resources.

Rock Type = 15 (limonite) has not been included in the calculations for the Mineral Reserves due to insufficient metallurgical testwork for this type of mineralization.

BBA imported the block model into the MineSight software and checked the validity and integrity of the transfer from the original WGM files.

It should be noted that in the March 2017 PEA, BBA discovered an inconsistency in the block model, specifically while carrying out the estimation of mining dilution. In the block model that was received, blocks at the contact of two ore zones were coded with the majority zone as well as the associated percentage of the block that lies within that zone. The remaining portion of the block was incorrectly considered as waste. BBA corrected the block model for the mine design and this is captured in this updated FS; however, the Mineral Resource was not corrected as the impact on the Mineral Resource estimate is immaterial.

15.1.1 Model Coordinate System

The block model was provided in UTM NAD83 coordinates, with an applied rotation of 45 degrees. The model was delivered with a specified origin of $x = 630,790.381$ m, $y = 5,855,176.355$ m, $z = 730$ m. BBA un-rotated the model and used a Local Mine Grid with origin $x = 0$ m, $y = 0$ m when importing it into MineSight.

Table 15-1: Rose Block Model Items

Item	Description
Rock Type	Rose Central (RC): Hematite-Rich (1000), Magnetite-Hematite (2000), Magnetite-Rich (3000) North Rose (NR): Hematite-Rich (12), Magnetite-Hematite (13), Magnetite-Rich (14), Limonitic (15) RC-1=1000 RC-2=2000 RC-3=3000 NR-1=12 NR-2=13 NR-3=14
Percent	Percentage blocks within model
Density	Density of block (t/m ³)
HMF_e	Grade of hematite Fe in model (%)
MTF_e	Grade of magnetite Fe in model (%)
Mn	Grade of manganese
TFe	Total iron (Fe) percent
Mag%	Percentage of magnetite
Hem%	Percentage of hematite
SiO₂	Grade of silica in model (%)
RC	RC domains for Central Rose Deposit (flagged in this folder)
NR	NR domains for North Rose Deposit (flagged in this folder)
Rescat	Measured (1), Indicated (2), Inferred (3)

15.1.2 Model Densities

Densities for the mineralized rock types were coded into the block model and follow the regression curve provided by WGM for the 2012 FS. The density of mineralized material in the model ranges from 2.81 to 4.09 t/m³. A density of 2.35 t/m³ was used for overburden, which is the layer of sand and gravel that lies above the bedrock. This density was confirmed by Stantec in the 2012 FS.

The in-situ waste rock densities were calculated by taking weighted averages of the relative volumetrics of the specific waste rock lithology, as logged by the Alderon geologist, and of the densities of the lithological formations. The density data is supported by DGI probe data points for the major waste rock formations. The division of the waste rock formations and their respective densities, as provided by Alderon, are presented in Table 15-2.

Table 15-2: Variety of Waste Rock Densities

Formation	Unit	Density (t/m ³)
Kastsao	Kastsao	2.69
Wishart	NR Wishart	2.69
Wishart	RC Wishart	2.69
Denault	RC Marble	2.78
Sokoman	RC Waste FW Silicate IF	3.05
Menihek	Waste Menihek	2.77
Sokoman	Waste Sokoman	3.05

It is important to note that some densities were given more weight than others (e.g., Sokoman and Menihek). The in-situ waste rock density of 2.83 t/m³ was confirmed by Alderon.

15.1.3 Model Recoveries

The model Fe recoveries were determined from metallurgical testwork. The Fe recoveries are shown in Table 15-3, and are based on mineralized rock types in the model.

Table 15-3: Fe Recovery by Ore Type

Ore Type	Fe Recovery (%)
RC-1	82.3
RC-2	81.0
RC-3	79.6
NR-1	67.2
NR-2	84.8
NR-3	73.1

These recoveries were used to calculate the weight recovery item in the model. The weight recovery in the model is dependent on the total iron (“TFe”) variable, the Fe recovery for each type of ore, and the final concentrate Fe grade of 65.2%, which was also derived from the metallurgical testwork. The variable weight recovery equation in the model is:

$$\text{Weight Recovery (WREC)} = \frac{\text{TFE (Variable)} \times \text{Fe Recovery (Variable)}}{\text{Concentrate Fe grade (65.2%)}}$$

15.1.4 Model Surfaces

In addition to the block model file, the following DXF files were provided to BBA:

- Topography Surface ("Surface Topo DEM.dxf");
- OB Solid ("OB Volume.dxf").

The two files provide information about the portions of the block model that are actually in air or are below either the topographic surface in the overburden region, or in bedrock.

Two of the additional model items, "TOPO%" and "OB%", were coded into the block model by BBA. The TOPO% item represents the portion of the block that is below the topographic surface. The OB% item represents the percentage of the block that is overburden. When a block is at least 50% OB, it was given a classification code as OB.

The overburden solid that was provided is important for understanding the large variability of overburden thicknesses that are present in the area. The overburden thicknesses vary the most towards the north and south of the deposit, where the lakes are present. Figure 15-1 shows that the area of greatest overburden thickness reaches approximately 55 m. The range of thicknesses of 30 m to 55 m manifests itself along the weaker thrust zone in the deposit, which is described in detail in Stantec's pit slope report (Stantec 2012).

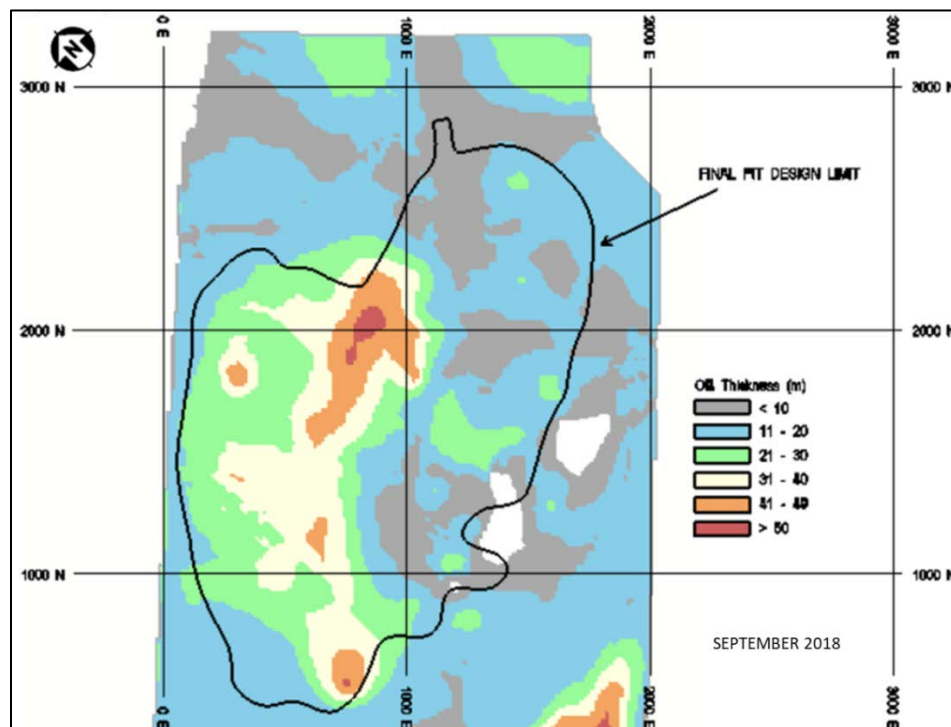


Figure 15-1: Isopach Mapping of Overburden Thicknesses

15.2 Mining Dilution and Ore Loss

In every mining operation, it is impossible to perfectly separate the ore and waste due to the large scale of the mining equipment and the use of drilling and blasting. In order to estimate the mining dilution it was assumed that the minimum selectivity for the mining operation is an entire block (15 m x 15 m x 14 m). Therefore, for blocks that have an ore/waste contact passing through them, it was assumed that the waste portion will be mined with the ore and sent to the crusher. In order to remain conservative with the dilution estimate, the TFe grade of the waste portion was considered to be 0%. Figure 15-2 presents a plan view of a block with an ore/waste contact passing through it. Once dilution is considered, this block has a TFe grade of 16.8%. If the dilution causes the grade of the block to drop below the 15% cut-off, the entire block is then considered as waste.

For the Kami Project, mining dilution was estimated at 3.4% and ore loss at 2.5%, which results in the in-pit Mineral Resources of 512.6 Mt at 29.7% TFe being converted into 517.2 Mt with a grade of 28.8% TFe for the Mineral Reserves.

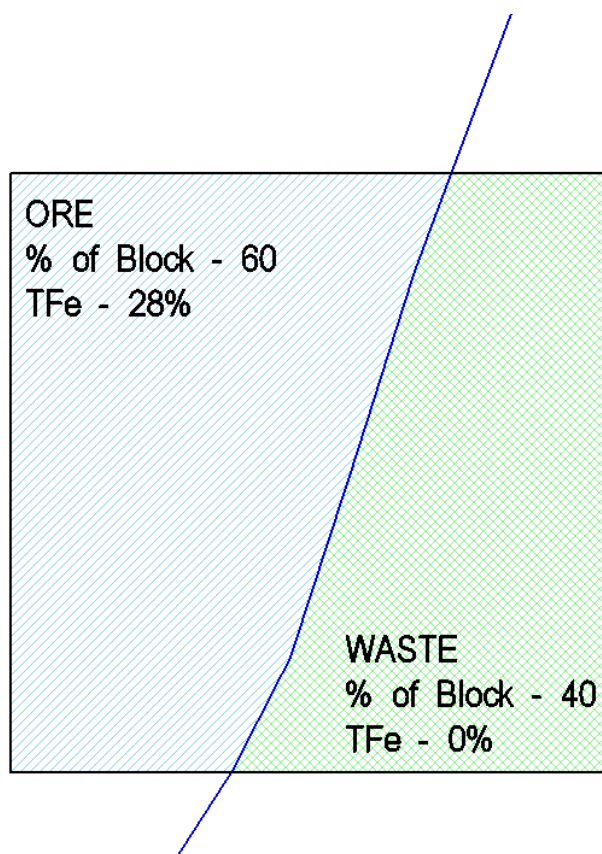


Figure 15-2: Mining Dilution

15.3 Pit Optimization

A pit optimization analysis was conducted to determine the cut-off grade and to what extent the deposit can be mined profitably. The pit optimization was done using the MS-Economic Planner module of MineSight. The optimizer uses the 3-D Lerchs-Grossman algorithm to determine the economic pit limits based on input of mining and processing costs, revenue per block and operational parameters, such as the Fe recovery, pit slopes and other imposed constraints. Since this Study is at a FS level, NI 43-101 guidelines do not allow Inferred Mineral Resources to be used in the pit optimization analysis and mine plan.

Table 15-4 presents the parameters that were used for the pit optimization. It should be noted that for this pit optimization analysis, all dollar amounts are expressed in Canadian Dollars. Iron ore concentrate selling price was converted from US dollars at an exchange rate of 1.00 CND = 0.77 USD. The costs indicated are based on the best available information including some costs from the November 2017 PEA Update, on benchmarking of similar mining operations in the region and on BBA's experience. The costs and operating parameters are preliminary estimates for developing the economic pit limit and should not be confused with the operating costs subsequently developed for the FS and presented in Chapter 21.

The pit slopes used in the optimization are based on Stantec's recommendations, which are presented later in this chapter. It is important to note that the slopes used in the optimization have been shallowed in certain areas to account for the pit access ramp that will be added during the engineering design process. The thrust zone and overburden slopes were left the same as those recommended.

Table 15-4: Pit Optimization Parameters (in Canadian Dollars)

Description	Units	Values
Mining cost ore, waste	\$/t mined	2.16
Mining cost overburden (OB)	\$/t mined	1.26
Unit mining cost per bench	\$/t / bench	0.03
Processing cost	\$/t milled	2.38
Tailings management cost	\$/t conc.	1.00
Rail transport + port cost + ship loading	\$/t conc.	14.25
SG&A cost	\$/t conc.	3.58
Weight recovery	Per rock type	
Iron sale price (FOB Sept-Iles)	\$/t conc.	94.00
Royalties	\$/t conc.	2.80

The following additional limits and constraints, presented in Figure 15-3, were considered:

- 70 m buffer zones around Pike Lake South and the lake to the south of the pit were considered for environmental and hydrogeological purposes;
- A 30 m buffer zone was considered from the small lake to the east of the pit;
- A 120 m buffer zone was considered from the Québec/Labrador border in order to ensure that the pit wall remains within the Alderon mineral rights claims. This buffer also enables access to the overburden pile for final site rehabilitation and closure;
- No depth/elevation constraints were applied to the pit optimization. The pit optimization therefore considered all Measured and Indicated Resources with an economic value. As it turns out, the optimum pit shell did not have any blocks below elevation 0 m, thus conforming to the global resource reported above this elevation.

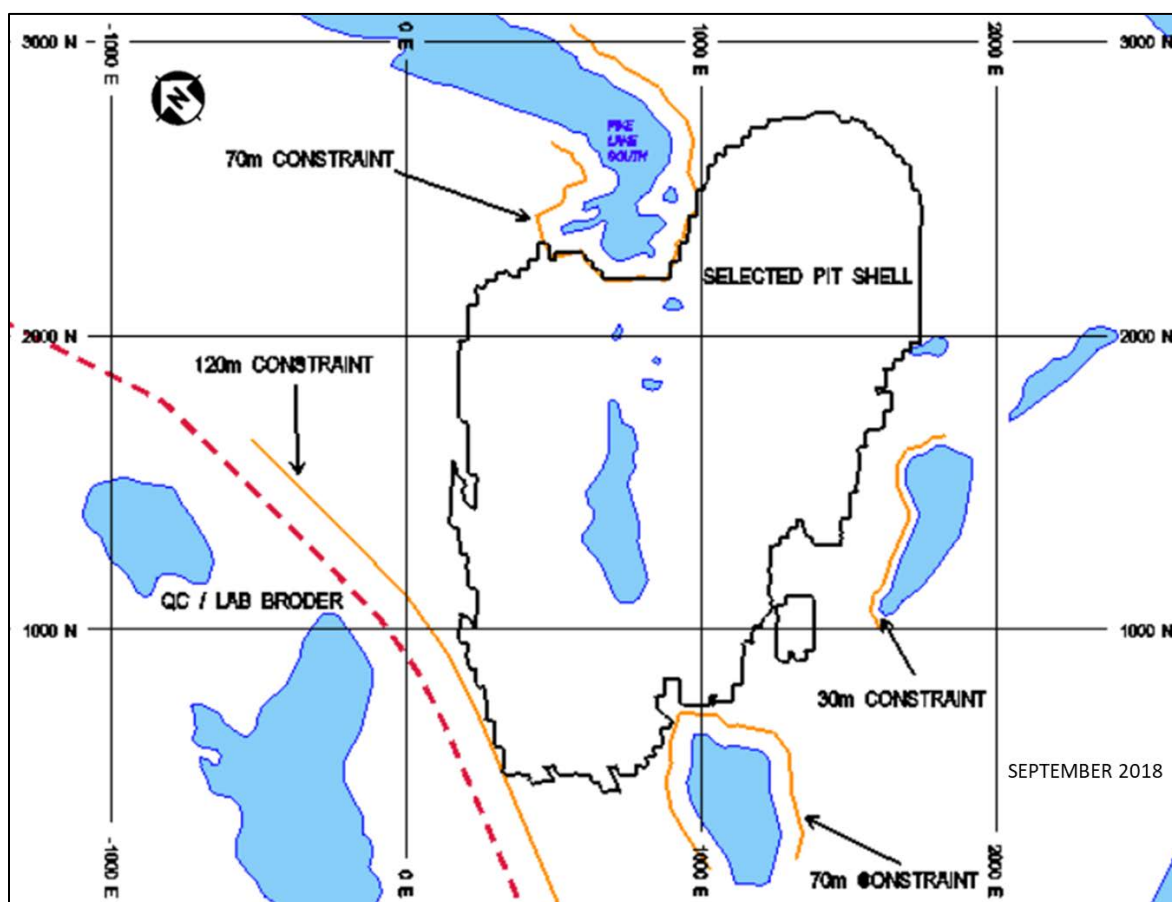


Figure 15-3: Surface Constraints for Pit Optimization

Using the cost, revenue, pit slope, operating parameters and surface constraints, a series of 49 pit shells were generated by varying the selling price (revenue factor ("RF")) from \$34/t to \$94/t of concentrate.

Once the series of pit shells were generated, sensitivities on net present value ("NPV"), total material moved, total Measured and Indicated Resources and stripping ratios were evaluated to identify the optimal pit, based on the discounted NPV, which was calculated at a rate of 10%. Figure 15-4 presents the results of the pit optimization analysis and Figure 15-5 presents various pit shells, run at different selling prices.

The pit that was selected to be used as the basis for the pit design is the \$48.1/t (RF=0.51). This pit includes 530 Mt of Measured and Indicated Resources at a diluted grade of 28.9% TFe and has a stripping ratio of 1.1 to 1.

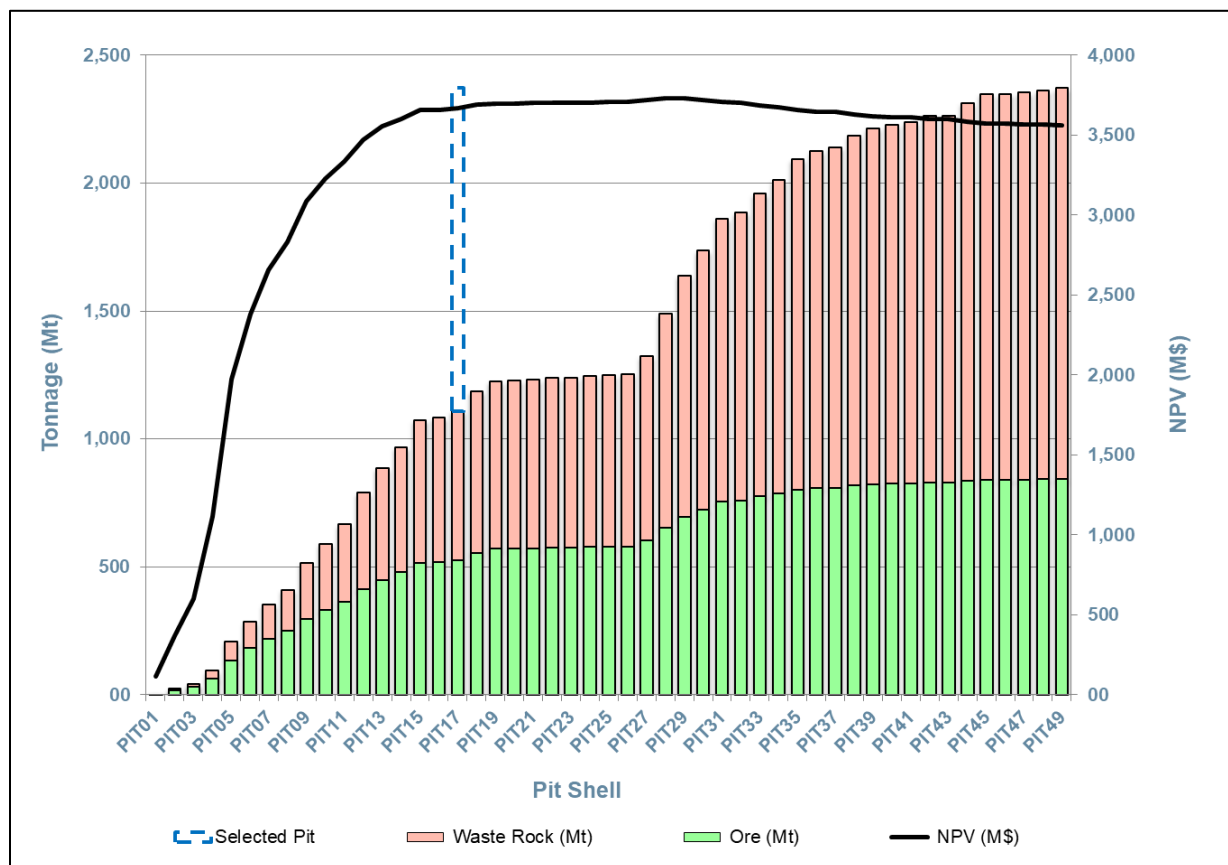


Figure 15-4: Pit Optimization Results

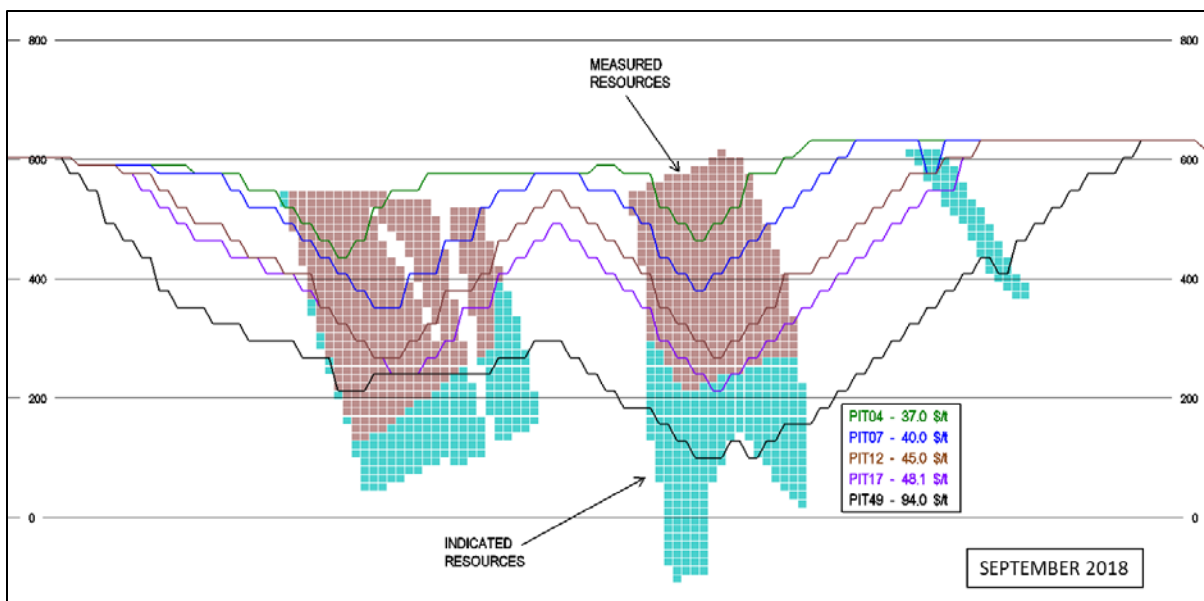


Figure 15-5: Pit Optimization Results (Section N1860 m)

15.4 Cut-off Grade

The break-even milling cut-off grade is used to classify the material within the pit limits as mill feed or waste rock. A break-even cut-off grade of 3% TFe has been calculated using the economic parameters from the pit optimization.

Table 15-5 presents an analysis of the Measured and Indicated Resources within the selected optimized pit shell and the TFe grade sensitivity to the cut-off grade. As can be seen, the Measured and Indicated Resources and TFe show very low sensitivity to cut-off grade variations between 3% and 15% TFe. Based on this analysis, the cut-off grade used for the Study was taken at 15% TFe. This selection benchmarks well with similar operations in the region. A higher mill cut-off grade should also contribute to optimizing Project NPV by generating a smaller pit shell with a lower strip ratio.

Table 15-5: Cut-off Grade Sensitivity

Cut-Off Grade (TFe%)	M+I Resources (Mt)	TFe% Grade
3	566	27.6
7	555	28.0
10	545	28.3
15	530	28.9

15.5 Engineered Pit Design

The engineered pit was designed using the optimized pit shell as a guide. Operational factors that are required for a mine are incorporated during the engineered pit design phase. These features include haulage ramps, safety berms, bench face angles and minimum operational widths.

The pit slope benching configuration recommendations were provided by Stantec for the overburden and bedrock. The overburden inter-ramp angle used for this Study is 17°. The bedrock angles vary depending on the different geotechnical zones, which are presented in Figure 15-6.

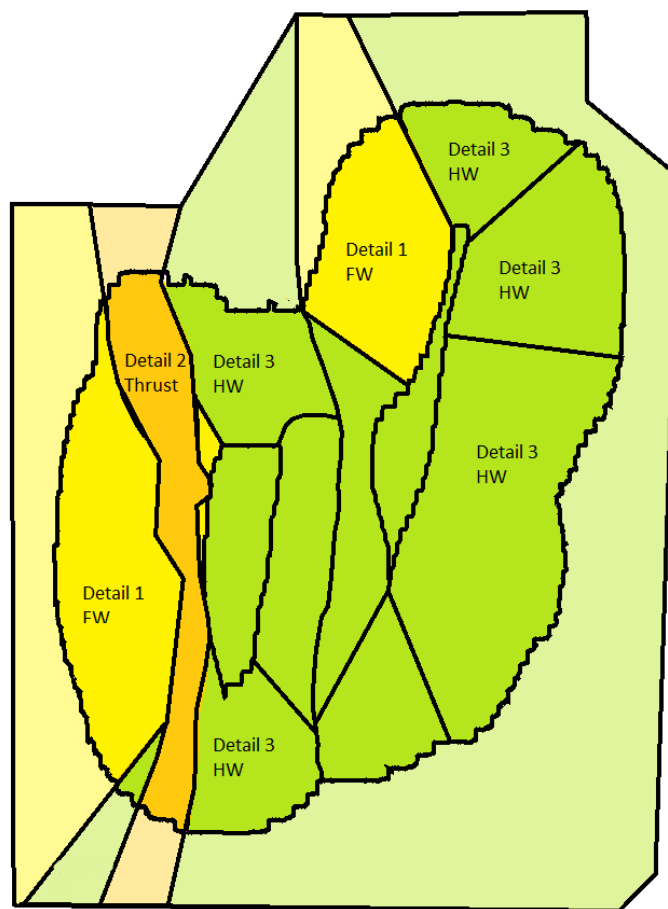


Figure 15-6: Slopes Sectors for Pit Optimization

The height of the blocks in the model is 14 m, which enabled BBA to design benches that coincide with the block height. Stantec recommends double benching in the more competent rock domains (i.e. the footwall and hanging wall domains). In the weaker thrust zone, stability and sloughing of material is a concern and therefore single benching is recommended. The deepest overburden thicknesses occur around the two larger lake zones to the north and south of the deposit. The overburden zone, like the weaker thrust domain, uses a single benching arrangement.

The width of the in-pit haulage ramp is 38 m to accommodate uninterrupted double lane traffic for the selected mine fleet. The final benches towards the bottom of the pit are designed with a ramp width of 25 m in order to reduce the stripping ratio. The maximum ramp gradient is 10%.

Table 15-6 presents the engineered pit design parameters.

Table 15-6: Engineered Pit Design Parameters

Description	Thrust Zone	Footwall	Hanging wall	Overburden
Inter-Ramp Angle	30	50	53.4	17
Bench Face Angle	40	70	75	22
Berm Width (m)	7.6	13.3	13.3	8
Bench Height (m)	14	14	14	10
Benching Arrangement	Single	Double	Double	Single

The pit access ramp of the final engineered pit design only traverses the hanging wall regions, as they are the most stable, with the steeper slopes. The ramp avoids the weaker thrust zone, and switchbacks through a central pillar region of the pit, in order to maintain stability and gain on mining recovery in the bottom of the pit.

Figure 15-7 presents a plan view of the Rose Pit, Figure 15-8 presents a typical section and Figure 15-9 presents a typical plan view in section.

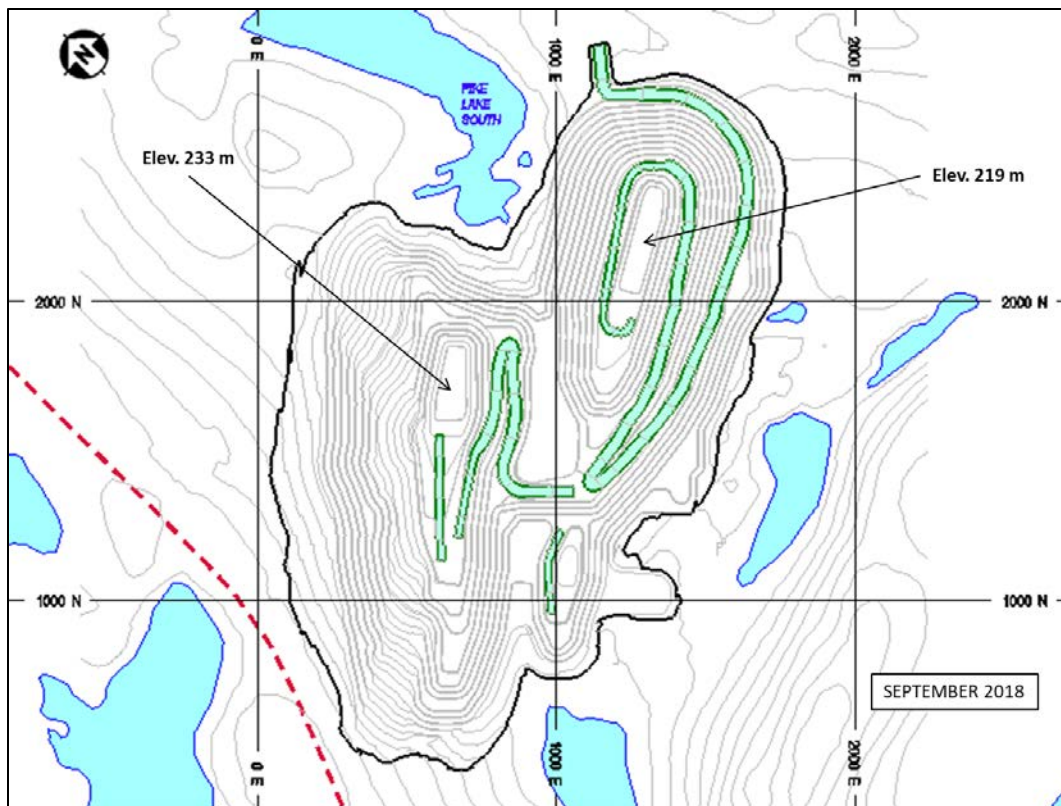


Figure 15-7: Engineered Pit Design Plan View

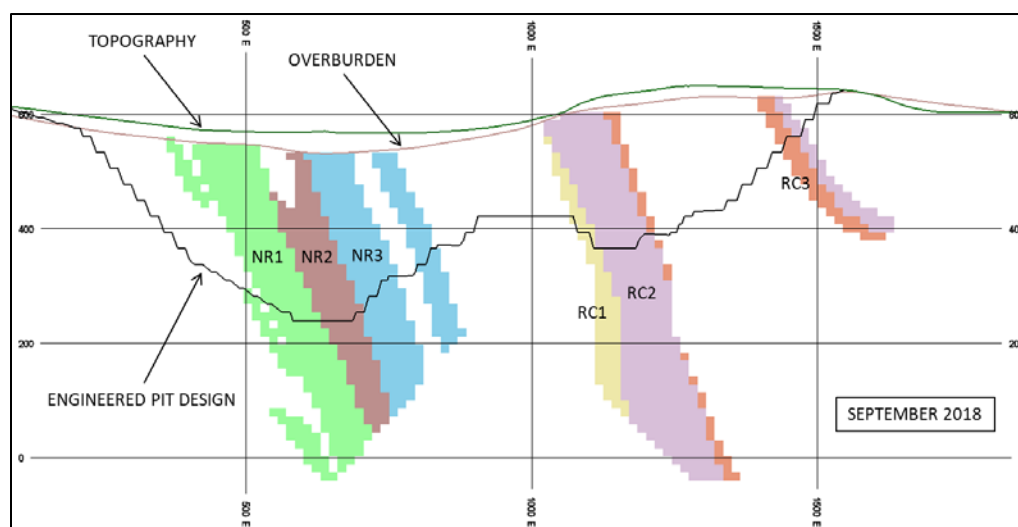


Figure 15-8: Engineered Pit Design Section View N1560 m

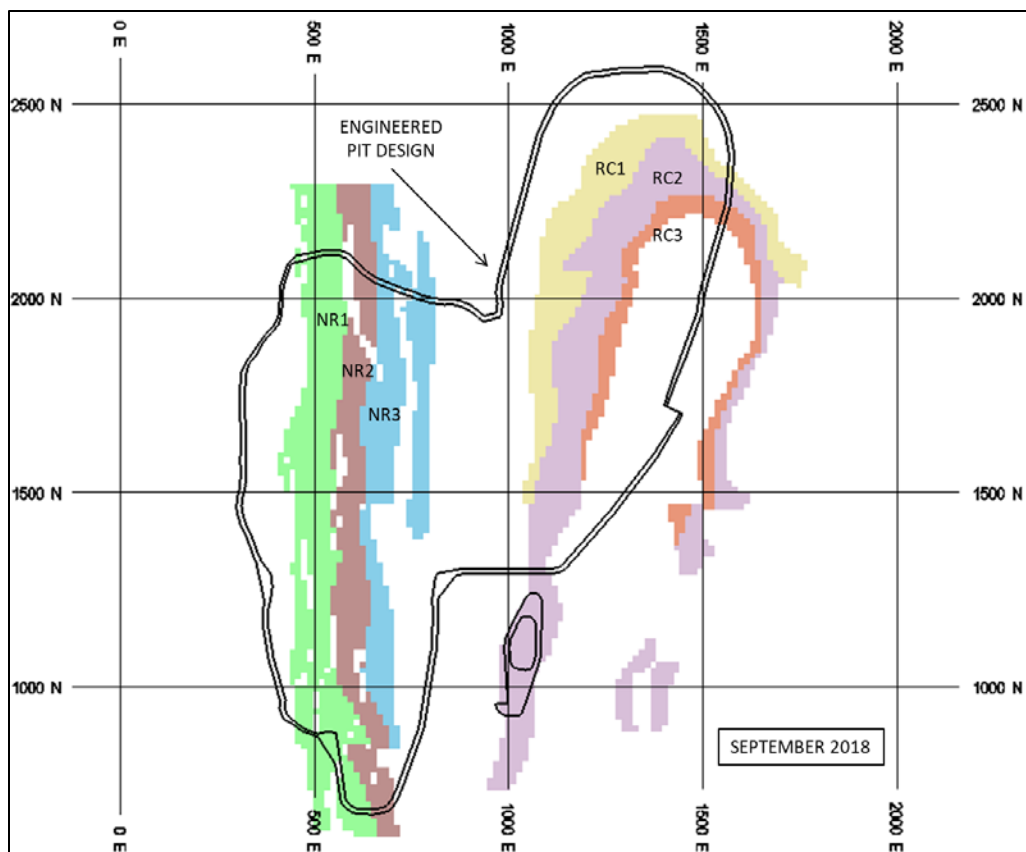


Figure 15-9: Engineered Pit Design Plan View z=450 m

15.5.1 Mineral Reserves

The Mineral Reserves for the Rose deposit that are inclusive of mining dilution and ore loss and are above a cut-off grade of 15% TFe are 392.7 Mt of Proven Mineral Reserves with an average grade of 29.0% TFe and 124.5 Mt of Probable Mineral Reserves with an average grade of 28.2% TFe. The total stripping to access these Mineral Reserves is 644.8 Mt, which includes 92.3 Mt of overburden, 52.9 Mt of material below the cut-off grade, 52.0 Mt of Inferred Mineral Resources, and 447.6 Mt of waste rock, resulting in a stripping ratio of 1.25 to 1. The reference point for the Mineral Reserves is the mill feed. Table 15-7 presents the Mineral Reserves and Table 15-8 presents the Mineral Reserves by rock type. These Mineral Reserves are included in the Mineral Resource estimate presented in Chapter 14 of this Report.

Table 15-7: Rose Deposit Mineral Reserves (Effective as of September 26, 2018)

Material	Tonnage (Mt)	TFe (%)	WREC (%)	MagFe (%)	Mag (%)	Mn (%)
Proven	392.7	29.0	34.7	15.0	20.8	1.20
Probable	124.5	28.2	32.0	11.1	15.3	1.07
Total Proven and Probable	517.2	28.8	34.1	14.1	19.4	1.17
Overburden	92.3					
Waste Rock	522.5					
Total Stripping	644.8					
Stripping Ratio	1.25					

Table 15-8: Rose Deposit Mineral Reserves by Rock Type

Material	Tonnage (Mt)	TFe (%)	WREC (%)	MagFe (%)	Mag (%)	Mn (%)
Proven						
NR-1	69.3	32.1	33	4.5	6.3	1.03
NR-2	71.0	28.4	36.9	18.6	25.6	0.74
NR-3	41.9	25.2	28	15.4	21.3	0.46
RC-1	32.8	29	36.5	7.8	10.8	2.87
RC-2	122.7	29.5	36.6	18.7	25.8	1.60
RC-3	55.1	27.5	33.7	19.6	27	0.72
Total Proven	392.7	29.0	34.7	15.0	20.8	1.20
Probable						
NR-1	47.8	30.8	31.7	3.3	4.6	1.20
NR-2	10.3	26.6	34.5	8.7	11.9	0.28
NR-3	23.4	24.7	27.5	15.5	21.3	0.45
RC-1	5.0	28.1	35.3	10.2	12.4	2.57
RC-2	24.2	27.8	34.5	19	26.2	1.63
RC-3	13.8	27.2	33.4	19.2	26.5	0.73
Total Probable	124.5	28.2	32.0	11.1	15.3	1.07
Total Proven and Probable	517.2	28.8	34.1	14.1	19.4	1.17

16. MINING METHOD

16.1 Mining Methodology

The Kami Project will be operated using conventional open pit mining methods (drill, blast, load & haul) using an owner operated fleet. The mining sequence will begin with tree clearing and grubbing followed by the removal of the topsoil that will be hauled to a stockpile where it will be used for future reclamation activities. Overburden will be removed with the fleet of shovels and trucks and hauled to the overburden stockpile. Pre-stripping overburden removal will be contracted out. Ore and waste will be drilled and blasted on 14 m benches and loaded into the fleet of haul trucks with the hydraulic excavators. The majority of the waste rock will be hauled to waste rock pile and a certain amount will be hauled to the tailings management facility ("TMF") to be used for dam construction. The ore will either be hauled directly to the primary crusher or to the ore stockpile. Mining operations will be conducted on a 24 hour basis, 7 days per week and 52 weeks per year.

16.1.1 Phase Designs

A series of mining phases (pushbacks) have been designed for the Kami deposit with the objective of developing a mining strategy that minimizes early strip ratios and maximizes weight recovery. This, in turn, maximizes discounted cash flow generated by operations.

The pit optimization analysis identified that starting operations in the RC region of the deposit would provide the best conditions for minimizing the stripping ratio in the early years, while generating favourable rock type proportions that maximize processing throughput and the production of iron concentrate.

A total of eight phases have been designed, which consider a minimum mining width of 80 m between phases and use the same operational parameters used for the engineered pit design described earlier in this Report. Three phases have been designed in the RC region, two in the NR region, followed by a phase that combines both areas and then a phase that mines the bottom portion of the RC region and a phase that mines the bottom portion of the NR region.

Figure 16-1 presents the phases in a plan view and Figure 16-2 presents a typical section through the deposit showing the eight phases. Table 16-1 presents the Mineral Reserves for each phase.

Table 16-1: Mineral Reserves by Phase

Phase	Ore (Mt)	TFe (%)	WREC (%)	Waste (Mt)	Strip Ratio
RC - Phase 1	5.0	27.8	34.4	5.7	1.15
RC - Phase 2	25.6	28.7	35.6	23.5	0.92
RC - Phase 3	70.4	28.9	35.9	80.5	1.14
NR - Phase 1	14.2	28.0	31.7	20.2	1.42
NR - Phase 2	66.3	28.8	32.6	62.1	0.94
Common Phase	155.8	28.3	33.0	396.6	2.55
RC - Phase 4	96.2	29.2	33.4	30.0	0.31
NR - Phase 3	83.7	29.2	36.2	26.3	0.31
Total	517.2	28.8	34.1	644.8	1.25

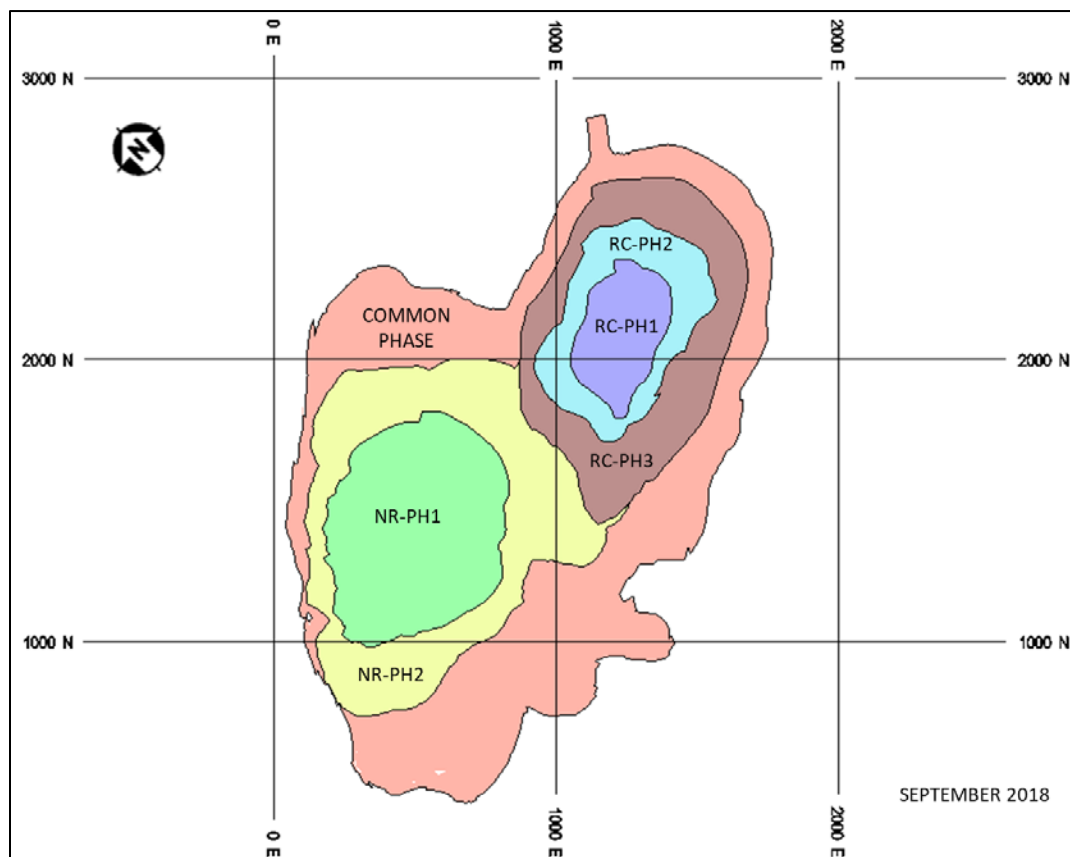


Figure 16-1: Phase Design (Plan View)

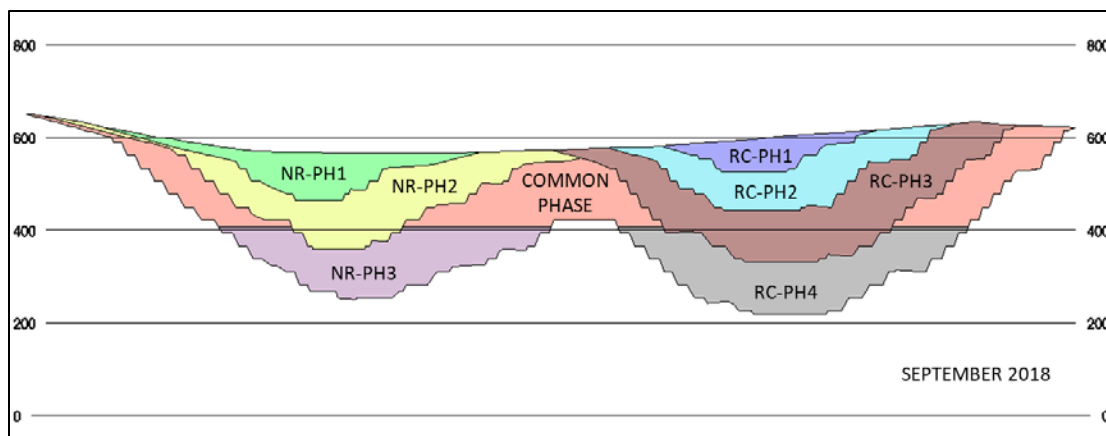


Figure 16-2: Phase Design (Typical Section)

16.2 Waste Rock Pile Design

An overburden stockpile and a waste rock pile have been designed for the Kami Project with adequate capacity to contain the quantities of material that will be generated during the life of the mine. The locations of the overburden and waste rock stockpiles require that Kami LP obtains surface land rights to accommodate the required footprint for each.

The design of the overburden stockpile considers an overburden density of 2.35 t/m^3 , a swell factor of 1.2 and a compaction factor of 1.1. The design of the waste rock pile considers a waste rock density of 2.83 t/m^3 , a swell factor of 1.34 and a compaction factor of 1.1.

The overburden and waste rock stockpiles were designed according to the geotechnical specifications presented in Table 16-2. The arrangements of the piles around the open pit are presented in Figure 16-3. The overburden stockpile has a capacity of 45 Mm^3 , a footprint area of 127 ha, and reaches an elevation of 695 m. The maximum height of the waste rock pile design is 100 m. The waste rock pile has a capacity of 210 Mm^3 , a footprint area of 554 ha, and reaches an elevation of 665 m. The maximum height of the waste rock pile design is 100 m. It should be noted that throughout the mine life 34.5 Mt of waste rock will be used for construction at the tailings management facility.

Table 16-2: Stockpile Design Parameters

Description	Unit	Overburden	Waste Rock
Lift Height	m	10	20
Bench Face Angle	deg	30.0	38.7
Berm Width	m	10	10
Overall Slope	deg	20.0	29.8

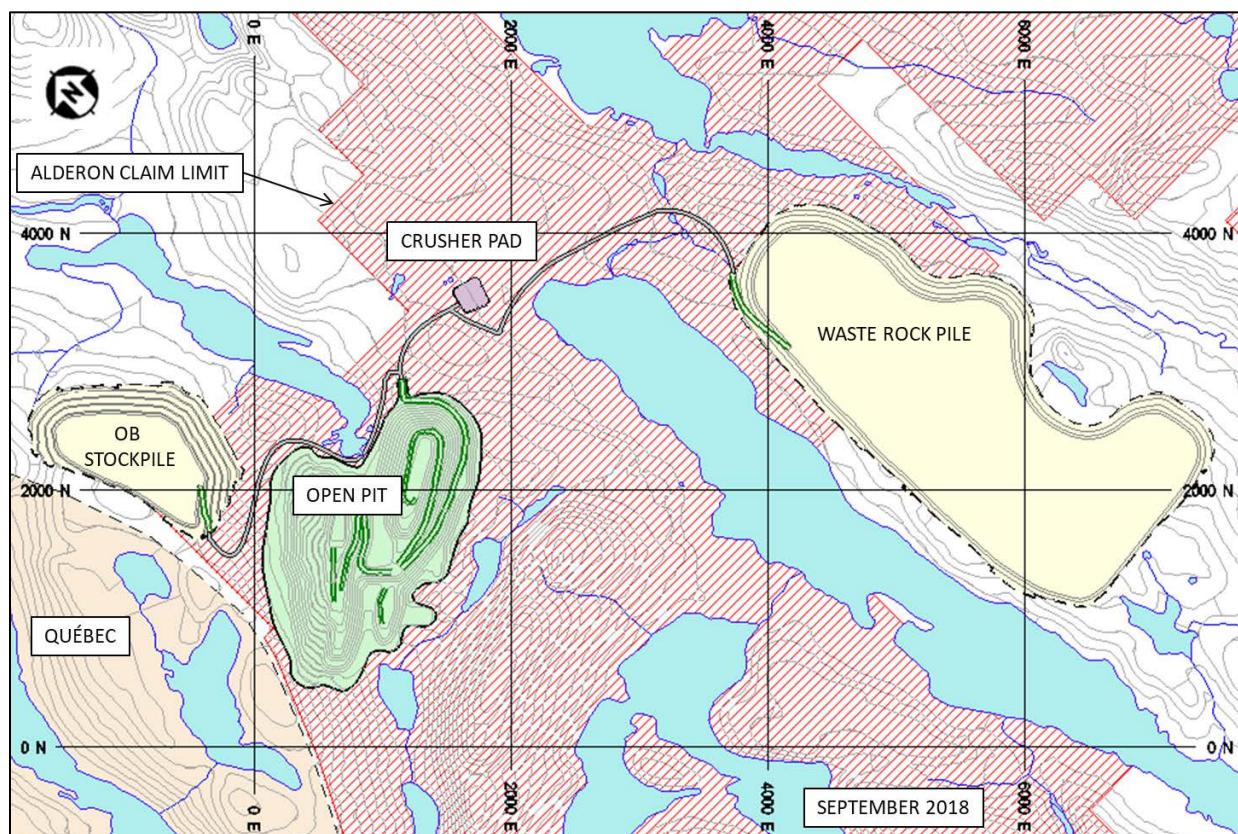


Figure 16-3: Stockpile Layout

16.3 Mine Production Schedule

A mine production schedule was prepared annually for the entire mine life using the MineSight Schedule Optimizer (“MSSO”) with the objective of maximizing the NPV of the Project. The following mine planning constraints were considered in MSSO:

- Maximum of 7,972 plant operating hours per year (91% utilization);
- Maximum total material movement of 80 Mt per year;
- Maximum plant capacity of 25.1 Mt of mill feed per year;
- Mill throughput limited to 18.5 Mt in ramp-up Year 1;
- The vertical advance rate has been capped at 7 x 14 m benches per year per phase (or 98 m vertical advance per year).

To achieve an optimal blending strategy that maximizes the overall NPV and plant utilization, the time in hours to process each block according to its rock type was also coded into the block model. The throughput by rock type is presented in Table 16-3. These throughputs were calculated based on rock hardness determined from the testwork performed during the 2012 FS and the power available for the AG mill.

Table 16-3: Mill Targeted Throughput Design per Rock Type

Rock Type	t/h
RC-1	2,911
RC-2	2,926
RC-3	2,799
NR-1	2,982
NR-2	2,952
NR-3	2,616

A pre-production period of one year is assumed to develop the open pit, construct the haul road network and build the starter dyke for the tailings management facility. During this period, 9.7 Mt of overburden will be stripped, 9.1 Mt of waste rock will be mined and 2.2 Mt of ore will be stockpiled close to the crusher pad. The overburden in pre-production will be removed by a contractor while the ore and waste will be mined using Kami LP’s fleet of equipment. The majority of the waste rock mined in pre-production will be hauled to the tailings management facility, and for fleet calculations and costing it has been assumed that the placement of the waste rock on the dyke will be done by a contractor. It should be noted that the waste rock

quantity mined in pre-production and in the first two years of operation has been aligned with requirements to build the TMF dykes. Without this constraint, less waste rock would be required to be excavated during the first few years and the mine plan can be optimized further.

Mining activities will begin in both the RC and NR regions but the entirety of ore in the first year of production will come from RC. During Year 2, ore mining will be split roughly between the two regions and in Year 3 ore mining will be limited to NR. Both areas will be mined concurrently during the remaining years of the operation.

The total run of mine material mined will gradually ramp up from 21 Mt in pre-production, peaking at 80 Mt in Year 12. During the life of the mine, a total of 27.9 Mt of mostly lower grade ore will be hauled to the stockpile and re-handled throughout the operation. In the last year of operations, approximately 60% of the mill feed will come from the ore stockpile.

Table 16-4 presents a summary of the mine production schedule and Table 16-5 presents the mill feed by rock type.

Figure 16-4, Figure 16-5, Figure 16-6, and Figure 16-7, present various charts relating to the mine production schedule. Figure 16-8 to Figure 16-12 present end of period maps showing the advance of the open pit throughout the mine life.

Table 16-4: Mine Production Schedule

Description	Units	PP	Year 01	Year 02	Year 03	Year 04	Year 05	Year 06	Year 07	Year 08	Year 09	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Total
Total Ore Milled	t	0.0	18.5	23.2	23.0	23.0	23.3	23.0	23.0	23.2	22.9	23.1	23.1	23.2	23.0	23.0	22.9	22.8	22.9	23.1	22.9	22.6	22.8	23.1	15.6	517.2
Grade Milled (MagFe)	%	0.0	19.5	13.5	9.0	10.5	14.5	17.6	16.7	15.0	12.7	12.5	11.5	12.1	16.4	9.8	17.8	17.0	12.8	16.6	12.9	13.3	14.1	14.2	15.7	14.1
Grade Milled (TFe)	%	0.0	28.1	28.8	29.0	29.7	29.5	28.7	28.6	29.1	27.2	27.6	28.0	29.0	28.9	29.3	29.1	29.0	29.1	29.7	29.3	29.0	29.0	29.7	25.6	28.8
Weight Recovery	%	0.0	34.8	34.1	32.3	33.5	35.0	35.6	35.4	35.8	32.1	32.3	32.3	33.6	34.6	33.1	36.0	35.8	34.5	36.9	33.8	32.9	33.5	34.4	29.6	34.1
Concentrate Produced	t	0.0	6.4	7.9	7.4	7.7	8.2	8.2	8.1	8.3	7.4	7.4	7.5	7.8	8.0	7.6	8.2	8.2	7.9	8.5	7.7	7.4	7.6	7.9	4.6	176.1
ROM to Mill	t	0.0	17.3	22.6	22.7	23.0	23.3	23.0	22.2	23.0	18.9	19.1	21.2	23.2	23.0	23.0	22.9	22.8	22.9	23.1	21.5	22.6	21.4	21.2	5.6	489.2
ROM to Stockpile	t	2.2	0.0	0.5	1.0	2.5	2.5	2.0	2.0	0.3	0.0	1.0	1.0	2.0	2.0	2.0	1.8	0.0	0.1	0.0	0.6	0.3	2.0	2.0	0.0	27.9
Stockpile to Mill	t	0.0	1.2	0.5	0.3	0.1	0.0	0.0	0.7	0.2	4.0	4.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	1.5	2.0	10.0	27.9
Waste Rock	t	9.1	14.6	4.0	20.9	25.3	29.6	34.1	39.2	34.6	40.4	50.3	53.7	54.6	44.1	33.5	21.3	7.6	10.1	1.5	8.9	9.6	4.7	0.9	0.0	552.6
Overburden	t	9.7	4.9	20.4	12.1	4.1	4.8	0.9	5.3	11.9	16.7	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	92.3
Total Material Moved	t	21.0	38.0	48.0	57.0	55.0	60.2	60.0	69.4	70.0	80.0	75.9	77.9	79.7	69.1	58.5	46.0	30.5	33.0	24.6	32.4	32.5	29.5	26.0	15.6	1,189.9
Total ROM Mined	t	21.0	36.8	47.5	56.7	54.9	60.2	60.0	68.7	69.8	76.0	71.9	75.9	79.7	69.1	58.5	46.0	30.5	33.0	24.6	31.0	32.5	28.1	24.0	5.6	1,162.0
Stripping Ratio		8.49	1.13	1.05	1.39	1.16	1.33	1.40	1.83	1.99	3.01	2.58	2.42	2.17	1.77	1.34	0.86	0.34	0.44	0.07	0.41	0.42	0.20	0.04	0.01	1.25

Table 16-5: Mill Feed by Rock Type (Mt)

Year	RC-1	RC-2	RC-3	NR-1	NR-2	NR-3	Total
Year 01	2.2	8.8	7.5	0.0	0.0	0.0	18.5
Year 02	1.2	7.6	3.2	6.1	3.8	1.2	23.2
Year 03	0.0	0.3	0.0	11.8	5.8	5.1	23.0
Year 04	0.2	0.3	0.3	10.6	7.2	4.4	23.0
Year 05	1.6	4.5	1.7	6.8	7.7	1.1	23.3
Year 06	4.1	10.1	7.1	0.2	1.5	0.0	23.0
Year 07	4.2	11.8	6.4	0.2	0.0	0.4	23.0
Year 08	4.7	14.7	2.6	1.1	0.0	0.1	23.2
Year 09	1.9	10.6	0.9	4.4	1.1	4.0	22.9
Year 10	0.9	7.5	3.5	6.5	2.5	2.1	23.1
Year 11	0.4	7.3	1.2	8.1	3.4	2.6	23.1
Year 12	0.8	6.5	1.2	8.1	4.1	2.4	23.2
Year 13	1.4	10.0	3.4	3.3	2.4	2.4	23.0
Year 14	0.1	1.5	0.8	10.1	5.8	4.6	23.0
Year 15	3.9	10.4	8.6	0.1	0.0	0.0	22.9
Year 16	3.2	8.9	10.4	0.3	0.0	0.0	22.8
Year 17	2.5	5.5	2.9	4.8	3.6	3.6	22.9
Year 18	3.2	14.9	4.9	0.0	0.0	0.0	23.1
Year 19	1.1	5.3	0.6	7.4	3.7	4.8	22.9
Year 20	0.0	0.0	0.0	8.2	6.6	7.8	22.6
Year 21	0.0	0.0	0.0	7.7	8.9	6.2	22.8
Year 22	0.0	0.0	0.0	9.3	10.1	3.8	23.1
Year 23	0.0	0.4	1.5	1.9	3.1	8.6	15.6
Total	37.8	146.9	68.9	117.0	81.4	65.2	517.2

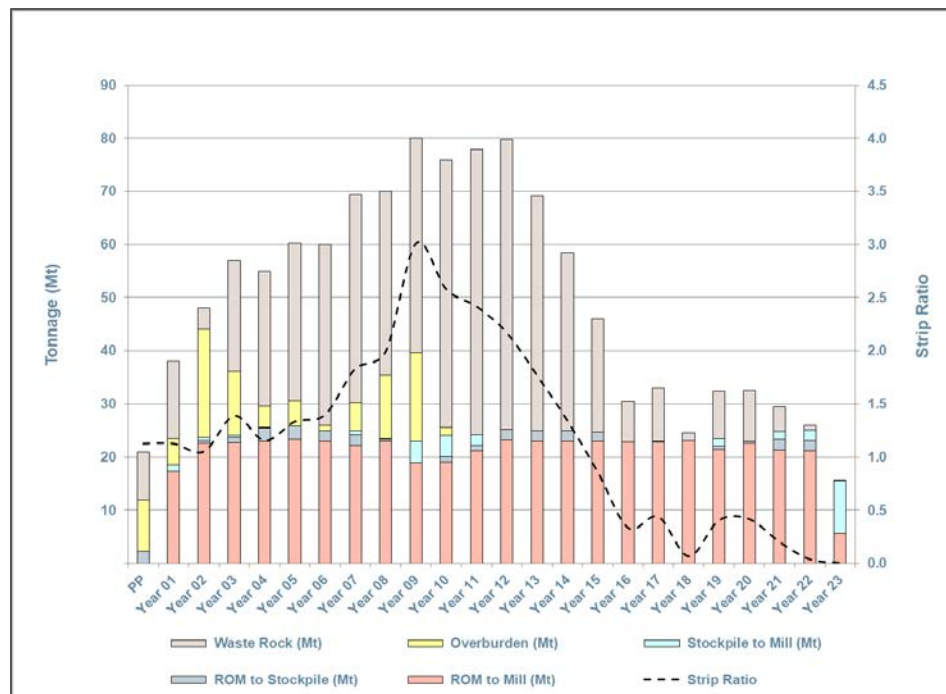


Figure 16-4: Total Material Movement

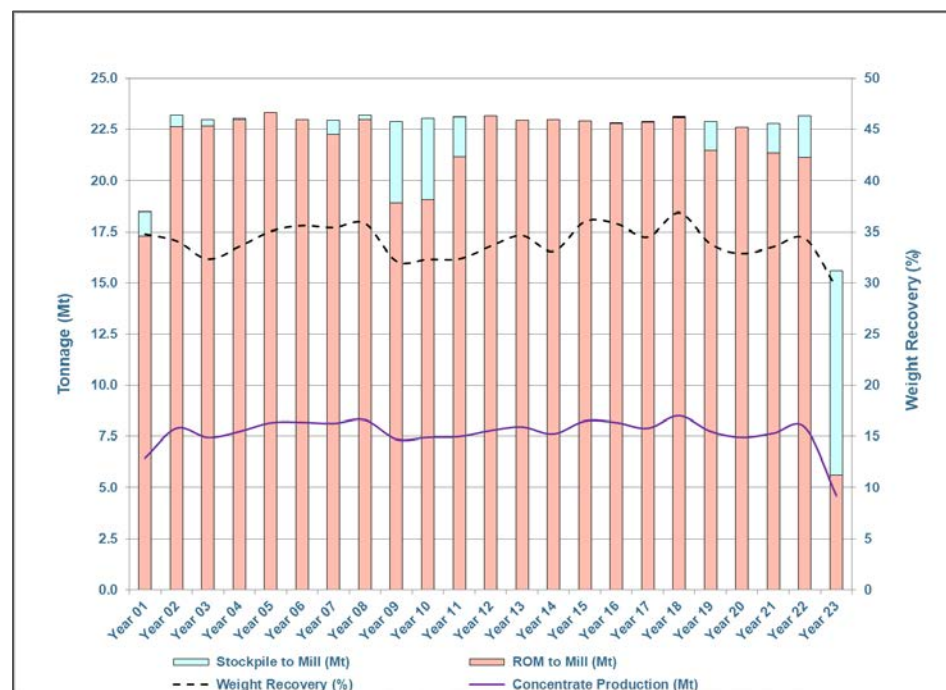


Figure 16-5: Mill Feed

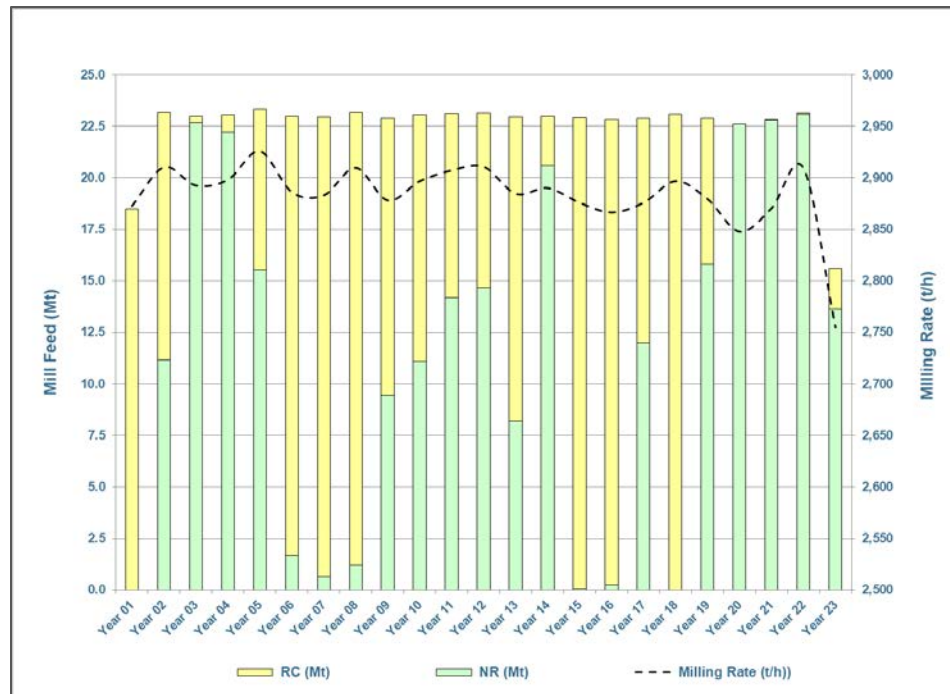


Figure 16-6: Mill Feed by Region

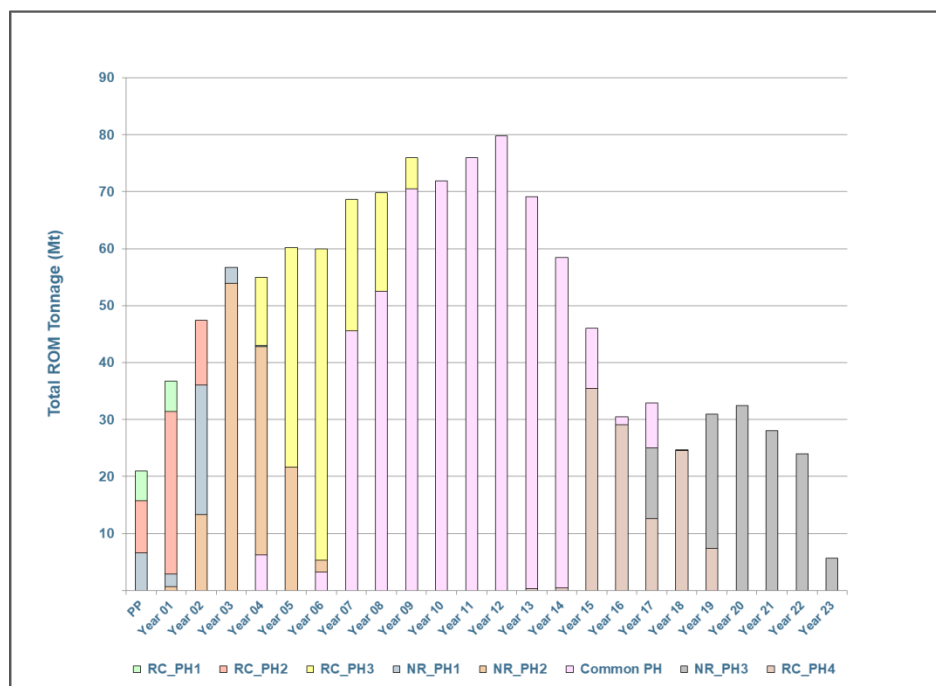


Figure 16-7: Material Mined Phase

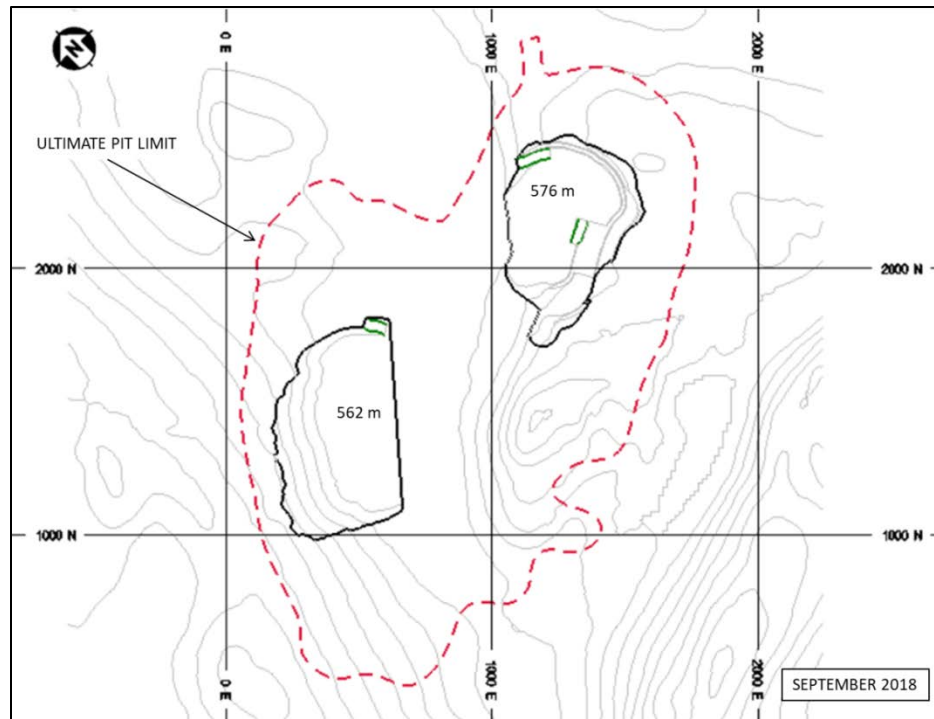


Figure 16-8: End of Pre-production

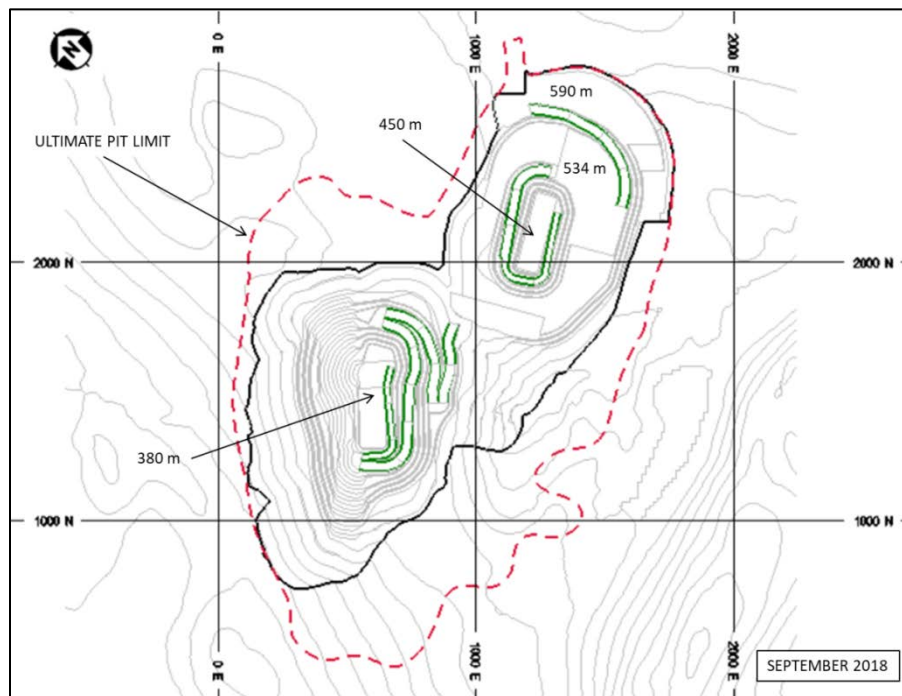


Figure 16-9: End of Year 5

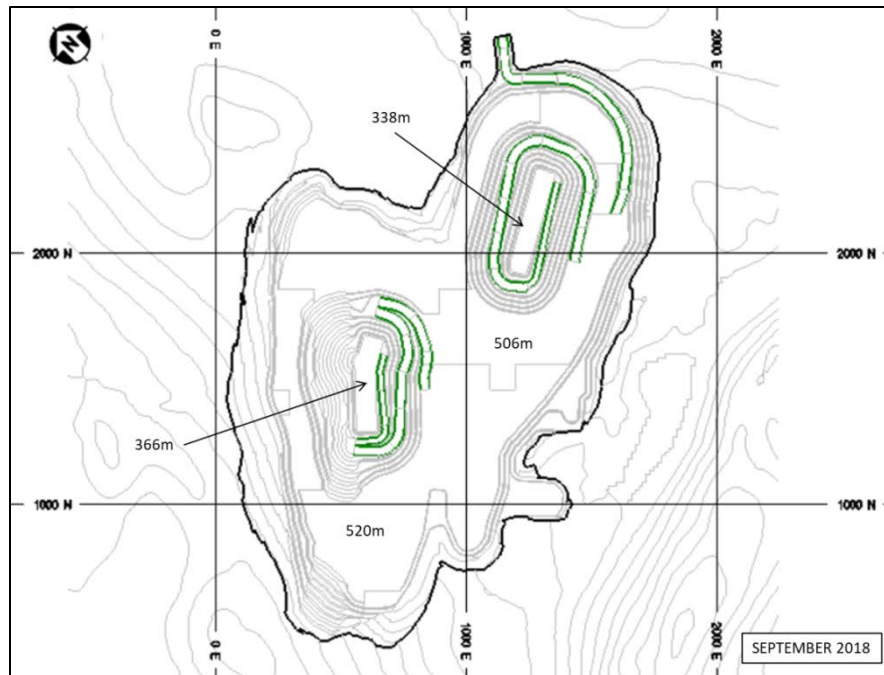


Figure 16-10: End of Year 10

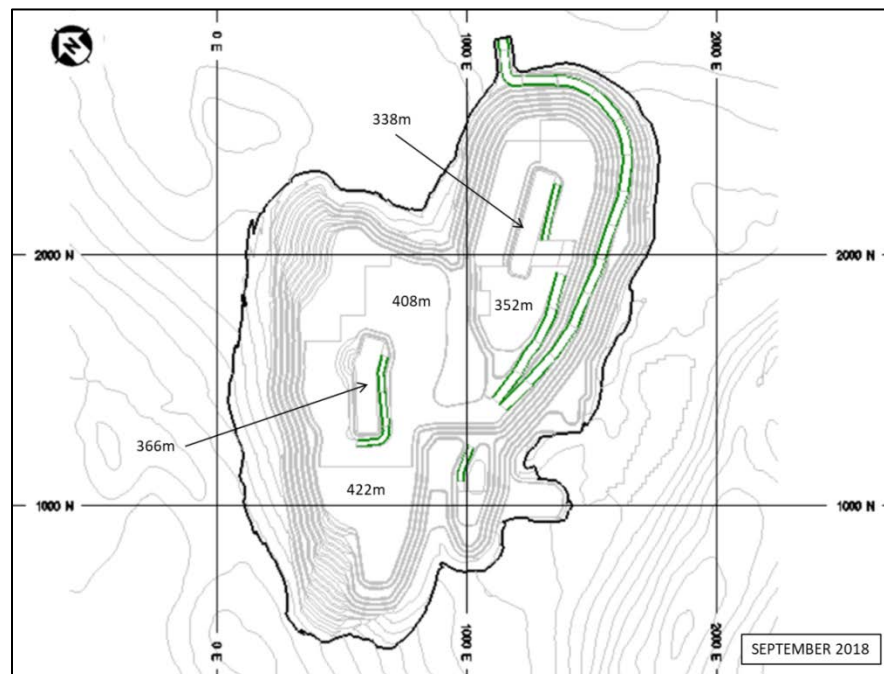


Figure 16-11: End of Year 15

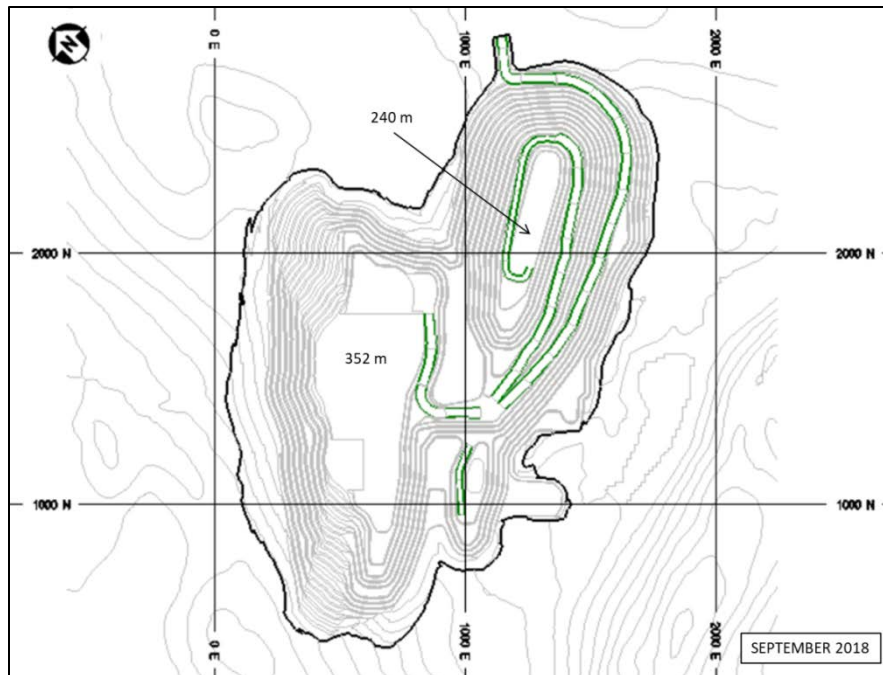


Figure 16-12: End of Year 20

16.4 Mining Equipment

The following section discusses equipment selection and fleet requirements in order to carry out the mine plan. Table 16-6 presents the list of equipment required during peak production. The table identifies the Caterpillar equivalent or other well-known models to give the reader an appreciation of the size of each machine although the specific equipment selection will be done in the next phase of the Project.

Table 16-6: Mine Equipment Fleet

Equipment	Typical Model	Description	Unit
Haul Truck	CAT 794	Payload – 292 t	23
Hydraulic Shovel	CAT 6060FS	Bucket Payload – 61 t	3
Wheel Loader	CAT 994	Bucket Payload – 38 t	1
Production Drill	CAT MD6640	Operating Weight – 157 t	4
Pre-split Drill	FlexiROC D65		1
Track Dozer	CAT D11T	Operating Weight – 105 t	3
Wheel Dozer	CAT 844	Operating Weight – 71 t	1
Road Grader	CAT 16M	Operating Weight – 28 t	4
Utility Excavator	CAT 336	Operating Weight – 40 t	1
Water Truck	CAT 777	90,000 litre tank	2
Cable Reeler	CAT 966	Operating Weight – 24 t	2
Utility Loader	CAT 988	Operating Weight – 50 t	2
Backhoe Excavator	CAT 430	Operating Weight – 9 t	1
Mechanic Service Truck			4
Tire Handler			1
Aggregate Plant			1
Fuel Truck			1
Lowbed Truck			1
Small Crane			1
Boom Truck			1
Lighting Plant			10
Light Vehicle			12
Transport Bus			3
Dewatering Pumps			4

16.4.1 Haul Trucks

The haul truck selected for the Project is a rigid frame mining truck with a payload of 292 tonnes. A fleet of five trucks is required in pre-production, followed by seven in Year 1, nine in Year 2 and ramps up gradually until reaching a peak of 23 between Years 10 and 12, after which the truck requirements gradually decline. The fleet size was estimated using the following parameters, resulting in 5,872 working hours per year for each truck as is presented in Table 16-7.

- Mechanical availability – Averages 87% but varies by year as the fleet ages;
- Use of availability – 96.5% (25 minutes of standby time per shift);
- Nominal payload – 292 tonnes;
- Shift schedule – 12 hours per shift, two shifts per day, 360 days per year (five days of major weather delays have been considered per year);
- Operational delays – 85 min/shift (this accounts for shift change, coffee and lunch breaks, and refuelling);
- Job efficiency – 92% (accounts for queuing at the shovel and other delays);
- Rolling resistance – 3%;
- Maximum speed limit – 50 km/h.

Table 16-7: Truck Hours (h/y)

Description	Hour	Detail
Total Hours	8,760	365 d/y, 7 d/w, 24 h/d
Hours Down Mechanically	1,139	87% availability
Available Hours	7,621	Total hours minus hours down mechanically
Standby Hours	265	25 minutes per shift
Gross Operating Hours	7,357	Available hours minus standby hours
Operating Delay Hours	974	85 minutes per shift + Weather delays
Net Operating Hours	6,382	Gross operating hours minus delays
Working Hours	5,872	Accounts for 92% Job Efficiency

To calculate the truck requirements, haul routes were generated for each material type, for each phase and for each period of the mine plan. These haul routes were imported in Talpac[®], a commercially available truck simulation software package that BBA has validated with mining operations. Talpac[®] calculated the travel time required for a 292 tonne haul truck to complete each route. Table 16-8 shows the various components of a truck's cycle time. The load time is calculated using an excavator with a 61-t bucket payload as the loading unit. This sized excavator, which is discussed in the following section, can load a 292 tonne haul truck in five passes. Due to the low density of the overburden, BBA recommends to install sideboards on trucks that will haul overburden in order to increase the volume capacity and allow payloads nearing the 292 tonnes capacity. Similarly, the overburden shovel should be equipped with a larger sized bucket.

Table 16-8: Truck Cycle Time

Activity	Duration (sec)
Spot @ Shovel	42
Load Time ⁽¹⁾	180
Travel Time	Calculated by Talpac [®]
Dump Time	42

⁽¹⁾ Five passes at 30 sec/pass minus the first bucket.

Haul productivities were calculated for each haul route using the truck payloads and cycle times. Table 16-9 shows the cycle times and productivities for the overburden, ore and waste haul routes for Year 5 as an example.

Table 16-9: Truck Productivities (Year 5)

Material	Cycle Times (min)					Productivity	
	Travel	Spot	Load	Dump	Total	(Load/h)	(t/h)
Overburden	16.98	0.70	3.00	0.70	21.38	2.81	787
Ore	17.18	0.70	3.00	0.70	21.58	2.78	812
Waste	20.13	0.70	3.00	0.70	24.53	2.45	714

Truck hour requirements were then calculated by applying the tonnages hauled to the productivity for each haul route. The truck productivities have been reduced by 50% during pre-production to account for conditions that typically arise at the start of new operations. Figure 16-13 presents the truck requirements by year as well as the truck productivities and total run of mine material hauled by year.

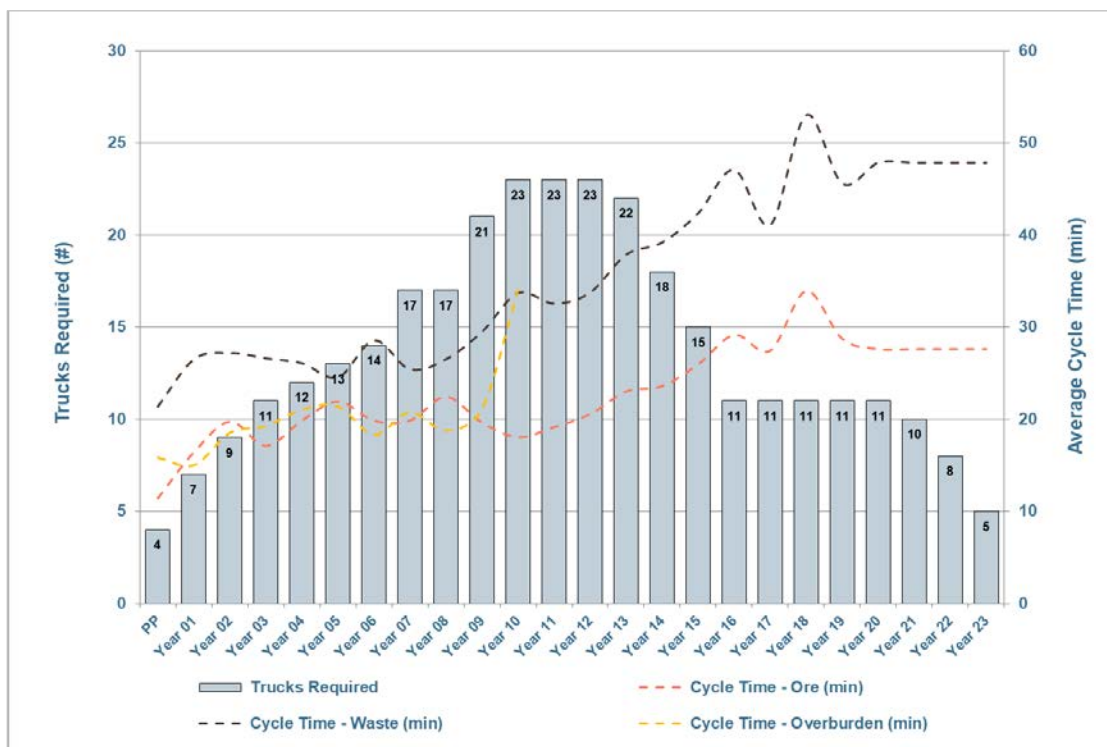


Figure 16-13: Truck Requirements and Productivities

The one-way haul distance for overburden during the life of mine averages 3.2 km, 3.8 km for ore and 7.5 km for waste rock.

16.4.2 Excavators

The loading machine selected for the Project is an electric powered hydraulic shovel with an operating weight in the 300-tonne class, capable of digging 61 t per bucket load. This size shovel should typically load the haul trucks in five passes. Using an 85% mechanical availability, 50 minutes per shift in operating delays, and 100 minutes per shift in standby delays, it was estimated that three shovels are required to manage the tonnages of overburden, ore and waste rock in the mine plan.

A large wheel loader is also included in the fleet primarily for re-handling from the ore stockpile but it will also be used as an alternate loading machine in the pit. The loader will have a bucket capacity of 38 tonnes.

16.4.3 Drilling and Blasting

The drill and blast design for the Study was selected by BBA in collaboration with explosive vendors familiar with this type of operation and benchmarking in the region. The general guiding principle for blast design is based on having a greater powder factor in ore to achieve optimal fragmentation. This is less important for waste and therefore a lower powder factor is used. The selected electric powered rotary drill model is configured to drill 311 mm (12¼") diameter blastholes. The drill was also chosen due to its performance in similar operations.

Using a mechanical availability of 86%, 55 minutes per shift in operating delays and 150 minutes per shift in standby delays, it was estimated that one drill will be required in pre-production, followed by two in Year 1, three in Year 3 and a fourth drill from Year 7 to 12. The drilling calculation is based on a penetration rate of 30 m/h and a re-drill percentage of 10%.

The supply of explosives and blasting services will be outsourced locally. The contractor will be responsible for delivering, mixing and loading the drillholes. As such, a list of services and materials was provided by a local vendor and was used for developing the design and costing for blasting. Kami LP personnel will be responsible for detonation. The contractor will have an explosives magazine on site to store the blasting accessories.

The explosive type will be 100% bulk emulsion with average explosive energy of 1.20 g/cm³. Electronic detonators will be used to provide consistent blasts. Bulk emulsion was selected because it is easily transported and has a lower environmental impact than other types of explosives, resulting in lower ammonium nitrate levels emitted into the watershed.

Explosive requirements average 16.4 million kg per year and peak at 28.8 million kg in Year 12. This represents a total of approximately 550,000 kg per week during peak production.

Final pit walls will need to be pre-split to achieve more accuracy in reaching the final design and to provide a more stable wall. A down-the-hole ("DTH") air track drill has been included in the fleet for pre-splitting. Table 16-10 presents the drilling and blasting parameters that have been used for the feasibility study.

Table 16-10: Drilling and Blasting Parameters

Description	Unit	Ore	Waste
Explosive Density	g/cm ³	1.20	1.20
Bench Height	m	14	14
Blasthole Diameter	mm	311	311
Burden	m	7.5	9.0
Spacing	m	7.5	8.5
Sub-drilling	m	1.5	1.5
Stemming	m	4.0	4.0
Powder Factor	kg/m³	0.39	0.35

16.4.4 Auxiliary Equipment

A fleet of support equipment including track dozers, wheel dozers, road graders, water trucks, cable reelers, utility loaders and excavators has been included in the fleet. The fleet also includes service equipment such as fuel trucks, mechanic service trucks, a boom truck, a mobile crane, pick-up trucks, transport buses, lighting plants, and a low boy to transport the tracked equipment. An aggregate plant has also been included to produce the crushed rock required for road maintenance and the stemming required for the blastholes.

16.5 Operations Management

Kami LP's mining operation management philosophy is to build an organization that would recruit skilled employees with the experience to manage, operate and maintain the mining equipment fleet and achieve operational performance at, or better than, industry standards. Kami mining activities are designed for continuous operations and as such, maintenance and operations personnel and crews will be scheduled accordingly.

As was described in Chapter 13 of this Report, ore hardness control is critical to optimize ore processing operations. An adequate ore blending strategy incorporated within the mining operation is therefore necessary. This is achieved by identifying and stockpiling "hard ore" for subsequent blending with "soft ore", according to procedures and guidelines established. To support this strategy, mining operations include contracted services for planned infill drilling, sampling and hardness testing. Costs associated with these services are included in the mine operating costs discussed in Chapter 21 of this Report.

Mine dewatering has not been developed to any detail in this Study. An allowance has been made for personnel and costs associated with mine dewatering and mine water management.

16.6 Workforce

Manpower requirements to support mining operations and maintenance for the mine area have been estimated annually and reach a peak of 326 employees in Year 12. Table 16-11 presents the workforce during Year 12. Salaried personnel requirements were based on other similar operations and were validated with Kami LP management based on their experience. Annual hourly operations and maintenance personnel requirements were estimated based on operational requirements as well as equipment vendor data. The operations team is responsible for achieving production targets in a safe and efficient manner. The engineering and geology team will provide support to the operations team by providing short term and long term planning, controls, surveying, geotechnical engineering, mining reserves estimation and other technical functions. The maintenance team is responsible for planning and executing maintenance on mining equipment and as such the team is directly responsible for achieving equipment availability targets. A full complement of qualified supervisors and trades people is required to assure a safe and optimal mine equipment fleet.

Table 16-11: Mine Workforce Requirements (Year 12)

Description	Number	Description	Number
Mine Operations – Salaried Staff		Mine Maintenance – Hourly Staff	
Mining Manager	1	Field Gen Mechanics	12
Mine Superintendent	1	Field Welder	6
General Mine Foreman	2	Field Electrician	6
Mine Shift Foreman	8	Shovel Mechanics	12
Blaster	4	Shop Electrician	9
Dispatcher	4	Shop Mechanic	19
Training Foreman	2	Mechanic Helper	7
Production / Mine Clerk	1	Welder-machinist	7
Secretary	1	Lube/Service Truck	9
Mine Operations – Hourly Staff		Electronics Technician	3
Shovel Operators	12	Tool Crib Attendant	2
Loader Operators	4	Janitor	2
Haul Truck Operators	84	Millwright	2
Drill Operators	16	Mine Technical Service	
Dozer Operators	16	Chief Engineer	1
Grader Operators	16	Senior Mine Planning Engineer	1
Water Truck Operator	8	Planning Engineer	1
Other Auxiliary Equipment	8	Pit Engineer	1
General Labour	8	Geotechnical Engineer	1
Janitor	2	Blasting Engineer	1
Dewatering Crew	2	Environmental Engineer	1
Mine Maintenance – Salaried Staff		Mine Surveyor	3
Maintenance Superintendent	2	Chief Geologist	1
Maintenance Planner	2	Senior Geologist (Long Term)	1
Mechanical/Industrial Engineer	1	Geologist	1
Mine Maintenance Foreman	4	Grade Control Geologist	2
Mechanical Foreman	2		
Electrical Foreman	2		
Mine Maintenance Trainer	1		
Mine Maintenance Clerk	1		

17. RECOVERY METHODS

Subsequent to the issue of the 2012 Feasibility Study NI 43-101 Report, Alderon and Kami LP proceeded with detailed engineering for the Kami Project. This chapter provides an update of the process description based on the design developed during the course of detailed engineering and provides the basis for the estimation of the capital and operating costs for this updated FS on the Kami Project.

17.1 Process Design Basis

For the current FS, the process design basis developed during the 2012 FS has been updated based on the revised mine plan presented in Chapter 16 of this Report. Table 17-1 presents a global balance of nominal and design tonnages for the processing plant. The concentrate values presented consist of combined gravity and magnetic concentrates. The design basis presented aligns well with the parameters developed following detailed engineering used for final plant design.

Table 17-1: Process Design Basis for Kami Concentrator

	Nominal Operating Parameters (Dry basis)		
	Average LOM	Nominal Hourly Throughput	Design Value
Throughput (fresh feed)	23.003 Mtpa	2,886 t/h	3,310 t/h
Concentrate production	7.844 Mtpa	984 t/h	1,122 t/h
Tailings generated	15.159 Mtpa	1,902 t/h	2,188 t/h
Concentrate Wt Rec %	34.1%		
Concentrate Fe Rec %	77.4%		
Plant utilization %	91.0%		
Head grade %Fe (with mining dilution)	28.8%		
Concentrate grade %Fe	65.2%		
Concentrate grade %SiO ₂	4.30%		

Process design was based on using the largest diameter proven dual-pinion Autogenous Grinding (AG) mill. The maximum throughput through the AG mill was determined by the material hardness, as quantified by its operating work index, which was derived from testwork and the grinding simulations based on geometallurgical modelling presented in Chapter 13 of this Report. Final concentrate production is determined by this throughput as well as by overall weight recovery (in turn determined from testwork results) for a given targeted concentrate Fe and SiO₂ grade. In general, throughput design values provide for process variations from

nominal conditions on the basis of +/-15% however equipment sizing in some areas of the process, specifically the magnetic concentration area, allow for variations of nominal +25% to account for ore variability in hardness and magnetite content. Mining, processing and ancillary operations are designed for continuous year-round operations, 365 days per year, 7 days per week and 24 hours per day.

The indicated throughput was determined using grinding simulations as presented in Chapter 13 of this Report. The targeted 4.3% SiO₂ grade was provided by Kami LP based on market requirements. Grade/Recovery curves developed from the testwork resulted in a total concentrate weight recovery of 34.1% at 65.2% Fe grade. Considering all these factors, the average annual dry concentrate production over the LOM is estimated at 7.84 Mtpa. It should be noted that the mine plan is based on providing an average of 23.0 Mtpa of ROM ore annually to the process plant. Considering that each mineralization zone has ore hardness and iron (Fe) recovery specific to the rock type, it can be expected that annual throughput and concentrate production will vary based on the mineral type and blend from the mine. The annual concentrate production numbers are indicated in the Economic Analysis table in Chapter 22 of this Report.

17.2 General Process Description and Plant Design

General process and plant design criteria for the Kami processing plant for this FS are generally based on the criteria, design, general arrangements and equipment sizing developed by Kami LP during detailed engineering and on the following considerations. Figure 17-1 to Figure 17-4 present the general process flow diagrams for the Project:

- ROM material crushing takes place in a single gyratory crusher located in the vicinity of the Rose deposit;
- The Kami process plant is located on the Kami Property, to the east of Waldorf Crossing;
- Crushed material is conveyed using an overland conveyor that discharges onto an uncovered stockpile located ahead of the Kami concentrator;
- Crushed material from the stockpile is reclaimed onto a belt conveyor feeding the AG mill;
- AG mill discharge is screened using a two-stage screening circuit. Oversize from the scalping and classification screens is recirculated back to the AG mill;
- Slurry from the grinding and screening circuit is first subjected to gravity concentration using a three-stage spiral circuit that produces a tailings stream and a final gravity concentrate, which is dewatered using horizontal pan filters and steam injection when required;

- Tailings from the gravity circuit are subjected to a cobbing process using low intensity magnetic separation (“LIMS”). The cobber concentrate is further reground in a ball mill and processed in a magnetic separation circuit. This circuit produces a tailings stream and a final magnetic concentrate, which is dewatered using drum filters and steam injection;
- Filtered concentrate from the gravity circuit and from the magnetic circuit are combined on a belt conveyor, which directs the product to the train load-out silo system;
- Tailings from all sources are combined and treated through hydrocyclones where they are dewatered, and coarse and fine fractions are separated. Cyclone underflow (coarse tailings) are pumped to the TMF and used for progressive dam construction. Hydrocyclone overflow is directed to a thickener where it is dewatered and subsequently pumped to the TMF and deposited based on the tailings deposition plan;
- The general location of the crusher, stockpile, concentrator, load-out, tailings disposal area and other infrastructure are shown on the general site plans in Chapter 18 of this Report.

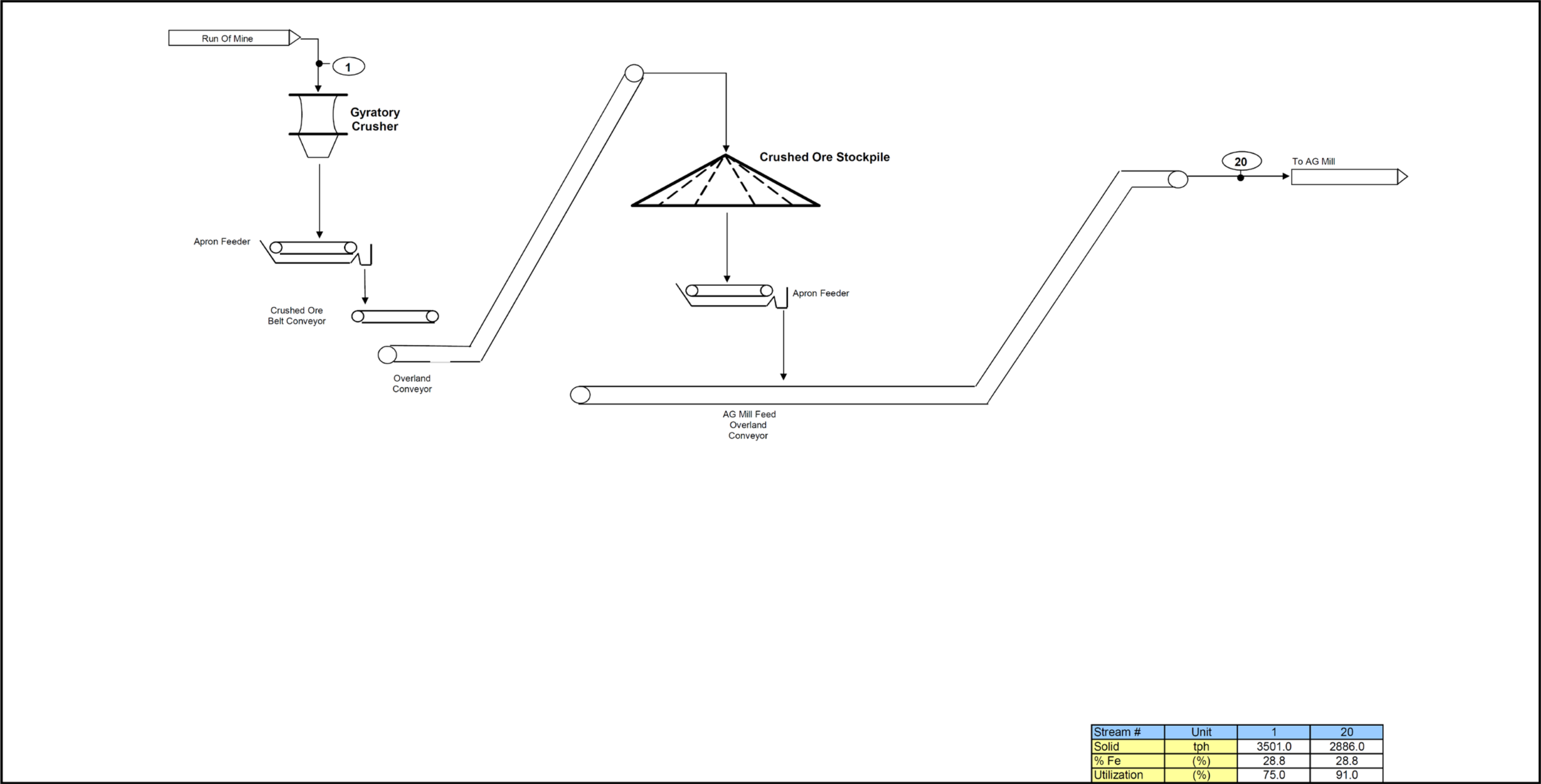


Figure 17-1: Process Flow Diagram Crushing, Stockpiling and Reclaiming

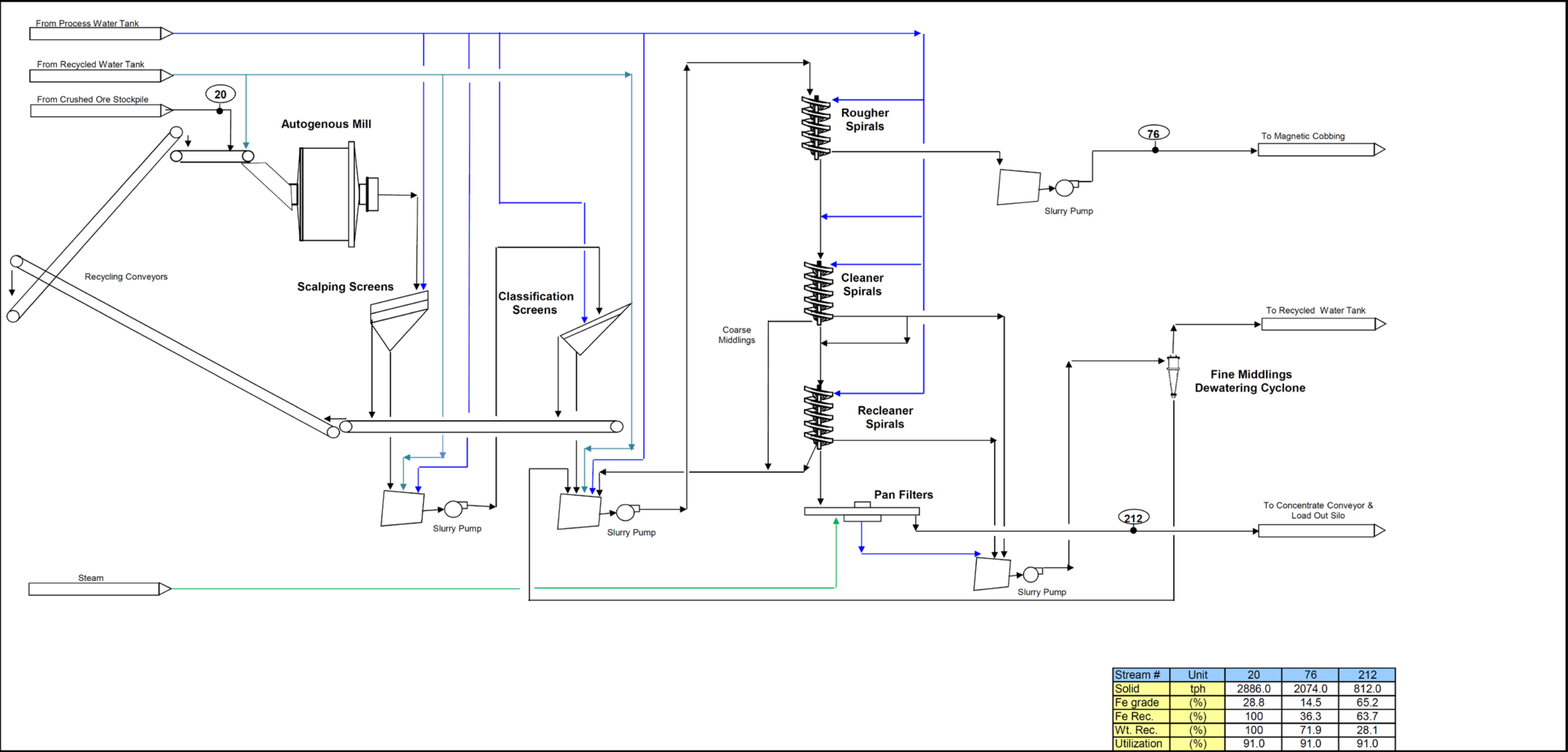


Figure 17-2: Process Flow Diagram Grinding, Screening and Gravity Concentration

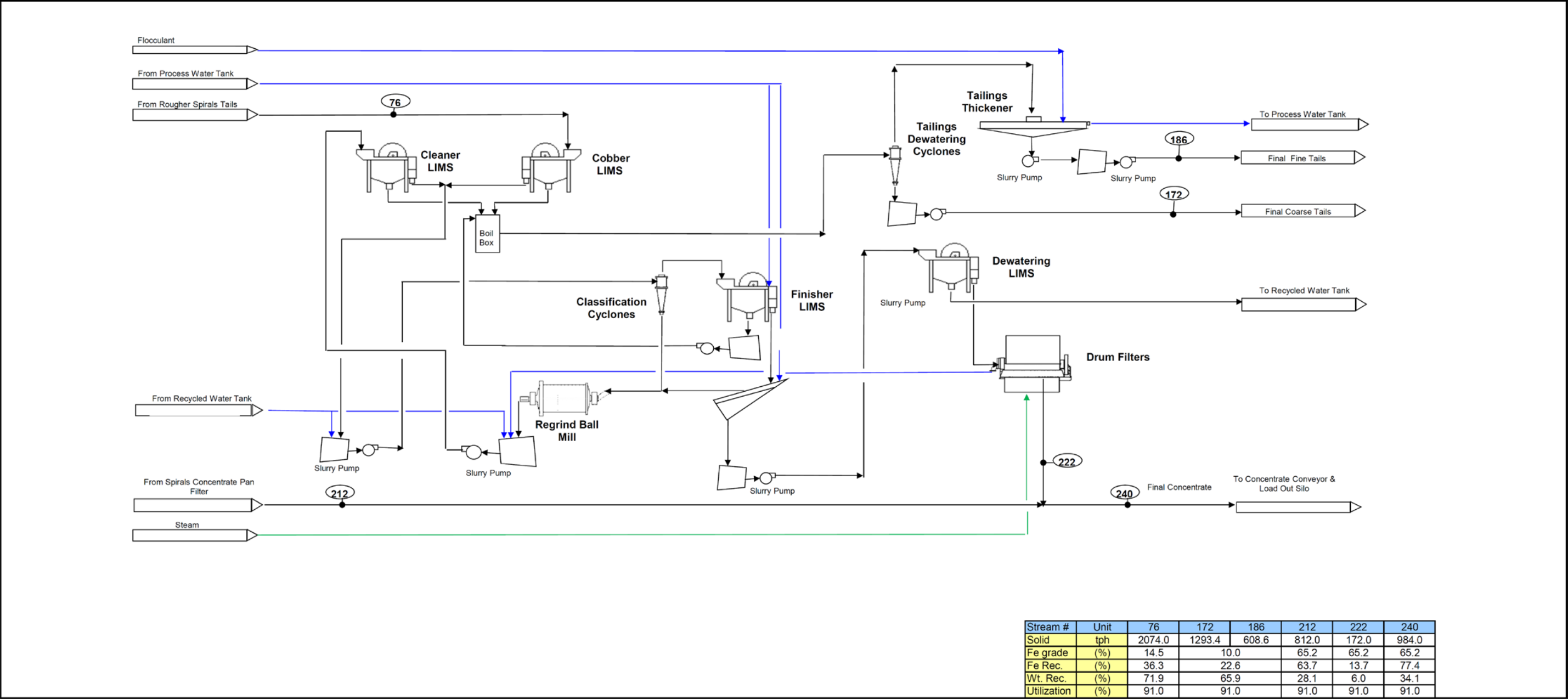


Figure 17-3: Process Flow Diagram Magnetic Separation Plant

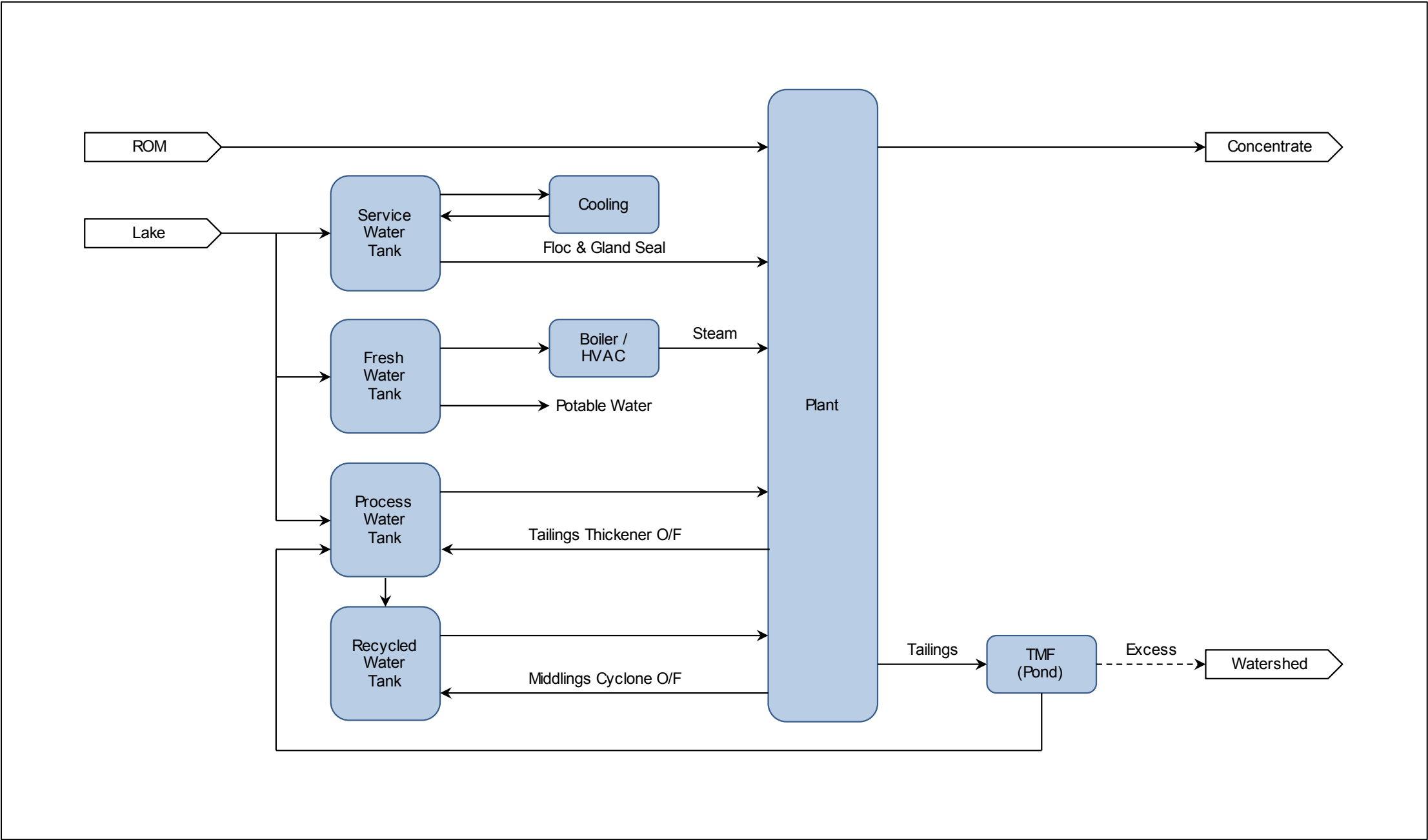


Figure 17-4: Process Flow Diagram General Process Water Balance

17.3 Crushing, Conveying and Storage

Material from the mine is delivered by haul truck to a dump pocket directly feeding one 1,525 mm x 2,260 mm (60" x 89"), 750 kW gyratory crusher. Crusher power was determined based on a design crusher work index of 12.8 kWh/t, F_{80} of 800 mm and P_{80} of 150 mm. During periods when the crusher is not available, stockpiling ahead of the crusher can be done within a designated area. Specific throughput is based on crusher utilization of 75%, and nominal and design capacities are 3,501 t/h and 4,026 t/h (dry) respectively. ROM material moisture is assumed to be 1.5% and density is 3.4 t/m³. A hydraulic rock breaker operated from the crusher control room is provided adjacent to the crusher to break up and manipulate oversized or improperly positioned rocks. Crushed ore is collected in a surge pocket below the crusher and fed onto a belt conveyor. This conveyor discharges onto an overland conveyor.

The overland conveyor discharges onto an outside stockpile of 38,000 t live capacity. This live capacity is sufficient to sustain about 12 hours of processing plant operation, allowing the crusher to be taken out of service for normal maintenance while maintaining feed to the mill. The total pile capacity is in the order of 290,000 t (about 4 days), sufficient to maintain an uninterrupted feed to the grinding circuit while permitting major repairs to be undertaken on the crusher. When required, reclaim from the dead area of the stockpile can be done using dozers and/or loaders.

Crushed material is reclaimed from the stockpile by two variable-speed apron feeders located inside a tunnel. The feeders discharge onto a stockpile reclaim conveyor at the rate required to feed the AG mill. The mill feed tonnage is controlled by varying the feeder and the conveyor speed with a signal from the belt weigh scale.

17.4 Grinding and Screening Circuit

17.4.1 Grinding

Crushed material at a nominal rate of 2,886 t/h is fed to a single 10.97 m dia. x 7.01 m long (36' x 23') flange to flange (6.48 m EGL), 2 x 7,500 kW dual-pinion AG mill. Recycled process water is added in the feed box to control the slurry at 65% solids. The material is ground to a particle size P_{80} of 300 microns, which is the size required to achieve sufficient liberation for effective gravity concentration. The length of the AG mill has been increased from that of the 2012 FS to provide increased available grinding power in order to avoid having to stockpile and blend hard material. The AG mill can accept a ball charge of up to 5%, thus providing an opportunity to increase throughput and to deal with periods of hard ore as necessary.

17.4.2 Screening

The slurry from the AG Mill is discharged into a splitting chute distributing the slurry to two horizontal single deck scalping screens of 4.27 m x 8.56 m (14' x 28') with a screen mesh opening of 4.0 mm. The oversize fraction from the scalping screens is returned to the AG mill by belt conveyor.

The passing fraction from the scalping screens is collected within a single pump box having two discharges, each having one single-stage pump and each feeding a three-way distributor. Each of these distributors feeds three multi-slope (banana) classification screens of 4.27 m x 8.56 m (14' x 28') with a mesh opening of 1 mm. Oversize material from the classification screens is returned to the AG mill by belt conveyor. The classification screen passing fraction is collected into two pump boxes.

Each of the two classification screen undersize pump boxes, handling half of the total AG mill product, is equipped with a two-stage pumping system, each feeding one primary distributor (two total), at the required 40%-solids to the rougher spirals.

17.5 Gravity Concentration Circuit

The gravity concentrating circuit layout is based on a conventional three-stage spiral circuit. There are two primary distributors, each feeding 12 banks of roughers (24 in total). Each rougher spiral bank has a distributor that feeds 16 double-start spirals arranged in a back to back configuration of eight spirals. There are a total of 384 double-start spirals.

The rougher spirals produce a concentrate stream and a tailings stream. The concentrate is collected in a network of launders and directed to the cleaner spiral distributors. The tailings are directed to the Magnetic Separation Circuit. The rougher spirals have wash water added to promote a better selectivity and separation efficiency of the iron rich particles from the lighter silica rich particles. Dilution water is added to the rougher concentrate to allow for better cleaner spiral performance.

The cleaner spirals produce three products: concentrate, coarse middling, and fine middling. The concentrate is fed directly to the recleaner spirals. The coarse middling stream is recirculated to the rougher spiral feed pump box. The fine middling stream is directed to the fine middling cyclone feed pump box for dewatering. Dilution water, as well as wash water, is added to the cleaner spirals.

The recleaner spirals also generate three products: concentrate, coarse middling, and fine middling. The concentrate flows to the pan filters and constitutes the final gravity circuit concentrate. The coarse middling stream is recirculated to the rougher spiral feed pump box.

The fine middling stream is directed to the fine middling cyclone feed pump box. Wash water is added to the recleaner spirals.

Fine middlings from the cleaner and recleaner spirals, being very low in %-solids, are pumped to two clusters of dewatering cyclones. The underflow of these cyclones flow by gravity to the rougher spiral feed pump box. The overflow from these cyclones is sent to the recycled water tank. This water, having a higher concentration of suspended solids than process water, is kept within a separate circuit intended for use at the AG mill as well as in the scalping screen and classification screen underflow pump boxes. This strategy allows for a smaller thickener and a better overall water management system.

The gravity circuit concentrate produced by the recleaner spirals is directed by gravity to four horizontal pan filters having a 7.93 m (26') diameter. The filtered concentrate is conveyed to the concentrate load-out while the filtrate is directed to the fine middling cyclone pump box. Each pan filter is provided with a scroll discharge and a steam hood for steam injection during the winter months. Moisture levels for filtered gravity concentrate are expected to be in the order of 3.5% in the summer and 2.5% in the winter. This practice is aimed at reducing the risk of concentrate freezing in the railcars during transport to the port terminal facility.

17.6 Magnetic Separation Circuit

The rougher spiral tailings are pumped to the magnetic separation circuit (mag plant) cobbing low intensity magnetic separators ("LIMS"). There is a total of twelve 1.2 m x 3.6 m LIMS units configured in two banks of six, each fed by its own distributor. The concentrate from the cobbing drums consists mainly of non-liberated magnetite, requiring regrinding, and fine liberated magnetite that was not recovered in the spirals. This concentrate is directed to the classification cyclone. The cobber LIMS tailings are directed to the tailings boil box.

The classification cyclone system consists of one cluster having six, 650 mm diameter cyclones (and two blanks for future requirements). The cyclone underflow is sent to the regrind ball mill 6.7 m x 12.3 m (22' x 40.5'), while the overflow is directed to the finisher LIMS. The mass balance, as developed during detailed engineering, is based on a 150% recirculating load to the ball mill.

Slurry from the ball mill discharge is pumped to eight, 1.2 m x 3.6 m, single-stage cleaner LIMS units. The cleaner LIMS concentrate is directed to the classification cyclone pump box, while tailings are directed to the tailings boil box, thus joining the cobber tailings.

The finisher LIMS consists of six, 1.2 m x 3.6 m, single-stage units. Their objective is to recover liberated magnetite or mixed magnetite/SiO₂ middling particles, but discarding gangue and peppered SiO₂ (particles which are primarily SiO₂ with very minor amounts of fine magnetite).

The concentrate is directed to the fine screens and the tailings are directed to the tailings boil box.

The finisher LIMS concentrate is sent by gravity to five fines screens (5-deck stack sizers), having a screen opening of 75 µm, where wash water can be added to assist the operation. The fine screen oversize is sent back to the regrind mill as it consists mainly of coarse, unliberated particles. The undersize, a high magnetite grade but dilute stream, is directed to the dewatering LIMS.

Two, 1.2 m x 3.6 m, dewatering LIMS units are used to increase the %-solids of the slurry and further remove entrained tails prior to filtration. The dewatering LIMS concentrate is pumped to the drum filters while their tailings are directed to the classification cyclone pump box.

Each of the four drum filters (3.93 m dia x 6.55 m length) is provided with a steam hood for steam injection year round. Moisture level for this finer concentrate is expected to be in the order of 7%. The filtered concentrate is discharged onto a conveyor system where it joins the gravity concentrate for conveying to the concentrate load-out. Filtrate is directed to the classification cyclone pump box.

17.7 Tailings Dewatering and Pumping

The non-magnetic tailings from the mag plant consist mainly of SiO₂ and other gangue minerals such as silicates, carbonates (including some unrecoverable iron minerals), and unrecovered fine hematite and magnetite. In detailed engineering, process design provided that all tailings generated (coarse and fine) were directed to the tailings thickener for dewatering and the thickener underflow was directly pumped to the TMF by the tailings pumping. No intermediate pump box for density control was provided. This configuration in iron ore incorporates certain technical and operational risks.

For the present FS, Kami LP has determined that the tailings deposition plan should be based on delivering coarse and fine tailings separately to the TMF. As such, the tailings dewatering system proposed herewith by BBA is similar to that in the 2012 FS. Tailings from the mag plant are collected within two boil boxes that feed by gravity two hydrocyclone clusters, each having five, 660 mm diameter cyclones. The underflow of the cyclones is directed by gravity to a coarse tailings pump box, initially having a two-stage pump system and a 500 mm rubber lined steel pipe delivering coarse tailings to the initial tailings deposition point.

The overflow from the tailings hydrocyclones (fine tailings) discharges by gravity into a 55 m diameter high-rate thickener that dewateres the fine tailings to the targeted %-solids. The thickener underflow is pumped into a fine tailings pump box, initially having a two-stage pump system and a 460 mm rubber lined steel pipe delivering fine tailings to the initial tailings deposition point at the TMF.

Reagents are added to the thickener feed stream to promote settling and to maintain process water clarity. The clarified thickener overflow stream flows by gravity to the process water tank. Water from the TMF is returned to the process water tank as required, using a pump station mounted on a floating barge. The TMF area as well as the water reclaim system is described in more detail in Chapter 18 of this Report.

For both the coarse and fine tailings pumping systems described previously, additional pumping capacity and piping are added as the tailings deposition plan evolves in time and costs associated with these additions are covered in sustaining capital. For the initial installation, it is planned that coarse and fine tailings are combined and pumped together during the first year of operation. The coarse and fine tailings are only required to be pumped separately after the first year of operation. As such, the fine tailings pumping system is excluded from initial capital and included in sustaining capital.

17.8 Concentrate Conveying and Load-Out

The concentrate discharged from the pan filters and the drum filters is collected onto a common belt conveyor system that discharges into a steel silo. Railcars are loaded from the silo. An emergency storage/reclaim system is provided.

17.9 Process Plant Utilities

17.9.1 Compressed Air

Two air compressors (one operating and one standby) with a capacity of 270 m³/h, each with a desiccant dryer of equivalent capacity, provide the plant and instrumentation air for the concentrator. Three smaller air compressors supply compressed air for the crusher area, stockpile and load-out area. This was validated during detailed engineering.

17.9.2 Fresh Water

A freshwater tank for make-up water, cooling water, gland seal water and service water, is provided. Each system has a dedicated pump with back-up. Fresh water for the concentrator area is sourced from Long Lake, whereas the mine services area has deep water wells.

17.9.3 Recycled Process Water

Process water is recycled from the thickener and from the TMF. The thickener overflow discharges into an above-ground steel process water tank. The level in the process water tank is controlled by modulating water reclaim from the TMF. Process water distribution is provided by a piping network throughout the plant. Two process water pumps, one operating and one standby, are used to provide the required flow and pressure throughout the plant.

Next to the process water tank lays the recycled water tank. This tank is fed by the fine middling cyclone overflow and the dewatering LIMS tailings stream from the mag plant. The recycled water has higher solids content than process water and is therefore used for stream dilution at various points within the concentrator where operation is insensitive to the small amount of fine solids accompanying the water.

17.9.4 Steam

Steam is used during the winter months for both heating of the main concentrator building and drying concentrate, in order to reduce moisture levels for rail transport. Steam is used year round to reduce the moisture content of the mag plant concentrate. Design provides for two electric steam boilers and a back-up fuel boiler, each having a capacity of 18,000 kg/h (12 MW each).

18. PROJECT INFRASTRUCTURE

This chapter describes the major infrastructure required to support the Kami Project, as developed in the Feasibility Study. Design is based on the following:

- The general site plot plan for the Kami Project is based on the plan and layout developed during detailed engineering, which used the latest available geotechnical data, including design consideration from the Kami LP Environmental Impact Study (“EIS”);
- Mining of the Rose pit and adjacent crushing plant are located at the Kami mine area considering the open pit footprint developed as described in Chapter 15 of this Report;
- The overburden waste dump is located to the north of the Rose pit and the waste rock dump is located to the east of Mills Lake;
- Crushed ore is conveyed from the crusher to the crushed ore stockpile, which is located ahead of the concentrator, to the west of the Waldorf Crossing;
- The concentrator and ancillary infrastructure is located to the east of Waldorf Crossing;
- Tailings are disposed of in an area to the south of the concentrator;
- The concentrate load-out and rail loop are located to the east of the Kami concentrator with a connecting railway to the QNS&L main rail line;
- The main access road to the Property follows the new railway, passing to the east of the Tacora rail loop and through the Town of Wabush, to ultimately connect to Highway 500;
- Rail transportation of concentrate from the Kami rail loop to the common port terminal facilities in Sept-Iles, Québec (Pointe Noire, owned and operated by a third party);
- Ship loading services are provided by Port of Sept-Iles;
- Electric power as well as the main electric substation will be provided by Nalcor (through its subsidiary NLH), as per agreement described in Chapter 19 of this Report.

In this FS, it is assumed that labour requirements for mining and processing operations will be sourced from Labrador West residents.

18.1 Project Plot Plan

A preliminary project plot plan was developed in the November 2017 PEA, based on Kami LP’s detailed engineering design, however, the tailings management facility (“TMF”) as well as the tailings deposition plan were only developed to a conceptual level. In this Study, the TMF and the tailings deposition plan have been developed to a feasibility study level of detail. Also, for this Study, the footprint for the open pit mine has been updated and major site infrastructure have been confirmed as presented in Figure 18-1 and Figure 18-2.

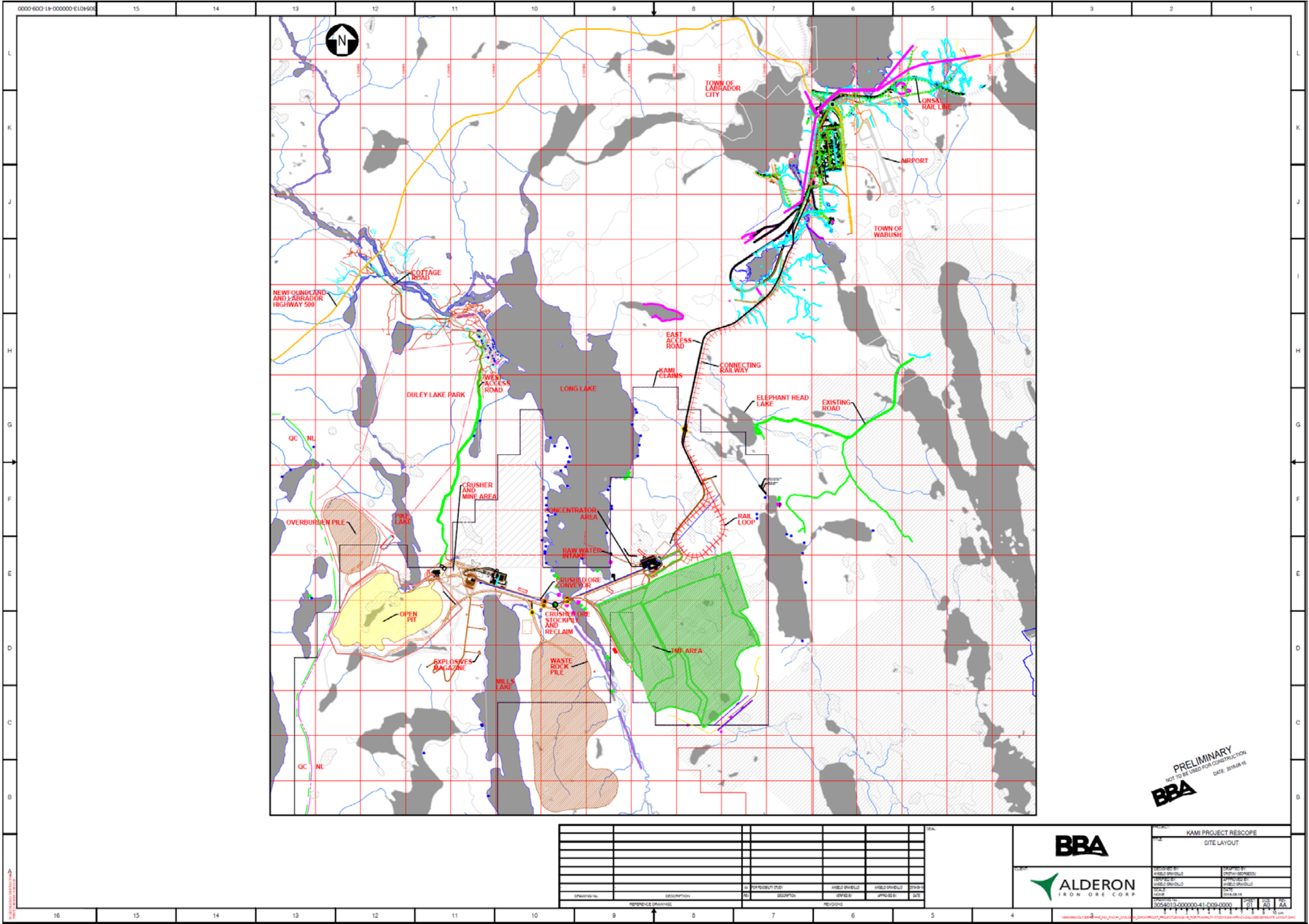


Figure 18-1: General Site Plan for the Kami Project

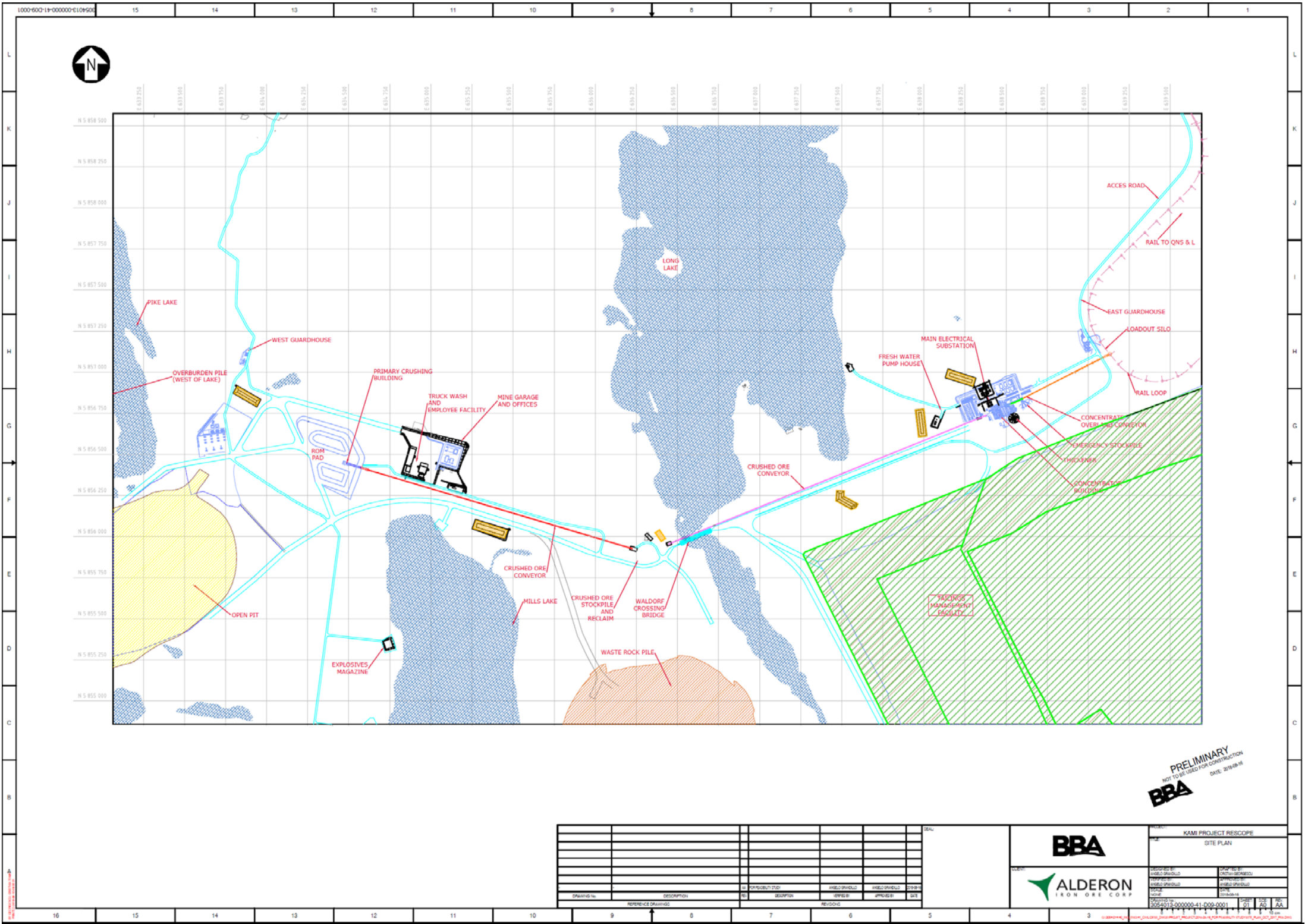


Figure 18-2: General Site Layout for the Kami Project

18.2 General Kami Mine Site Infrastructure

18.2.1 Site Access Roads

- The main access to the site is from the town of Wabush through an access road to the northeast of the Kami concentrator in the same general corridor as the rail loop and the railway connecting to the main QNS&L Line;
- An access road, to be used mainly during construction, is provided to the west of the Property providing access to the Rose Pit and crusher areas;
- Gated guardhouses are provided to control access to the facilities from both access roads.

18.2.2 On-Site Roads

- Mine roads connect the open pit to the crusher, to the waste stockpiles and to the TMF, where waste rock is required for dam construction over the life of the mine. These roads are generally 28 m in width;
- A 20 m wide, single lane bridge, for heavy traffic, will be constructed over the Waldorf Crossing allowing mine trucks to transport waste rock to the TMF for dam construction, as required throughout the life of the mine;
- Light vehicle service roads are provided to service areas such as the explosives magazine and connecting road between the concentrator and the mine. Design provides that light vehicle roads do not cross the mine roads;
- Parking areas for both mine trucks and light vehicles are provided.

18.2.3 Mine Services Area

- Initial truck wash bay building with full system implemented in Year 2;
- Initial two-bay mine garage with the addition of two bays in Year 4;
- Mechanical and electrical services as well as indoor warehouse (one bay);
- Mine employee facilities;
- Parking areas for mine trucks separate from parking areas for light vehicles and staff;
- 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 a contractor.

18.2.4 Kami Mine Site Stockpiles

- Overburden will be disposed of in the Rose North stockpile and will have the capacity to hold all the overburden generated during the life of the mining operation;
- Waste rock will be disposed of in the Rose South stockpile located east of Mills Lake. The same footprint as in the 2012 FS is maintained but the ultimate height of the stockpile will be lower due to the reduced quantity of waste rock generated over the LOM, based on the current mine plan presented in Chapter 16 of this Report;
- ROM ore is stockpiled (peak of 10 Mt), as required, in designated areas in proximity to the crusher.

18.2.5 Primary Crusher Station

- The primary crusher building is located in proximity to Rose Pit, about 500 m from the final pit shell boundary;
- During detailed engineering, the primary crusher station design was finalized and a procurement contract was awarded to a major equipment vendor.

18.2.6 Crushed Ore Conveyors and Stockpile

- The primary crusher discharges onto a sacrificial conveyor which, in turn, discharges onto an overland conveyor having a length of 1.9 km;
- The overland conveyor from the crusher discharges onto the uncovered, crushed ore stockpile ahead of the concentrator, located to the west of the Waldorf Crossing,
- The crushed ore stockpile provides a live capacity of about 38,000 t (12 h) and a total capacity of about 290,000 t (about 4 days);
- Crushed ore is reclaimed using two apron feeders, feeding an overland conveyor having a length of 2.3 km discharging onto the AG mill feed conveyor in the concentrator.

18.2.7 Process Plant

- The process plant, located to the northeast of Waldorf Crossing, consists of the concentrator and ancillary process areas including thickener, process water reservoirs, tailings pumping, boiler house, maintenance shop, warehouse, electrical rooms, etc.;
- The various processing areas located within the concentrator include grinding and screening, gravity concentration, and magnetic concentration and regrind;
- The plant administration office, concentrator employee facilities and other service areas are located adjacent to the concentrator main building.

18.2.8 Concentrate Load-Out and Kami Rail

- Final gravity and magnetic concentrate is transported with a 630 m conveyor to a 20,000 t capacity steel silo located directly over the rail loop;
- The rail loop is provided for loading concentrate into gondola railcars;
- A connecting railway to the QNS&L main line will be constructed within a corridor that has been accepted during the Project permitting process;
- An emergency stockpile is provided in proximity to the concentrator, which allows for concentrate to be stored (and reclaimed) outside in the event that the main silo is full or unavailable.

18.2.9 Fuel Storage

- Diesel fuel for mine equipment will be trucked in using tanker trucks from a local depot;
- The on-site fuel storage capacity consists of three storage reservoirs, each having a capacity of 175,000 L;
- The diesel boiler has a single fuel tank dedicated for its operation (50,000 L capacity);
- A mine truck diesel filling station is provided in the mine services area.

18.2.10 Fresh Water Pumphouse

- The fresh water pumphouse will be located southeast of Long Lake. This water is used for fresh water requirements for various areas of the process, occasional make-up water and potable water for the concentrator area;
- The length of the water pipeline from the raw water pumphouse to the concentrator is approximately 1 km.

18.2.11 Steam Boiler House

- Design includes two electric steam boilers and a back-up fuel boiler, each having a capacity of 18,000 kg/h (12 MW each);
- The steam boilers are located in a boilerhouse adjacent to the concentrator building.

18.2.12 Fire Protection

- There are independent fire protection systems for the mine service facilities, the crushing area and the processing plant area. For the processing plant building, the fire system water supply is connected to the freshwater system of the plant.

18.2.13 Temporary Construction Camp

- It is assumed that Kami LP will not be required to construct a temporary construction camp. Local contractors will not require room and board. Contractors on a fly-in-fly-out basis are assumed to lodge their workforce within existing facilities, in Labrador West and Fermont. It is assumed that these facilities will be rented and operated by the Project.

18.2.14 General

- Communications systems (internal and external) will be provided to support operations and provide a safe and secure environment;
- Sewage treatment systems, sanitary facilities as well as domestic waste disposal will be provided according to local conditions and requirements;
- Major building structures will be made of steel with pre-painted steel cladding. Concrete foundations will consist of spread footings. Secondary buildings will be of pre-engineered or prefabricated type when applicable. Temporary buildings and warehousing will be of “sprung structure” or Megadome type. The concentrator is heated using steam. Other buildings are heated using electricity;
- Slurry and process water pipelines generally run above ground although some pipework may be buried, such as sewage treatment piping.

18.3 Electricity

Electric power will be supplied to the Kami Project by Nalcor, through its subsidiary, NLH. Kami LP secured its power requirements through a power purchase agreement with NLH dated February 2014, as described in Chapter 19 of this Report. It is assumed that in order for the Kami LP to take power, NLH will need to construct a new power transmission line from Churchill Falls as well as a new 230 kV substation in proximity to the Kami concentrator. The battery limit for the Kami owned infrastructure will be at the low voltage side of the 230 kV transformers. It is also assumed that the NLH agreement will provide a 46 kV powerline for construction.

Table 18-1 presents the estimated power requirements for the initial operating phase of the Project, including peak mining electrical equipment. Power requirements will increase incrementally with the evolution of the tailings deposition plan. It is estimated that power demand will peak at 86 MW once the final tailings pumping configuration is reached.

Table 18-1: Estimated Kami Power Requirements Electrical Consumption

Description	Running Power (MW)	Power Demand (MW)	Estimated Annual Energy Consumption (GWH)
Grinding	25.0	22.3	163.0
Process Equipment	39.2	26.9	212.2
Electric Boilers	24.0	13.8	43.8
Services	16.0	9.4	66.1
TOTAL Process and Infrastructure	104	73	485
Mining Equipment (Peak)	7.1	3.7	Variable
TOTAL (Initial)		76	

18.4 Tailings Management Facility

18.4.1 Background

In the November 2017 PEA, the TMF design was developed to a conceptual level. For this Study, Kami LP engaged Golder Associates Ltd. to complete a feasibility level tailings deposition plan and TMF design combining the cellular approach used in detailed engineering with the upstream dam raise design approach proposed by Golder (Golder 2018).

The dam safety program established in NL requires that dams must be designed, operated and maintained to meet the requirements of Canadian Dam Association (“CDA”) Dam Safety Guidelines. In accordance with the dam classification methodology presented in the CDA Dam Safety Guidelines, the proposed TMF dams are classified to have a “Very High” consequence of failure. The design of the TMF was carried out to meet minimum allowable factors of safety under static and pseudo-static loading conditions recommended in the current CDA Dam Safety Guidelines. Seepage, liquefaction and stability analyses were carried out as part of the design. Based on the model results, the dams are expected to be stable under the loading conditions assumed in the analyses.

As part of its mandate, Golder first proceeded with a high-level options evaluation to select the best tailings deposition method appropriate for the selected TMF site. The option selected, following this exercise, includes construction of a starter perimeter dam on the north side of the TMF footprint followed by an upstream stacking method of deposition. To be able to have an upstream overall slope of 8H:1V for the tailings stack for stability purposes, the upstream berms will be constructed over a compacted coarse tailings foundation. With this approach, it is required that coarse tailings and fine tailings be segregated at the concentrator and pumped separately to the deposition points at the TMF.

One advantage of raising by the upstream method is that it saves on fill volume requirements for dam construction after the start-up as compared with that of the downstream method. It is also noted that the upstream construction method has been adopted by other iron ore mining operations in the area.

18.4.2 Tailings Management

The revised tailings management plan was intended to:

- Minimize the potential of dusting during the operating period by minimizing the active tailings management area;
- Facilitate progressive closure; and
- Optimize the deposition and construction requirements.

The TMF design concept and LOM construction quantities were determined based on the November 2017 PEA mine plan.

18.4.3 Design Basis

The final FS mine plan aligns well with the mine plan Golder used to develop its TMF design; in fact, total tailings produced by the final mine plan are slightly lower than those used to design the TMF. The total tailings storage requirement was estimated at 222 Mm³ over a LOM of just over 23 years.

The key deposition design parameters used by Golder for its design are listed below:

- Nominal annual tailings production: 15.2 Mt;
- Total LOM dry tailings produced: 355 Mt;
- Coarse and fine tailings ratio: 2/3 coarse to 1/3 fine;
- Average deposited dry density for the two streams: 1.6 t/m³;
- Discharge slurry density: 55%;
- Average beach slope: 1%;
- Tailings specific gravity: 2.81 to 2.87;
- Overall tailings stack slope: 8(H):1(V).

18.4.4 TMF Construction and Operations

The TMF incorporates internal cells, named as Cells 1 to 3, that will be filled and progressively reclaimed during the mine life. The tailings dams will be raised in stages to minimize the construction requirements over the LOM and coincide with the storage capacity requirements.

During the initial stages of filling in each cell, tailings deposition will occur from the crest of a starter dam. Once the upstream side of the dam is filled with tailings and the pond displaced a distance from the dam, a compacted coarse tailings berm will be constructed around the TMF perimeter on a compacted tailings foundation for subsequent tailings deposition. This process is repeated with the tailings surface rising with the berms. To enhance stability of the perimeter dam and to manage the seepage from the upstream berms and site runoff, the first coarse tailings berm is offset about 20 m from the starter dam in the upstream direction. The tailings berms will be 3 m high.

The perimeter dams will all have a crest width of 20 m. The upstream and downstream slopes of the dam have been set at 3H:1V and 2H:1V, respectively. The dam will be constructed using rockfill with upstream slope lined with geomembrane to minimize seepage. The geomembrane liner will be keyed at least 3 m into the glacial till foundation with a 2-m wide (at the base) seepage cut-off key trench that will be backfilled with compacted glacial till. A minimum of 0.6 m thick transition zone and a 0.3-m thick sand bedding zone are provided beneath the liner. Geotextile will be provided under the geomembrane for protection. The transition and bedding zones extend laterally as a 0.9 m thick filter blanket beneath the upstream rockfill shell to prevent the migration (piping) of foundation soils into the upstream shell. A 0.3-m thick layer of road surfacing will be placed and compacted along the dam crest to allow for heavy vehicle traffic during operations.

The tailings pond will collect runoff and tailings water. Water will be recycled from the tailings pond via a floating pump barge to the process plant and excess will have to be discharged to the environment. An attempt should be made to have a minimum volume of water in the tailings pond at all times. This may not always be possible, especially entering the winter months; when it is recommended to store an additional water volume, take into consideration frozen tailings water that will not report to the pond until the following spring (it has been assumed in the design that 20% of the total tailings water from November to March will freeze in the tailings beach before getting to the pond) and a water volume corresponding to 2 m of ice formation. Therefore, an alternative water supply should be available (i.e., Long Lake).

During the transition between two cells, two pump barges will be operated simultaneously. The floating barge must be able to handle freezing winter conditions. A side hill pumping system is an alternative, but a pump barge is preferred because the pond will move during the life of the facility.

Operating spillways will be provided at each cell to allow the surface runoff to drain safely to the nearby water courses. Rockfill finger berms will be constructed on either side of the spillways as needed to prevent blockage of the spillways from tailings deposition.

It is proposed that the TMF cells be substantially drained at closure by eliminating the pond of water in order to reduce maintenance and risk of dam failure. A revegetated dry cover of soil of 0.3 m thick will be placed over the deposited tailings to inhibit dusting and to improve the site aesthetics. Progressive rehabilitation of the completed cells will allow an assessment of the effectiveness of the proposed closure method.

Runoff and seepage collection ditches will be constructed along the toe of the perimeter dam in the TMF. Water collected in the ditches will be directed to sumps at various topographic low points around the dams and discharged directly to the environment (or pumped back to the TMF if the water quality does not meet the discharge criteria).

A non-contact diversion ditch is required at the northeast side of the TMF to divert water from upstream watershed. The water will be diverted towards Long Lake.

A total of seven deposition stages were developed for the TMF. The first stage has been sized to contain roughly 1.2 years of tailings deposition and will be required prior to start-up. This will involve the construction of the Northwest Dam to elevation of 582 m. The Northwest Dam will then be raised to elevation 592 m during the first year of operation. A divider dam is required within Cell 1 during Stage 1 operation. The entire base of the divider dam will be built to elevation 590 m. This will be raised to elevation 620 m by the end of Stage 2. Upstream dams will be constructed gradually during Stage 3 of operations, utilizing coarse tailings from the deposited tailings beach to construct compacted tailings berms as required, 3 m each in height, up to an ultimate elevation of 625.5 m. The Northeast Dam will be constructed to elevation 592 m during the Stage 4 of operations, while the East and South dams will be constructed to an elevation of 613 m and 625 m, respectively, during Stage 5 of operations. The East Dam will be raised to elevation 627.4 m by the end of Stage 6.

The upstream dams at the northeast and south ends of the TMF Cell 3 will be gradually constructed during Stage 6 and Stage 7 up to an ultimate elevation ranging from 629.5 m to 635.5 m. For the ultimate configuration, a storage volume of 5.47 Mm³ is required below the emergency spillway. This volume consists of:

- Storage of 0.10 Mm³ for suspended solids sedimentation;
- Storage of 1.03 Mm³ corresponding to 20% of the tailings water that may freeze before it reaches the pond during the five winter months. This water is assumed to melt and report to the pond in May during the spring freshet;

- Storage of 2.67 Mm³ for water that is lost to ice in the winter (assumed 2 m of ice build-up);
- Storage of 1.32 Mm³ for spring freshet corresponding to an average precipitation year; and
- Storage of 0.35 Mm³ for the Environmental Design Flood (EDF) event (24-hour, 100-year return precipitation 67 mm) below the invert of the emergency spillway.

The contingency water supply of 0.5 Mm³ will be provided in the tailings pond of Cell 2.

At closure, a small pond will remain at each cell. The spillways at Cells 2 and 3 will be lowered to allow passive discharge from the ponds during an Inflow Design Flood (IDF) event while minimizing the size of the pond. An overflow spillway will be constructed between Cells 1 and 2 to passively discharge the water ponded at Cell 1 into Cell 2. Decommissioning of ditches and sumps will be carried out once water quality meets criteria for direct discharge to the environment.

Figure 18-3 illustrates a typical cross section of the dam raise. Figure 18-4 shows the stages of the deposition plan through the LOM.

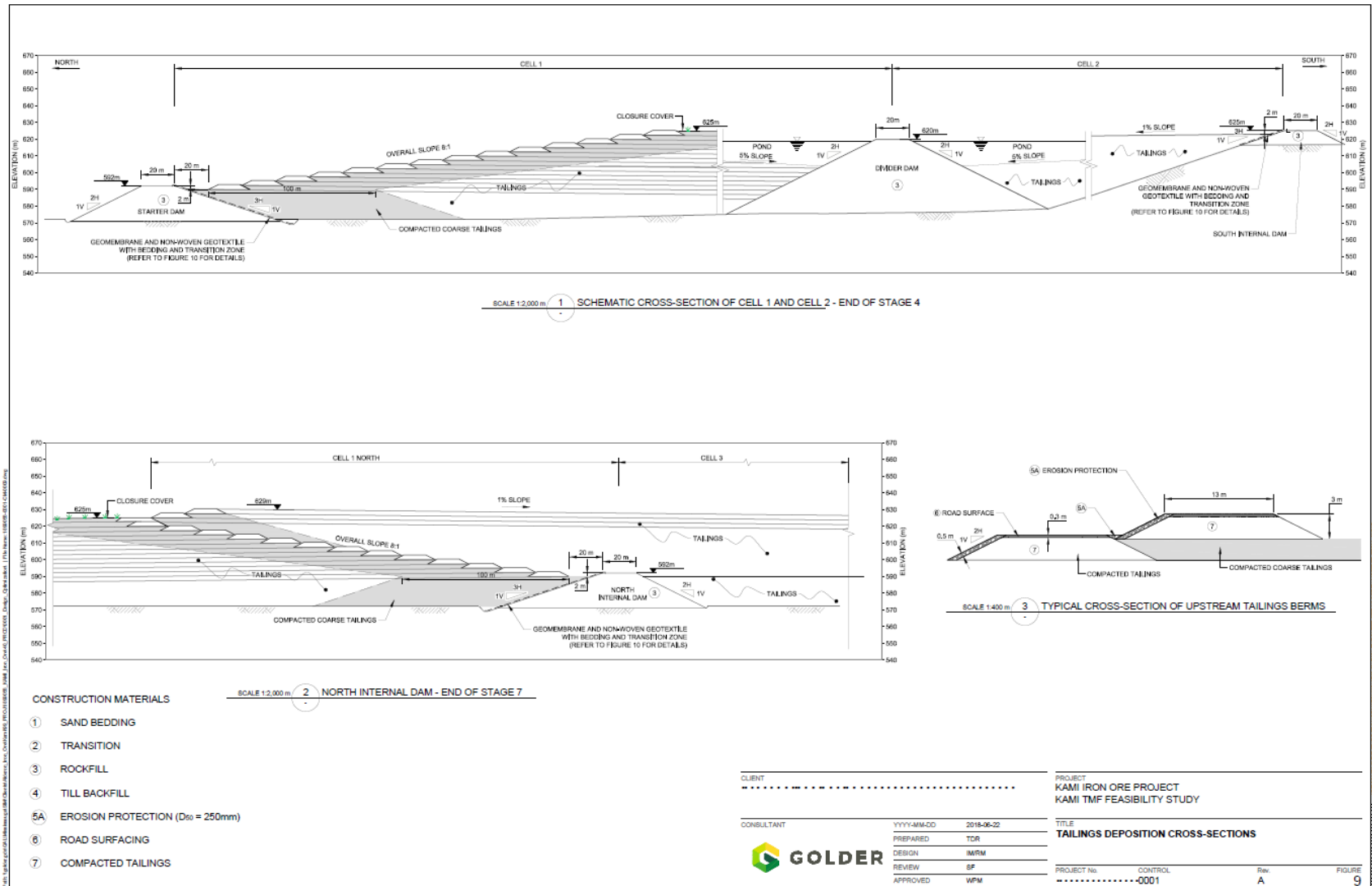


Figure 18-3 Schematic of the TMF Design

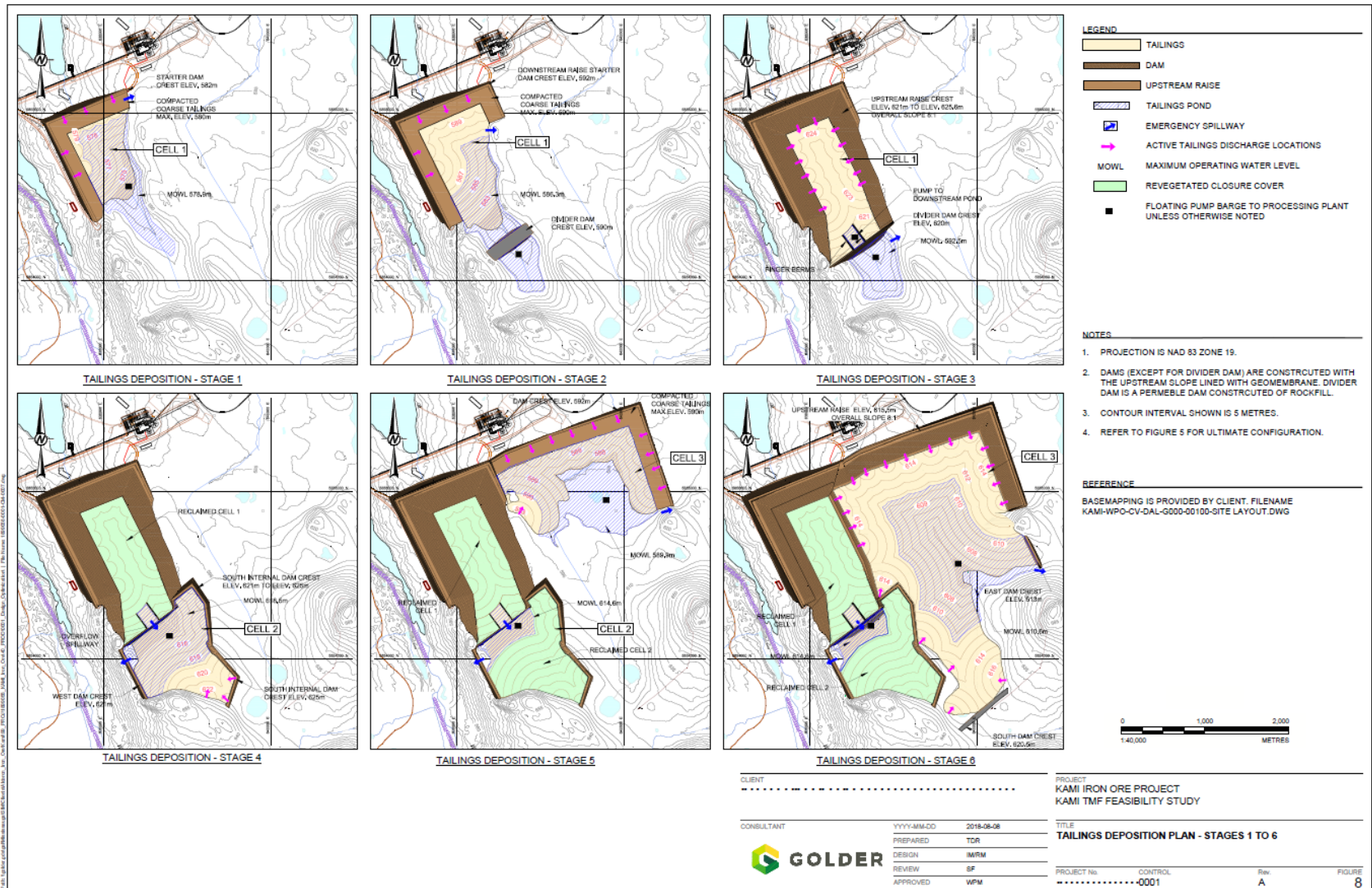


Figure 18-4 Tailings Deposition Plan Stages

18.4.5 Construction Requirements

The TMF will require the placement of approximately 14.8 Mm³ of rockfill, along with approximately 602,000 m² of geotextile and geomembrane liner material throughout the mine life. Furthermore, about 4.3 Mm³ and 33.2 Mm³ of coarse tailings will be required respectively for the construction of berms and upstream shells over the LOM.

18.5 Railway and Port Infrastructure

This FS is based on iron ore concentrate being shipped by rail over a 450 km route from the Kami concentrator to the Pointe-Noire port terminal. The following assumptions are made:

- The new rail loop and railway at Kami will connect to the Québec, North Shore and Labrador Railway (“QNS&L”) main rail line;
- Rail transportation will take place over existing rail infrastructure owned by QNS&L and La Société Ferroviaire et Portuaire de Pointe Noire (formerly owned by Chemin de Fer Arnaud (“CFA”));
- At Pointe Noire, a multi-user unloading and storage facility will be established and operated by a service provider. Further details are provided in Chapter 19 of this Report;
- Ship loading services will be provided by the Port of Sept Iles using its new deep-water port;
- Rail transportation, unloading, reclaiming and ship loading services will therefore all be provided by a third party through contractual agreements, as discussed in Chapter 19 of this Report.

The Project rail transportation requirements will be served using a dedicated fleet of gondola type railcars owned by the Kami LP. A logistics analysis, performed during detailed engineering, indicated that three trainsets of 240 railcars each (total of 740 railcars) would be required. This is included in the Economic Analysis presented in Chapter 22.

19. MARKET STUDIES AND CONTRACTS

19.1 Iron Ore Market

19.1.1 Iron Ore Selling Price Assumptions

As part of this FS Study, it is required that a commodity selling price be assumed in order to perform the Project Economic Analysis. The Kami LP has not recently undertaken a market study and must, therefore, resort to other means to reasonably assume the selling price of iron ore concentrate.

Iron ore product prices have been traditionally tracked using benchmarks. There are five regularly quoted benchmarks used by the industry:

- Platts Iron Ore Index;
- Metals Bulletin Iron Ore Index (“MBIOI”);
- The Steel Index (“TSI”), owned by Platts;
- IRESS;
- CME Group Futures.

The IODEX and MBIOI 62% Fe, CFR China Port indices are commonly used as the benchmarks for basing off-take agreements.

When the Kami LP signed its off-take agreements with HBIS and Glencore (discussed later in this chapter), the benchmark indices were based on a 62% Fe product. Adjustments in the form of a premium or penalty were agreed to, based on higher or lower Fe content. Since the signature of these agreements, benchmarks for higher Fe content products have been more widely used along with premiums/penalties for other elements such as SiO_2 , Al_2O_3 and P, which have an important impact on downstream operations such as sintering, ironmaking and steelmaking.

This is a prominent shift to recognize value in quality of iron ore products. For sinter fine concentrate, which is the intended use for the Kami concentrate, the following indices are currently used as benchmarks:

- Platts IO Fines, 65% Fe, CFR China;
- MBIOI-65-BZ;
- MBIOI-CO (concentrate at 66% Fe).

Considering that both of Kami LP's off-take agreements are based on the Platts benchmark IODEX 62% Fe index, the Platts benchmarks are used for further discussion. For this FS, Kami LP has updated the market price analysis for iron ore (Hatch 2018) from the previous November 2017 PEA.

19.1.2 Premium for Fe Grade

As a first step, a comparison of the spot price and the 3-year trailing average between the Platts 62% Fe and 65% Fe indices was performed and is presented in Table 19-1.

Table 19-1: Spot and 3-Year Trailing Average
 (Source: Platts, Steel Business Briefing as of June 26, 2018)

Benchmark	Spot Price Jun 26, 2018 (US \$/dmt)	3-Yr Trailings Average (US \$/dmt)
Platts IODEX 62% Fe CFR North China	\$64.70	\$63.30
Platts IO Fines 65% Fe CFR North China	\$90.50	\$74.60
Price Premium for 65% Fe Index	\$25.80	\$11.30

As can be seen, the spot price premium per dmt (difference between 65% Fe and 62% Fe benchmarks) stands at \$25.80 (or \$8.60 per 1% Fe increment), at the date of June 26, 2018. On September 1, 2017 this premium stood at \$23.50 (\$7.83 per 1% Fe increment). This clearly shows that higher grade iron ore products attract a significant premium. This premium has remained strong despite the fact that the spot 62% Fe benchmark price has decreased from \$69.90/dmt on September 1, 2017 to \$64.70/dmt on June 26, 2018.

19.1.3 Other Premium/Penalties Applicable to Kami Concentrate

A comparison of the published Platts 65% Fe benchmark composition for both the spot price as of June 26, 2018 and the 3-year trailing average and the Kami fines composition was made and associated unit premiums/penalties were determined as presented in Table 19-2. As can be noted, for Al_2O_3 and for P, the Kami concentrate is well below the Min-Max range covered by the Platts benchmark suggesting that the Kami concentrate is of superior quality for these two parameters. Only the Kami concentrate SiO_2 content is above the Platts reference value, thus generating a penalty. For this Study, it is assumed that a value price premium or penalty is applicable to all elements, even if they are outside of the prescribed range.

Table 19-2: Kami Impurity Premium/Penalty
 (Source: Platts, Steel Business Briefing Daily, June 26, 2018)

Benchmark Parameter	Platts 65% Fe Reference	Kami Fines	Premium/Penalty per Differential (Spot as of June 26, 2018)	Premium/Penalty per Differential (3-yr trailing average)	Within Min-Max
SiO ₂ Content	3.5%	4.3%	\$0.20 /dmt per 1% SiO ₂	\$1.24 /dmt per 1% SiO ₂	4.5% to 6.5% SiO ₂
Al ₂ O ₃ Content	1%	0.1%	\$8.50 /dmt per 1% Al ₂ O ₃	\$1.03/dmt per 1% Al ₂ O ₃	1.0% to 2.5% Al ₂ O ₃
P Content	0.075%	<0.007%	\$1.50 /dmt per 0.01% P	\$0.75 /dmt per 0.01% P	0.09% to 0.12% P

Concerning premiums/penalties relating to impurities, the following trends are observed:

- Spot Premiums/Penalties for SiO₂ and P have fluctuated considerably over the past year. For SiO₂ the spot penalty has decreased significantly from around \$3.50 to \$0.20 per 1% increment, whereas for P, the spot premium has increased from around \$1.00 to \$1.50 per 0.01% increment.
- For Al₂O₃, the trend is quite drastic as spot premiums have increased from under \$2.00 over the course of the first four months of 2018 to \$8.50 per 1% increment, as indicated in Figure 19-1. There is no indication that this is sustainable but if this premium stabilizes at the higher end, it can present significant upside for the Kami concentrate.

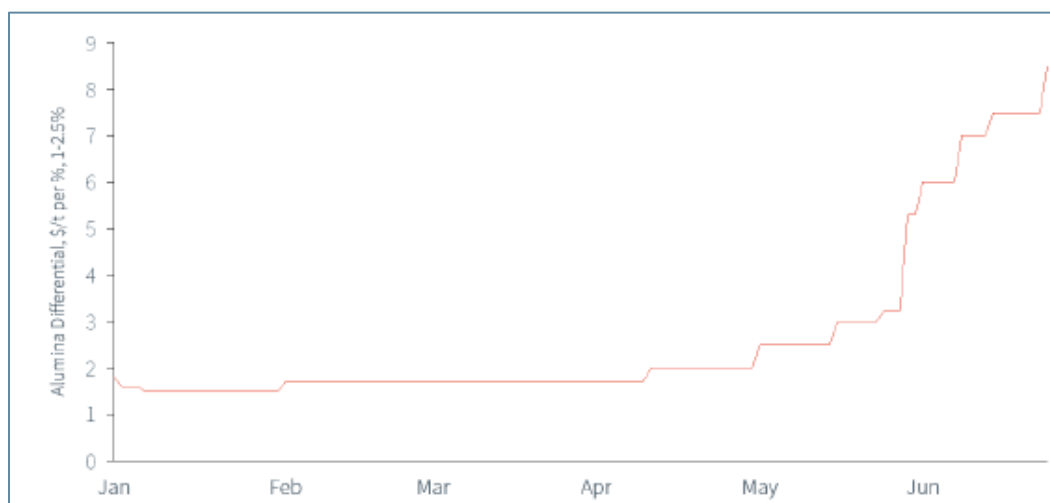


Figure 19-1 Al₂O₃ Spot Premium Trend

19.1.4 Basis for Determination of Concentrate Price Used for Economic Analysis

The high quality sinter fines produced by the Kami Project can potentially attract significant premiums over the standard quality IODEX 62% Fe benchmark product, thanks to its higher Fe grade and its low content of deleterious elements.

Using the aforementioned data and recognizing that the Kami concentrate benchmarks well with the indices used in this analysis, including its low content in Al_2O_3 and P, the assumed selling price for the Economic Analysis presented in Chapter 22 of this Report was determined as follows:

- Considering that both the HBIS and Glencore off-take agreements are based on the Platts IODEX 62% Fe CFR China index, the 3-year trailing average value of \$63.30/dmt (the lowest between spot price and 3-year trailing average) was assumed as the base price;
- The assumed premium for 65% Fe (from 62% Fe content) is \$25.80/dmt based on the current spot price. The spot price is considered to be more representative of the Fe premium than the 3-year average, for the reasons given earlier in this chapter;
- Concerning premiums/penalties for impurities, the Kami concentrate would attract a net premium of US \$5.87/dmt. This premium was based on the lowest of spot and 3-year trailing average and only applied to the Glencore portion of sales since the HBIS off-take agreement, in its current form, does not allow for such a premium.

For this Feasibility Study, the assumed iron ore selling price applicable to the Kami product is discussed in more detail in Chapter 22 of this Report.

19.2 Off-Take and Agreements

Kami LP has two off-take agreements that are in place as of the effective date of this Report. One is with HBIS and the other with Glencore.

19.2.1 HBIS Agreement

The terms of the strategic partnership with HBIS are summarized in Chapter 4 of this Report. In connection with the strategic partnership, HBIS has entered into an off-take agreement pursuant to which HBIS has agreed to purchase, upon the commencement of commercial production, 60% of the actual annual production from the Kami Project, up to a maximum of 4.8 Mt of the first 8.0 Mt of iron ore concentrate produced annually at the Kami Project. The price paid by HBIS will be based on the monthly average price per DMT for iron ore sinter feed fines quoted by Platts Iron Ore Index (including additional quoted premium for iron content greater than 62%) ("**Platts Price**"), less a discount equal to 5% of such quoted price. HBIS will also have the option to purchase additional tonnages at a price equal to the Platts Price, without any such discount. In addition, there are some quality related penalties that may impact final prices depending on the final specifications of the iron ore concentrate shipped. The aforementioned off-take agreement with HBIS can be terminated by HBIS any time after December 2016. As of the effective date of this Report, HBIS has not terminated the agreement, nor has it indicated to Kami LP that it intends to terminate the agreement.

19.2.2 Glencore Agreement

On July 29, 2014, Alderon announced that the Kami LP had entered into an off-take agreement (the “**Glencore Off-Take Agreement**”) with a subsidiary of Glencore plc (“**Glencore**”), with respect to an off-take transaction pursuant to which Glencore will acquire all of actual annual production from the Kami Project that has not been allocated to HBIS. Under the terms of the Glencore off-take agreement, Glencore will be obligated to purchase, upon the commencement of commercial production, 40% of the actual annual production from the Kami Project up to a maximum of 3.2 million tonnes of the first 8.0 million tonnes of iron ore concentrate produced annually at the Kami Project. The term of the agreement will continue until the Kami LP has delivered 48.0 million tonnes of iron ore concentrate to Glencore, which is expected to be 15 years after the commencement of commercial production. The market price paid by Glencore will be based on the monthly average price for iron ore sinter feed fines quoted by Platts Iron Ore Index for 62% iron content (plus additional quoted premium for iron content greater than 62%), less a discount equal to 2% of such quoted price. The agreement also allows for the Seller and Buyer to mutually agree to the use of another index provided that, in the event that Platts establishes an index that is more representative of the specifications of the Product produced from the Kami Mine, then such index will become the index used for the pricing of the Product. In addition, there are some quality related penalties that may impact final prices depending on the final specifications of the iron ore concentrate shipped.

19.3 Railway Transportation Negotiation Status

Kami LP intends to transport its iron ore concentrate the majority of the distance from the Project site to the Port via the section of QNS&L’s railway line that runs approximately 420 km from Wabush Junction, in the town of Wabush, to Arnaud Junction at Sept-Îles, Québec (the “QNS&L Line”). The Iron Ore Company of Canada (“IOC”) owns and operates the QNS&L Line, which provides rail services for both IOC operations and various third party clients (including existing and future mining operations).

Alderon commenced negotiations with QNS&L in 2012 to procure rail service over the QNS&L railway; however, the negotiations have been put on hold while Alderon focuses on its Project financing strategy. Alderon is confident that an acceptable agreement for rail service in this regard will ultimately be reached for the reasons described below.

Generally speaking, rail carriers that hold themselves out as being available to transport goods for third parties are subject to certain obligations referred to as “common carrier” obligations. In Canada, the *Canada Transportation Act* (the “CTA”) codifies the majority of these common carrier obligations as “level of service” obligations. It is important to note, however, that under the CTA a rail carrier does not have to hold itself out as providing transportation services in order to be subject to level of service obligations. Rather, a rail carrier simply needs to hold a

certificate of fitness under the CTA to be subject to the CTA. The QNS&L Line is subject to the CTA because it holds a certificate of fitness issued by the Canadian Transportation Agency (the “Agency”) on November 2, 2007. In summary, a CTA-regulated federal railway must:

- Provide adequate and suitable accommodation for (a) receiving and unloading all traffic ordered for carriage and (b) carriage and delivery of traffic;
- Receive, carry and deliver traffic without delay and with due care and diligence;
- Provide and use all proper equipment, accommodations and means necessary for the foregoing functions; and
- Provide any other customary or usual service incidental to railway transportation.

A rail carrier must take, carry and deliver traffic upon payment of the lawfully payable rate. A lawfully payable rate is a rate established either by way of a lawful tariff or pursuant to a confidential contract. Tariff rates are most commonly used in short-term or infrequent shipping relationships. Confidential contracts tend to be used in situations where it is in both parties’ interests to enter into a long-term contract at a lower commercial shipping rate.

Unless it enters into a confidential contract with a shipper, pursuant to Section 126 of the CTA, a rail carrier may not charge a rate in respect of the movement of traffic unless the rate has been set out in a tariff that has been issued and published in accordance with the CTA. In addition, a rail carrier shall, at the request of a shipper, issue a tariff in respect of the movement of traffic on its railway. Section 119 of the CTA provides that tariffs have effect from the date stated in the tariff until they expire or are superseded by a new tariff. A rail carrier must publish a notice 30 days’ prior to increasing its tariff.

As noted above, Section 126 of the CTA allows rail carriers and shippers to enter into confidential contracts. Confidential contracts typically include, among other things, the rates the rail carrier will charge the shipper and the specifics according to which the rail carrier will fulfill its level of service obligations. No party to a confidential contract is entitled to submit a matter to the Agency for final offer arbitration without the consent of all other parties thereto. In the event a shipper brings a service level complaint to the Agency, the terms of any confidential contract between the shipper and the relevant rail carrier will be binding on the Agency.

Section 116 of the CTA enables shippers to bring a complaint to the Agency that a rail carrier is not fulfilling its level of service obligations. QNS&L Line has been the subject of level of service complaints in the past when it attempted to change or reduce a customer’s level of service.

The CTA provides shippers with a number of remedies to obtain service and rates from a rail carrier if negotiations fail. Alderon, as a potential shipper claimant against QNS&L Line, is most likely to employ the CTA’s final offer arbitration mechanism to obtain a remedy. Part IV of the CTA sets out the process for conducting final offer arbitration. If a rail carrier and a shipper are

unable to come to terms acceptable to a shipper who is dissatisfied with the rate charged or proposed by a rail carrier or with the conditions associated with the movement of goods, such shipper may submit the matter for final offer arbitration. A shipper seeking final offer arbitration will normally include its required service levels as part of its final offer. The Agency facilitates final offer arbitration, but such arbitration is not a proceeding before the Agency. Nonetheless, a decision of an arbitrator appointed under the CTA is enforceable as if it were an order of the Agency. It is worth noting that any decision of an arbitrator under CTA final offer arbitration is only valid, unless the parties agree otherwise, for a maximum term of one year. However, rates established by arbitration, although only valid for one year, tend to provide the starting point for negotiations in subsequent years and any subsequent final offer arbitration process.

19.4 Discussions Regarding Access to Port Terminal Facilities at Pointe-Noire

Société Ferroviaire et Portuaire de Pointe-Noire ("SFPPN") is a private/public corporation whose principle mandate is to develop and enhance assets acquired from Cliffs Natural Resources in order to provide multi-user access to its port terminal facilities as well as access to the multi-user ship loading facilities owned and operated by the Sept-Îles Port Authority. The installation is capable of reaching a capacity of 40 million tonnes per annum with some upgrades and its key assets include:

- A railway (previously known as CFA) of roughly 38-km linking the main railroad (QNS&L Line) from the North and Labrador to Pointe-Noire through Arnaud Junction;
- An iron ore pellet plant with a nominal capacity of 6 Mt;
- Ship loading and unloading equipment;
- Storage area near port facilities;
- Brownfield and Greenfield industrial lots strategically located near the port, rail and power infrastructure;
- Rolling, handling (transshipment) and storage equipment as well as other assets.

A partnership has been formed between the Québec government's development arm (Société du Plan Nord) and so far with three mining companies (Québec Iron Ore, Tata Steel Minerals Canada and Tacora Resources). These companies are currently users or will become users in the near future. Access to the multiuser port terminal facilities will be given to partners or non-partners alike on reasonable commercial terms. The key advantage of having a multiuser terminal facility is that it removes or substantially reduces the burden on mining companies of having to build their own individual stockpiling and reclaiming infrastructure.

Kami LP has engaged in several discussions with SFPPN. It has been made clear to Kami LP that access to the multiuser port terminal facilities will be granted for the Kami Project subject to a commercial agreement between the parties. This will connect the Project to the Port of Sept Îles' multiuser ship loading facility to which the Kami LP has already secured access to. The details of this access will be discussed later in this chapter.

Kami LP understands that SFPPN is currently undertaking a study for the upgrade of the facilities to the planned capacity of 40 million tonnes per annum. As of the effective date of this FS, these studies have not yet been completed. It is important to note that these studies will provide SFPPN with capital cost estimates to develop its facilities and will serve to guide commercial discussions with future users, including Kami LP.

SFPPN has made clear that it expects users to make financial contributions for the development and upgrade of its facilities, however, no clear guidance has been provided to Kami LP as to the quantum and structure of these financial contributions. As such, the financial analysis presented in Chapter 22 of this Report does not consider any specific capital outlay for the terminal facilities but assumes any capital requirement would be covered under Owner's Costs. Kami LP plans to continue to engage in discussions with SFPPN with the objective of securing an agreement detailing technical and commercial conditions for Kami LP to have access and service at the port terminal facility.

19.5 Port Agreement

On July 13, 2012, Alderon signed an agreement with the Sept-Îles Port Authority (the "Port") to ship a nominal 8 Mt of iron ore annually via the new multi-user deep water dock facility that the Port is constructing. Subsequently the Port Agreement was assigned to the Kami LP.

Pursuant to the Port Agreement, Kami LP has reserved an annual capacity of 8 Mt of iron ore that it can ship through the Port. In order to finance the estimated \$220 million cost of the new multi-user dock facility, the Port required binding commitments from the potential end-users to provide a portion of the necessary funds. This buy-in payment will constitute an advance on Kami LP's future shipping fees (wharfage and equipment fees) and as a result, Kami LP will receive a discount on its shipping fees until the full amount of the buy-in payment has been repaid through the discount.

Based on its reserved annual capacity, Kami LP's buy-in payment is CND \$20.46 million (the "Buy-In Payment"), payable in two installments of \$10.23 million each. The first installment of CND \$10.23 million was paid upon signing of the Port Agreement and the second payment of CND \$10.23 million has also been paid.

The Port Agreement includes a base fee schedule regarding wharfage and equipment fees for iron ore loading for Kami LP's shipping operations. The rates, which are within industry norms, commence in 2014 and are on a sliding scale based on the volume of iron ore that is shipped. The term of the agreement is for 20 years from the execution date, with the option to renew for an additional five-year terms, to a maximum of four renewals.

Pursuant to the terms of the Port Agreement, once the multi-user dock is operational, Kami LP was required to provide take-or-pay payments to the Port in the event that Kami LP had not commenced shipping operations. In December 2017, the Port Agreement was amended to provide that the funds previously advanced by Kami LP for the Buy-In Payment will satisfy the take-or-pay obligation and that Kami LP has no further funding requirements in respect to the take-or-pay obligation. Once the funds previously advanced for the Buy-In Payment are fully offset against the take-or-pay obligation, Kami LP is able to reduce its reserved capacity proportionately based on the remaining term of the Multi-User Dock Contract. Kami LP also retains the option to satisfy the take-or-pay payments by making a reduced cash payment and once Kami LP commences shipping operations, the provisions of the Port Agreement will apply. In all other respects, Kami LP retains its rights under the Port Agreement.

As the exact date Kami LP will start production is uncertain and because Kami LP has the option to continue to make a reduced cash payment to preserve the Buy-In Payment, no adjustment has been made to the results of the financial analysis as a result of the amended Port Agreement. Even if the full Buy-In Payment was offset against the take or pay obligation, the impact on the financial analysis would not be material.

Kami LP has had discussions with port loading and handling providers in the Pointe-Noire area. Although agreements have not been finalized with these parties, Kami LP expects the terms of such agreements to be within industry norms.

19.6 Electric Power Supply

On February 19, 2014, the Kami LP entered into a Power Purchase Agreement with NLH pursuant to which NLH agrees to sell electrical power and energy to the Kami LP and the Kami LP agreed to purchase the same from NLH in accordance with the terms of the agreement. Power will be provided based on a rate schedule in line with the Labrador Industrial Rates Policy published in December 2012. It was a condition of the Power Purchase Agreement becoming a binding agreement that a Security Agreement be executed. Alderon announced on February 13, 2014 that the Government of Newfoundland and Labrador had confirmed that it will proceed with the construction of a third transmission line from Churchill Falls to Labrador West (the "New Transmission Line"). The New Transmission Line was intended to supply power to the Kami Project as well as other end users in the Labrador West area. As an end user of the

New Transmission Line, Kami LP provided a security for its commitment to begin purchasing electrical power under the terms and conditions of the Power Purchase Agreement. The first security deposit in the amount of CND \$21 million was due on the signing of the Security Agreement. The remaining CND \$44 million in security deposits was required to be provided to NLH at such time as NLH can reasonably demonstrate that it has additional existing and pending commitments for such amount to construct the New Transmission Line.

Subsequent to Kami LP providing the initial CND \$21 million deposit, construction of the New Transmission Line was halted. In September 2017, the Kami LP and NLH agreed to terminate the Security Agreement. As a result, Kami LP was returned CND \$11.5 million (plus accrued interest) from the release of the CND \$21 million security deposit. In addition, if construction of the New Transmission Line resumes within the next five years, Kami LP will receive a further \$750,000 payment on account of a re-start credit.

The Power Purchase Agreement has not been terminated. However, it is assumed that the New Transmission Line will be required for the Kami LP to receive power under the Power Purchase Agreement. It is assumed that the Kami LP will need to enter into an agreement similar to the Security Agreement at the time of re-start in order for NLH to resume the construction of the New Transmission Line.

19.7 Metso Life Cycle Services Agreement

The Kami LP has entered into a Life Cycle Services Agreement (the “LCSA”) with Metso Minerals Canada, Inc. (“Metso”). The LCSA deals with the supply to Kami LP of certain capital equipment and the provision of services related to the maintenance of the equipment. The main component of the equipment that is being supplied is the Primary Gyratory Crusher, which is a key component of the planned flowsheet for the Kami Project. The LCSA also covers the supply of capital spares, capital tools, a mill liner handler and wear parts required for the operation and maintenance of the majority of the machinery contained in the processing facility.

In terms of services, Metso shall provide planning, supervision, labour, hand tools and consumables to perform the preventative maintenance, normal course and peak mechanical maintenance, wear part replacements, parts management and other identified maintenance services for the equipment and the majority of the other machinery contained in the processing facility on the Kami Project site. Metso will provide a residential site crew to render the services, consisting of an initial mechanical crew of approximately 15 employees and three technical support and administrative personnel. Additional peak maintenance resources will be supplied on an as required basis.

The LCSA applies to all mechanical maintenance in the processing area and not just the equipment supplied by Metso. These include scheduled maintenance – short term and long term; breakdown maintenance; planning & scheduling; maintenance management system; parts/inventory control; lubrication; peak maintenance planning & scheduling; maintenance reporting and analysis; standard job packages; job specific safety analysis; risk assessments; premature failure analysis and related matters.

19.8 Memorandum of Understanding with Duro Felguera

Kami LP and Duro Felguera, S.A. (“DF”) have entered into a memorandum of understanding that provides a framework for the parties to enter into an engineering, procurement and construction contract (the “EPC Contract”) including, among others, the following material terms:

- DF will provide a lump sum turnkey EPC proposal for the Kami Project once Kami LP provides notice to DF that it is ready to proceed;
- DF will use its reasonable commercial efforts to optimize procurement of materials and equipment from China in order to reduce costs and garner efficiencies; and
- The EPC Contract will include such reasonable terms as are required by the senior lenders for the financing of the Kami Project and as agreed by senior lenders and the Parties.

20. ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

Various environmental studies, permitting, and stakeholder engagement activities for the defined Project area have been undertaken prior to halting the Project development in 2014. The Project defined in this Feasibility Study includes the Project area and features on the “Kami Property”, as described in Chapter 18 of this Report.

The information presented in this chapter is primarily based on Kami LP’s activities to date related to the Kami Property. Environmental aspects may require further review and assessment by Kami LP as the Project proceeds through the remaining planning and engineering stages.

20.1 Environmental Setting

The proposed Project is located in Western Labrador, within the Labrador City and Wabush municipal planning areas. Mineral exploration, mining and associated industrial activities have been ongoing in the region since the late 1950s and have become the backbone of its economic sustainability. The Kami Property is flanked by several iron ore mines (IOC’s Carol Lake Project, ArcelorMittal’s Mont Wright Mine, Québec Iron Ore’s Bloom Lake Mine and Tacora Resources’ Scully Mine).

The Kami Property is located to the immediate southwest of the Towns of Wabush and Labrador City, and to the northeast of the Town of Fermont, Québec. These are modern communities that provide a wide range of services and infrastructure. The relatively high standards of living in this region have resulted from the mining developments and associated activities that have characterized the economies of the area over the past several decades. The downturn in the iron ore markets that started in 2013 resulted in layoffs and mine closures as well as the postponement of several expansion projects in the region, and this has had a substantial negative impact on the communities and created significant issues for the region. The recent upswing in iron ore prices has, however, improved the economic outlook for the region.

The existing or baseline conditions of the environment, within and near the Kami Property, reflect the effects of past and ongoing human activities in the region. A range of biophysical surveys (e.g., wildlife, vegetation, freshwater, etc.) were carried out in the Project footprint and larger region to characterize the existing environmental conditions. Regional ambient air quality monitoring indicates that the average air quality in the region is good overall, with SO₂ and NO₂ ambient concentrations being below applicable standards and with total particulate levels occasionally exceeding regulatory guidelines. Similarly, baseline water quality monitoring data shows that existing surface water quality is good, with several parameters slightly exceeding ecological water quality guidelines on occasion. Prevailing winds are from the west and south.

The biophysical environment in which the Kami Property lies is within the Mid Subarctic Forest (Michikamau) Ecoregion of Western Labrador. Habitat types common to Western Labrador are found throughout the Project area. These habitat types support a wide range of wildlife species that are common throughout the region. Species at risk (SAR) and species of conservation concern that have been observed in the Kami Property area include: the Olive-sided Flycatcher (Threatened), and the Rusty Blackbird (species of conservation concern). There were no observations of any SAR plant species within the Project area. Several plant species of conservation concern were recorded in the Project area as well as outside the vicinity of the Project. No caribou were observed in proximity to the Kami Property area during the Project surveys conducted in 2011/12.

Wetlands cover a sizable proportion of the natural landscape of Labrador and are common throughout the Kami Property. Development of the Kami Property has been designed to avoid impacts on wetlands wherever possible; however, the ore body does intersect the Pike Lake South Habitat Management Unit, a designated habitat conservation area under the Town of Labrador City's municipal plan. No unique habitat features were identified within the Management Unit or elsewhere within the Kami Property area and an agreement with the Town of Labrador City was established to offset the Habitat Management Unit in a new area, outside the Project area.

Fish species and fish habitat common to Western Labrador are present within the Kami Property. Recreational fisheries are conducted throughout the region and in close proximity to the Kami Property. There were no observations of any SAR fish species within the Project area, and no commercial or indigenous fisheries have been identified in or near the Kami Property.

Current land and resource use in the vicinity of the Project area includes industrial activities and recreational activities such as cabin use, hunting and trapping, angling, wood harvesting, berry picking, snowmobiling, and boating. Due to the close proximity to the towns of Labrador City and Wabush, recreational land use in this area is extensive and a number of cabins have been identified within the Project area.

The closest Indigenous community to the Project is Schefferville, located approximately 200 km to the north. The Project is, however, located in an area where five Indigenous governments or organizations assert as their traditional territory. There are no treaties or settled land claims that overlap the Project area and although residents of Western Labrador engage in recreational land and resource use activities throughout the region, there is no evidence, based on available information, of current use of lands and resources for traditional purposes by Indigenous organizations in or immediately adjacent to the Project area. Additionally, no historic and cultural resources have been identified in the Project area.

The Environmental Impact Statement (EIS) (Alderon 2012) provides detailed descriptions of the existing biophysical and socio-economic environments that could be affected by the Project for each relevant Valued Ecosystem Component (VEC) pertaining to the Kami Property.

20.2 Jurisdiction, Applicable Laws and Regulations

The Project components and related infrastructure are wholly located within the Province of Newfoundland and Labrador. Mining projects in the Province of Newfoundland and Labrador are subject to Environmental Assessment (EA) under the Newfoundland and Labrador *Environmental Protection Act*, and associated *Environmental Assessment Regulations*. Federal Environmental Assessment is regulated under the *Canadian Environmental Assessment Act*, S.C. 1992, c. 37 (CEAA).

The EA process for the Kami Property was initiated in October 2011 with a formal Registration/Project Description submitted in a prescribed format to the Newfoundland and Labrador Department of Municipal Affairs and Environment (NLDMAE), and the Canadian Environmental Assessment Agency (CEA Agency). The Registration/Project Description was made available to the public and to government agencies for review. On December 8, 2011, following the provincial review, the Minister of NLDMAE advised Kami LP that an EIS was required for the Kami Project under the NL *Environmental Protection Act*. The CEA Agency notified Kami LP that a comprehensive study was required under the *Comprehensive Study Regulations*. The Ministers appointed a joint EA Committee (EAC), made up of provincial and federal government agency representatives, including subject area experts, to review documents submitted by Kami LP and to provide advice to the Ministers regarding the Project.

Final EIS Guidelines for the Project that addressed the requirements of both jurisdictions were issued on June 26, 2012. These guidelines were prepared jointly by the Governments of Canada, and Newfoundland and Labrador to identify the nature, scope, and minimum information and analysis required in preparing the EIS. The EIS was submitted in September 2012 and underwent review by the EAC and was also made available for public and Indigenous review. Comments from the EAC, the public and Indigenous governments and organizations were considered prior to the federal and provincial governments making a determination of the potential environmental impacts of the Project.

At the completion of the EIS review period, the Ministers advised that additional information was required in order to make a decision and a number of Information Requests were issued to obtain that information. Once it was determined that sufficient EIS information had been provided, the two levels of government advised that the Project could proceed. The Project was released from EA by the NLDMAE and the CEA Agency on January 10, 2014 and February 18, 2014, respectively. As part of the Release from the EA process, there were conditions, both

provincially and federally, that Kami LP is required to adhere to. Kami LP is maintaining a conditions/commitments register to track their status and progress and these conditions/commitments should be considered as planning and design of the Project advance.

The NL Environmental Assessment Regulations, 2003, s. 17, outlines the legal term of an EA decision and through written requests, Kami LP can extend the term of the EA decision by six years, i.e., until January 2020. There is no explicit legal term of a decision under CEAA 1992 or CEAA 2012. Where a period of time elapses from the release decision to the start of construction, federal regulators may revisit the Project description to determine if there have been any significant changes from the original Project.

20.2.1 New and Changing Regulations

Regulations at all levels of government continually evolve and change. Several regulations have changed in recent years that could impact Kami LP's current permits and approvals, e.g., fish habitat compensation under Fisheries and Oceans Canada. However, other more substantial changes are expected which could impact the Project.

A proposed "carbon tax" associated with greenhouse gas emissions targets will be implemented in 2018/19 based on legislation set forth by the Government of Canada. How the tax will be applied, and to whom, and how the emissions targets will be met by each province will be decided by the individual provincial governments, however, the Government of Canada has set guidelines and targets that must be achieved.

The NL Government introduced the *Greenhouse Gas Management Act* in 2016, which provides for management of existing larger scale emitters via a "cap and trade" system. Little information is currently available regarding the implementation of this legislation. The NL Government has indicated that they are building a 'hybrid model' that matches with features customized for Newfoundland and Labrador's economy. That model will likely have two phases, one for industry and one for domestic fuels and would likely have less impact on industry than the proposed federal plan. The costs to any greenhouse gas emitter in NL are currently unknown.

The Government of Canada has conducted stakeholder consultation relative to the proposed changes to major environmental regulations. This effort was part of a comprehensive review of environmental regulations in Canada, much of which underwent major changes under the previous Conservative Government. There is potential for significant changes to federal Acts and Regulations such as the *Canadian Environmental Assessment Act*, the *Canada Fisheries Act*, the *Navigation Protection Act* and their associated regulations related to fish, fish habitat, and navigable waters. Any changes in federal regulations may take some time to implement, and could come in late 2018 or 2019.

20.3 Environmental Studies

As part of the EA process, environmental baseline studies for the Kami Property were completed in 2011-2012. Environmental and baseline studies conducted included:

- Air Quality and Noise Monitoring and Modelling (summer and winter);
- Water Resources Studies;
- Freshwater Fish, Fish Habitat and Fisheries Studies;
- Socio-economic Studies;
- Ecological Land Classification;
- Archaeological Surveys;
- Rare Plant Surveys;
- Wetland Baseline Studies;
- Winter Wildlife Surveys;
- Waterfowl Surveys; and
- Forest Songbird Surveys.

An analysis of predicted Project effects is presented for each VEC in the EIS. Upon completion of the effects analyses, it was concluded, in the EIS, that the Project is not likely to result in significant adverse residual environmental effects during construction and normal operating conditions. In the case of economy, employment and business, the residual effects will be positive. The details of the environmental studies and the results are presented in the EIS and related documents, as well as environmental management documents developed during detailed engineering.

As noted in Section 20.2, the NL EA Release has a term of six years, i.e., until January 2020, while there is no legislated term related to the Federal EA Release. If construction has not started by January 2020, or if CEAA determines that there are changes to the Project that warrant further assessment, previous biophysical surveys and environmental studies may need to be repeated.

20.4 Environmental Permitting

Following release from the EA review process, numerous approvals, permits and authorizations are required from municipal, provincial and federal regulators, prior to Project initiation. In addition, throughout Project construction and operation, compliance with terms and conditions of approval, various standards contained in federal and provincial legislation, regulations and guidelines are required. Kami LP received numerous regulatory permits and approvals

subsequent to EA Release in early 2014, primarily related to early construction activities at the Kami Property. The long-lead and key permits and approvals have been maintained by Kami LP, however many 'smaller' permits have been allowed to expire. These expired permits can be obtained in a relatively short period of time when pre-development activities recommence.

Kami LP should continue its efforts to maintain existing long-lead key permits obtained for the Kami Property and should consult with regulators and stakeholders regarding Project status and advise of any proposed or potential changes to the Project.

As previously noted, permits, approvals and authorizations generally contain conditions which, combined with other regulatory requirements and environmental constraints, make up commitments that Kami LP will need to address through Project design and during the development, operation and closure phases. The aforementioned conditions/commitment register for the Kami Property will need to be considered during the remaining design, construction, operations and closure phases of the mine. A list of key permits, approvals and authorizations currently in place for the Property is presented in Table 20-1. Preliminary lists of future permits, approvals and authorizations that may be required from various regulatory agencies are presented in Table 20-2, Table 20-3 and Table 20-4.

Table 20-1: Key Permits, Approvals or Authorizations Currently in Place for Kami Property

Permit, Approval or Authorization Activity	Issuing Agency
Provincial	
Release from EA Process	DMAE – Environmental Assessment Division
Certificate of Approval (for Construction for work under the Abridged Plan) General Environmental Protection Plan Environmental Effects Monitoring Plan VEC Environmental Protection Plan	DMAE – Pollution Prevention Division
Approval of Abridged Development Plan, Rehabilitation and Closure Plan, and Financial Assurance	Department of Natural Resources (DNR) – Mineral Development Division
Surface and Mining Lease Mineral License	DNR – Mineral Lands Division
Federal	
Release from EA Process	Canadian Environmental Assessment Agency
Authorization for Harmful Alteration, Disruption or Destruction (HADD) of Fish Habitat	Fisheries and Oceans Canada (DFO)

Table 20-2: Potential Provincial Permits, Approvals and Authorizations

Permit, Approval or Authorization Activity	Issuing Agency
Permit to Occupy Crown Land	Dep of Fisheries and Land Resources – Crown Lands Division
Permit to Control Nuisance Animals	Dep of Fisheries and Land Resources – Wildlife Division
Permit to Construct a Non-Domestic Well Water Resources Real-Time Monitoring Development Activity in a Protected Public Water Supply Area Certificate of Env. Approval to Alter a Body of Water Culvert Installation Fording Bridge Pipe Crossing/water intake Stream Modification or Diversion Other works within 15 m of a body of water (rail infrastructure, site drainage, dewater pits, settling ponds) Water Use License Permit to Construct a Potable Water System (Water/Wastewater System)	DMAE – Water Resources Management Division
Certificate of Approval for Construction and Operation (Industrial Processing Works) Certificate of Approval for Generators Approval of MMER Emergency Response Plan Approval of Waste Management Plan Approval of Environmental Contingency Plan (Emergency Spill Response) Approval of Environmental Protection Plan Pesticide Operators License	DMAE – Pollution Prevention Division
Blasters Safety Certificate Approval for Storage & Handling Gasoline and Associated Products Temporary Fuel Cache Fuel Tank Registration Approval for Used Oil Storage Tank System (Oil/Water Separator) Fire, Life and Safety Program – Long Form Building Accessibility Registration Certificate of Approval for a Waste Management System Certificate of Approval for a Sewage/Septic System Application to Develop Land for Septic	Service NL –Government Service Centre (GSC)
Approval of Development Plan, Rehabilitation and Closure Plan, and Financial Assurance Mill License	DNR - Mineral Development Division
Quarry Development Permit	DNR – 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	DNR – Forest Resources
Approval to Operate a Railway in Newfoundland & Labrador	Department of Transportation and Works (DTW)

Table 20-3: Potential Federal Permits, Approval and Authorizations

Permit, Approval or Authorization Activity	Issuing Agency
Approval to Interfere with Navigation	Transport Canada
License to Store, Manufacture or Handle Explosives (Magazine License)	Natural Resources Canada
Approval to Operate a Railway	Canadian Transportation Agency

Table 20-4: Potential Permits, Approval and Authorizations – Municipal

Permit, Approval or Authorization Activity	Issuing Agency
Building Permit Development Permit Excavation Permit Fence Permit Occupancy – Commercial Permit Open Air Burning Permit Signage Permit	Town of Labrador City
Building Permit Development Permit Excavation Permit Fence Permit Occupancy – Commercial Permit Open Air Burning Permit Signage Permit	Town of Wabush

20.5 Tailings Management

20.5.1 TMF Design and Operation

The TMF design and operation is presented in Chapter 18 of this Report.

20.5.2 TMF Rehabilitation

If feasible, the TMF cells should be substantially drained at closure to reduce maintenance and to reduce risk of dam failure. Directed flow channels will be provided at each cell to allow for the surface runoff to drain safely to the nearby water courses. Progressive rehabilitation of the completed cells will allow an assessment of the effectiveness of the proposed closure method long before the final closure of the site is required.

For rehabilitation and closure planning and to provide a cost estimate for closure, in consideration of existing local site conditions and the pending completion of revegetation trials, it is assumed that the final tailings surface will be revegetated using techniques employed by adjacent mine operations, e.g., overburden cover, fertilizers and grass seeding, for most of the exposed tailings area. This cover minimizes erosion and dust release while allowing local, natural vegetation to take over with time.

20.5.3 Design Considerations and Recommendations

Environmental Considerations

Based on studies and testing performed to date, the tailings are considered to be non-acid generating (NAG) with low metal leaching potential. However, some waste rock, particularly from the Menihek Formation, is potentially acid generating (PAG). Kami LP proposes to use waste rock in the construction of the starter dams, the separation dykes, and the upstream raise dykes for the tailings facility. Therefore, care will have to be taken to ensure that potentially acid-generating and/or metal leaching waste rock will not be used for the TMF construction, unless it can be shown that these materials can be placed such that they will be permanently covered by water and/or soil (tailings) to prevent the generation of acidic and metals laden drainage.

The potential for red water and sedimentation will need to be evaluated with respect to the updated TMF design. The new design and operational characteristics of the TMF will change the water and effluent management parameters relative to previous designs, and will require further review as this design is developed for construction.

Operational Considerations

The development and operation of the TMF should align with the rest of the mine site infrastructure. Consideration should be given to the storage capacity, accessibility of equipment during construction, operation and closure phases, the distance and elevation from the mill for tailings pumping, and the availability of construction materials. Integration of the TMF with the mine plan and schedule will optimize operations.

Rehabilitation and Closure Considerations

The NLDNR requires that mining companies develop approved closure plans and provide Financial Assurance for the anticipated rehabilitation and closure of all mine site infrastructure. Factors that affect the rehabilitation and closure of the TMF include: long-term geotechnical and geochemical stability of the tailings and associated containment structures, ease of establishing permanent drainage and control of any potential drainage chemistry, dust control, ease of revegetation, and requirements for long-term monitoring and maintenance of the facility. These considerations need to continue to be factored into the TMF design during detailed engineering.

20.6 Waste Dumps

Overburden and waste rock stripped and mined from the Rose Pit will be disposed of at two separate locations. The two locations are designated as the Rose North and the Rose South dumps. These are shown in Chapter 16 of this Report. Waste dump design parameters, based on the FS mine plan, are also presented in this aforementioned chapter. Overburden will be placed in the Rose North dump and waste rock will be placed in the Rose South dump.

Both dumps have been designed to receive larger volumes of material than required by the mine plan developed for this FS and both can accommodate variations in the deposited densities and potential increases in waste material tonnage. Appropriate runoff collection ditches at the toe of each dump will run along the perimeter to convey flow towards sedimentation ponds, prior to discharge to the environment.

20.6.1 Overburden and Waste Rock Management Considerations

Three phases of acid rock drainage / metal leaching (“ARD/ML”) test work have been conducted on the overburden and rock formations across the Kami Project site. The overburden in the mine area that is destined for the Rose North dump is considered to have a very low potential for ARD/ML and is therefore treated as NAG.

Two rock types, Menihek and Katsao formations, that will comprise a portion of the waste rock mined, are considered PAG. Further kinetic test work is required to make a final determination regarding their potential for ARD/ML; however, in the interim these materials should be considered as PAG. An initial Adaptive Management Plan was developed during detailed engineering to manage these two waste rock types within the Rose South waste rock dump. In simple terms, the PAG waste rock will be layered in the waste dump within zones of NAG materials that have sufficient buffering capacity to neutralize any acid drainage generated. These PAG materials would also be placed in the central parts of the dump, thereby minimizing contact with water and oxygen, both of which are required to produce ARD/ML. This mitigation method is commonly employed and is a practical solution where the volumes of PAG material can be contained and buffered in NAG waste materials. The waste rock dump runoff collection and treatment system will confirm that this mitigation method is working.

Development of the waste dumps will be progressive in terms of footprint and elevation. Construction of the perimeter collection ditches and drainage ditches and chutes on the slopes shall be ongoing during dump development and operation. Drainage from the waste dumps generally contains Total Suspended Solids (TSS) and nitrogen species concentrations (ammonia, nitrate (NO₃) and nitrite (NO₂)) during the March and April period, prior to the spring freshet. The collection and drainage ditches will direct surface runoff from the waste dumps to sedimentation ponds that are designed to provide the attenuation required to ensure that water released to the environment meets the applicable regulatory criteria.

Chapter 16 of this Report provides a detailed description of the overburden and waste rock pile design. The waste dump design volumes are considerably higher than the storage requirements based on the current mine plan. In the case of the Rose North overburden dump, the currently estimated storage requirement is approximately 45 Mm³ versus a design storage volume of approximately 76 Mm³, which can be achieved by building to higher elevations. If the full 76 Mm³ design volume is ultimately not required, the final waste dump elevation will be lower and should have no impact on the performance of the dump or rehabilitation and closure plans.

For the Rose South waste rock dump, the estimated waste rock volume of 210 Mm³ is substantially less than the designed volume of 692 Mm³, which can be achieved by building to higher elevations should the mine plan require more storage volume in the future. A detailed study of the waste rock management requirements, considering the ARD/ML Adaptive Management Plan, updated waste rock volumes, and surface water drainage collection and treatment requirements should be undertaken with a view to minimize the height and lateral extent of the waste dump and to optimize the design and haulage requirements.

20.6.2 Waste Dump Rehabilitation

For the Rose North Overburden Dump, which will comprise primarily of overburden materials, only limited organic materials will be required to be spread mixed with the overburden to create a suitable surface medium to promote vegetation growth.

For the Rose South Waste Rock Dump, locally sourced overburden and/or organic soils from site development will be placed over the benches and top plateau of the pile. These areas will then be fertilized and revegetated using grasses and local shrubs and trees. This method will concentrate the organic materials and overburden in areas relatively protected from wind and water scour near the toe of the slopes where the underlying soils will not drain moisture away. These vegetated areas then shed organic materials and seeds, primarily in the prevailing wind direction, which will accumulate and provide an improved organic base for the same vegetation to spread and cover the sloped areas naturally.

20.7 Site Geotechnical

Substantial geotechnical investigations, assessment and design have been completed on the Kami Property. The Project will require significant development across the site including roads, rail lines, conveyors, buildings, tailings dams, sedimentation ponds, waste dumps, etc. This infrastructure requires site development within five areas based on the following groupings: crusher area, tailings impoundment, rail loop, process plant area, and access roads.

Ground surface elevations across the five areas of infrastructure development vary significantly. Soils in the general Project area consist of a relatively thin surficial layer of root mat/peat/topsoil underlain by glacial till materials consisting of compact to very dense granular sand with gravel and occasional silt layers overlying bedrock. Tills up to 50 m thick were encountered in the Rose Pit area and in general, the depth to bedrock in this area is highly variable. Groundwater levels in the Kami Property area are generally close to the existing ground surface.

In general, foundations will be constructed on the dense native soils and/or on bedrock. Locally where loose sand and silt layers were encountered, such as the southern end of Long Lake, pile foundations will be required. In general, all foundations in the Project area will require 3.0 m of soil cover or equivalent for frost protection. For all structures, the surficial organic materials will require removal prior to setting foundations or structural fills.

20.7.1 Crusher Area

The crusher area is located within the central portion of the Project site and may be further subdivided into the following components: crusher, ROM stockpile, mine service building and employee facilities, explosive magazine storage building, mine fuel station, large vehicle parking area, and mine parking area for small vehicles.

Crusher foundations will be located on bedrock or a mud slab depending on the final crusher design requirements and foundation elevation. The bedrock in the proposed crusher area is of good quality and is capable of supporting the anticipated crushed loading. The remainder of the infrastructure, including the explosive magazine storage building, mine fuel station building, mine service building and employees facilities, are suitable for the use of shallow foundations founded on native soil or bedrock.

20.7.2 Tailings Impoundment

The tailings impoundment is located to the southeast of the process plant area in the eastern portion of the site and consists of the polishing pond and tailings pond and their associated dams and structures.

The organic soils will be removed in the footprint of the proposed dams and control structures. The competent *in situ* granular soils will serve as a layer for constructing the dams upon.

20.7.3 Rail Loop

The rail loop area is located in the easternmost portion of the site and may be further subdivided into the following facilities: Kami rail loop dual-culvert, Kami rail loop, reclaim transfer tower, load-out silo, and emergency concentrate stockpile.

The rail loop structures will be either founded on competent *in situ* native soils with shallow foundations and/or on piles. The foundation type will depend upon the structure details. Approach embankments for the rail crossings over streams and river crossings may be constructed with native granular sand materials or rockfill materials. Due to the high groundwater levels, construction of temporary cofferdams will likely be required for construction of crossing structure foundations.

The proposed rail loop will cross some wetland areas. Removal of existing root mat and/or peat soils will be necessary. The use of geosynthetics between the peat and the fill materials may be required. It is likely that regular maintenance of rail tracks due to consolidation settlement will be required in the wetland areas. Control of groundwater and surface water will be required during earthworks and excavation.

Bedrock excavation or blasting may be required in some locations. The use of wire meshing and/or rock bolting will be required to stabilize local instabilities in rock cut slopes. Fill embankments may be constructed with select native granular soils or rockfill materials.

Based on the soils encountered in the boreholes, both the concentrate reclaim transfer tower and the concentrate load-out silo can be supported on a shallow foundation system founded on intact bedrock. With a very thin soil cover over bedrock, the emergency concentrate stockpile can be constructed on *in situ* soils following removal of the root mat and topsoil.

20.7.4 Process Plant Area

The process plant area is located to the west of the access road area in the eastern portion of the site and may be further subdivided into the following infrastructure: crushed ore stockpile, process plant building and structures, fuel unloading and tank farm, and concentrator parking area for small vehicles.

The crushed ore stockpile will be approximately 25 m high. All surficial deposits of organic soils will be removed from the proposed stockpile footprint. The base of the reclaim tunnel located below the stockpile will be excavated in bedrock.

In the area of the process plant buildings, infrastructure will be supported on shallow foundations founded on native granular sands or bedrock, or on piles.

In the area of the fuel unloading and tank farm, these structures will be founded on shallow foundations on competent *in situ* granular soils and/or bedrock.

20.7.5 Access Roads

Site access roads extend from the northeastern end of the Property to the southwest portions, providing access to the various areas of the site. Based on the heavy traffic loads, site access roads will require removal of all organic materials to expose competent *in situ* granular soils or bedrock prior to placement of structural fill. Bridges, rail and/or conveyor crossings will require piled foundations to address the loose/soft sediment deposits within the river valleys.

20.7.6 Structural Fill

A detailed study of available structural fill materials was conducted during the detailed engineering phase. Key findings include:

- Some of the waste from the open pit development that could be used as structural fill is PAG. These materials could be used as structural fill in the TMF, so long as sufficient and permanent water cover is provided to prevent development of poor quality drainage.
- The near-surface bedrock, east of the Waldorf River and Long (Duley) Lake, is of poor quality with respect to its use as structural fill; however, it can be used for light structural loading conditions or for roadways, provided it is capped with a better quality structural fill.
- A good quality rock source was encountered in a ridge northeast of the rail loop. The cost of developing rock from this quarry needs to be considered against the cost of transporting waste rock from the open pit.

An aggregate source, an esker, was identified along the Waldorf River, south of the proposed site development. This esker formation is a source of sand and gravel that should be suitable for on-site concrete production.

20.8 Baseline Hydrogeology

Hydrogeological assessment work has been completed in the area of the proposed Rose Pit and general mine area in support of the EIS and detailed engineering completed for the Kami Property. During the EA process, Natural Resources Canada (NRCAN) requested additional study of the potential effects of the open pit development and pit dewatering on the surrounding surface water bodies. At that time, no additional field work could be completed in the Rose Pit area as permits would not be issued while the Project was in the EA process. In lieu of conducting further field studies, additional desktop study work was performed to provide information to NRCAN regarding the potential for the open pit development to impact surrounding surface waterbodies. Also, a detailed methodology for conducting more robust field and desktop hydrogeological assessments, once the Project was released from EA and prior to

open pit development, was submitted. Execution of this program became a Condition of Release from EA and remains to be completed.

The Kami Property occurs in a landscape comprised of hills and valleys that trend northeast-southwest to north-south across the site. Elevations range from 540 to 700 masl with local slope angles of 2% to 15%. The ground cover is primarily made up of coniferous vegetation with some isolated deciduous and alder growth covering areas of recent forest fires. The site is located in the Lake Plateau in the James Bay region of the Shield Physiographic region. The dominant direction of overland drainage is north and east.

Across the Kami Property, it was found that groundwater flow directions closely follow topography, flowing from local recharge areas at topographic highs towards local topographic lows. On a regional scale, groundwater is recharged in the uplands (Churchill River Basin watershed divide) located to the south and west of the Project, and discharges into the major lakes and streams in the vicinity of the Project. Based on how closely groundwater depths correspond with topography, it is anticipated that local groundwater flow directions will also follow topography. Conceptually, the local groundwater flow directions can be expected to be from local upland areas towards local lowlands that host lakes, streams and wetlands. Groundwater contour maps suggest that the general flow of groundwater on the Kami Property is locally towards topographic lows and Long Lake from southwest to northeast across the site. In general, water levels are highest (flowing artesian above top of casing) in the Rose Pit area around the lake and in the vicinity of the Waldorf River Crossing, and deepest along watershed divides in the upland areas around the Rose Pit. In general, the overburden was found to have hydraulic conductivities (K) ranging from 2.4×10^{-7} to 2.61×10^{-5} m/s. Across the till-bedrock interface, hydraulic conductivities are ranging from 9.5×10^{-8} to 1.2×10^{-6} m/s.

In the open pit area, a hydrogeological study was carried out to provide baseline information on potential groundwater inflows and other hydrogeological concerns. The water table depth is deepest in areas of high elevation and close to grade or flowing aboveground surface at wells located in low lying areas. The groundwater flow directions and gradients in the local area of the Rose Pit vary due to topography and the presence of water bodies at differing elevations. In general, groundwater flow is expected to closely follow topography and flow towards a topographic low running southwest to northeast through the centre of the pit area (Rose Lake). Hydraulic gradients of groundwater were found to range from very low (0.0001) to moderate (0.078). The hydraulic conductivities ranged from 10^{-7} to 10^{-6} m/s for the overburden and 10^{-8} to 10^{-6} m/s for the bedrock. Localized areas within bedrock boreholes were found to have hydraulic conductivities greater than 10^{-6} m/s. A preliminary estimate of groundwater seepage into the ultimate pit indicates an inflow of 4,472 m³/day (683 igpm) for overburden and 6,187 m³/day (945 igpm) for the bedrock. Further discussion of the hydrogeological parameters around the

open pit and the proposed study work to be completed are available in documents submitted to NRCAN (Stantec 2013, The Kami Mine Limited Partnership).

The pre-construction groundwater chemistry of the site is generally characterized as a clear, moderately hard (mean hardness 71 mg/L), electrochemically neutral (mean pH 8.0, mean alkalinity 76.5 mg/L, mean Langelier calcite saturation index -0.6), calcium bicarbonate water of low total dissolved solids (mean TDS 98 mg/L). All analyzed parameters typically meet Guidelines for Canadian Drinking Water Quality (GCDWQ), Health Canada, 2012, with the occasional exceptions of iron (mean 492 µg/L), manganese (mean 310 µg/L) and turbidity (mean 660 NTU attributed to method of sampling – bailing).

Groundwater recharge is locally variable based on topography, overburden thickness and permeability, bedrock permeability, and seasonal thaw periods. Groundwater recharge and evapotranspiration would be expected to occur during the summer months of June through September; groundwater outflow to streams could occur during the remaining periods of the year. In consideration of the low bedrock permeability compared to surficial permeability, the majority of base flow to local streams and lakes likely originates from the overburden.

20.9 Baseline Hydrology and Water Management

Hydrologic studies for the Kami Property were conducted to characterize baseline hydrologic conditions at the Project site and the following components were completed to support the hydrologic study:

- Regional hydrological information review;
- Hydrological and water quality monitoring;
- Climate assessment;
- Water balance assessment;
- Hydrologic and hydraulic analysis; and
- Development of a Project water management plan.

The following sections briefly describe hydrology and water quality conditions at the Kami Property, water supply requirements and water management plan for the Project.

20.9.1 Hydrology and Water Quality

Drainage across the Kami Property site is generally directed north and east through a series of wetlands, lakes and connecting streams that form part of the headwaters of the Churchill River watershed. The west side of the Project site drains through the Pike Lake South and North watersheds north to the Walsh River, which flows into Long Lake. The Kami Property generally drains to Mills Lake, the Waldorf River and Long Lake. Long Lake is the largest lake in the Project area and has a large upstream drainage area. The Project area environmental water balance was modelled on a monthly basis using the USGS Thornthwaite Monthly Water Balance Model and the results are presented in Table 20-5.

Table 20-5: Water Balance Results Under the 30-Year Climate Normal (Year 1982 to 2011) Conditions

Parameters	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Precipitation (mm)	50.0	39.0	54.2	51.9	54.1	83.3	116.1	107.7	94.4	77.3	75.5	54.5	858.1
Evapotranspiration (mm)	2.3	3.2	3.7	8.5	20.0	74.7	89.7	67.5	35.1	8.0	3.1	2.8	318.5
Streamflow (mm)	7.5	3.7	1.9	1.0	81.3	95.3	87.8	78.3	77.9	61.1	29.2	14.6	539.6
Surface Runoff (mm)	6.7	3.4	1.7	0.9	73.1	85.7	79.0	70.4	70.1	54.9	26.3	13.1	485.2
Infiltration (mm)	41.0	32.5	48.8	42.5	-39.0	-77.1	-52.5	-30.2	-10.7	14.4	46.2	38.6	54.4
Recharge (mm)	20.5	16.3	24.4	21.2	-19.5	-38.6	-26.3	-15.1	-5.4	7.2	23.1	19.3	27.2
Baseflow (mm)	20.5	16.3	24.4	21.2	-19.5	-38.6	-26.3	-15.1	-5.4	7.2	23.1	19.3	27.2

Monthly flows, peak flows and low flows at each watershed outlet were estimated using standard hydrologic analysis. Annual hydrology is characterized by major spring freshet and summer flows followed by later fall to winter low flow periods. The monthly flows at Long Lake outlet is presented in Table 20-6.

Table 20-6: Monthly Maximum, Minimum and Mean Daily Flows at the Outlet of Long Lake

Flow Characteristics	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Monthly Maximum Daily Flow, in m ³ /sec	12.5	12.3	10.2	25.1	85.5	51.9	30.2	24.0	14.1	19.8	26.9	19.0
Monthly Minimum Daily Flow, in m ³ /sec	10.1	8.5	8.0	7.2	35.3	26.8	18.5	11.7	9.1	7.3	12.3	10.7
Monthly Mean Daily Flow, in m ³ /sec	11.1	10.2	9.0	11.5	63.8	35.8	24.1	17.7	11.0	12.5	17.9	14.9

A seasonal baseline water quality investigation was conducted in 2011 and 2012. The monitoring results indicated that baseline water quality is slightly alkaline, non-scale forming and soft to moderately hard water with limited buffering capacity. Nutrients and metal concentrations generally indicate good water quality and are below regulatory “baseline” guidelines with just several specific individual metal exceedances.

20.9.2 Water Supply

The largest consumer of water for the Project will be the process plant and much of this water demand will be satisfied by water reclaimed from the TMF. Make-up process water and fresh water supply (potable and other requirements) will be drawn from Long Lake via a pumphouse located on the southeast shore of the lake. For the mine area infrastructure, fresh water supply requirements are modest and will be supplied via a small pumphouse to be located at Mills Lake.

20.9.3 Water Management

A water management plan was developed for the Kami Property to define water management systems and associated facilities that enable economical mine development, reduce mine operational risk and minimize environmental impacts. The specific objectives of the Kami water management plan include the following:

- Minimize impacts on receiving streams and lakes;
- Minimize the consumptive use of freshwater and minimize water takings from water bodies;
- Minimize the water inventory at the site;
- Minimize costs of construction, operation and maintenance of water management systems;
- Provide water management related progressive mine site reclamation and closure.

The following sections highlight the water management plan infrastructure and associated facilities.

Perimeter Ditches, Diversion Works, Dewatering and Water Crossings

Perimeter ditches will be constructed to collect and convey runoff from waste rock disposal areas to sediment ponds before discharging to the receiving water bodies. Perimeter diversion ditches will collect and convey the external surface runoff around the Rose Pit to receiving water bodies. Diversion and perimeter ditches are designed to convey 1:100 year peak flows with a minimum freeboard 0.5 m. A diversion dam and pipe will be provided to store the runoff from headwater areas upstream of the Rose Pit during 1:100 year storm events and divert to the downstream watercourse. Runoff from the Rose Pit, as well as groundwater seepage, will be pumped into a dewatering sedimentation pond before discharging to the receiving water bodies. The recommended Rose Pit dewatering capacity is based on the 1:10 year, 24-hour storm event plus groundwater seepage.

Sedimentation Ponds

Runoff from all the disturbed areas at the Kami Property will be diverted to sediment ponds to provide the required water quality treatment. The sediment ponds are designed to control 1:100 year storm events and to provide water quality treatment by removing particle sizes greater than 5 µm during 1:10 year storm events. An emergency spillway will be provided to convey storm events larger than 1:100 year. The sediment ponds contained by dams, as defined by the Canadian Dam Association (CDA), will be designed to handle the required design flood events and safety criteria specified in the CDA Dam Safety Guidelines.

Water Quality Considerations

Review of baseline water quality at the Kami Property and of expected Project effluent and runoff quality indicated that the following potential water quality concerns should be addressed at each major Project component area:

- Sedimentation;
- ARD/ML;
- Ammonia contamination from entrainment of explosive material residuals; and
- Red water effluent discolouration due to the suspension of very fine iron oxide particles.

The open pit mine and waste rock disposal areas are not expected to generate any adverse environmental effects associated with ARD/ML and red water. Therefore, water quality treatment for ARD/ML is not expected at those sites.

Nitrogen assessment for waste rock disposal areas indicate that ammonia concentrations are expected to be below regulatory criteria, however, the concentrations of both nitrate and nitrite are expected to exceed regulatory criteria. The following mitigation measures will be implemented to bring effluent concentration levels below NL Reg. 65/03 Schedule A:

- Sedimentation ponds will be sized to provide longer residence time for nitrogen species and effluent attenuation;
- Runoff from March to April will be held in the sedimentation ponds and before release to the receiving water bodies.

Surplus water that accumulates in the TMF tailings pond will be collected and held prior to being recycled back to the milling process or released to Long Lake. Sedimentation and red water treatments are the specific water quality considerations for TMF effluent. During detailed engineering, it was determined that sedimentation and red water could be managed using flocculant and through the design retention capacity of the tailings impoundment. As the TMF

design has been modified since this effluent and water management assessment was completed, further review will be required as the new TMF design concept is advanced.

20.10 Rehabilitation and Closure Planning

A Rehabilitation and Closure Plan has been developed for the Kami Project (Stantec 2014). The following sections describe the general rehabilitation and closure philosophies used in the development of the Kami Property Rehabilitation and Closure Plan. The rehabilitation and closure costs estimated in this Study are based on the current Project description. Cost estimates are based on previous closure cost estimates that have been reviewed and updated as required to comply with current guidelines and accepted practices in NL.

20.10.1 Rehabilitation Planning

For mining projects, a Rehabilitation and Closure Plan is a requirement under the Newfoundland and Labrador *Mining Act* (Chapter M-15.1, Sections 8, 9 and 10), which defines it as a plan that describes the process of rehabilitation of a project at any stage up to, and including, closure. Rehabilitation is defined as measures taken to restore a property, as close as is reasonably possible, to its former use or condition, or to an alternate use or condition that is considered appropriate and acceptable by NLDNR. There are three key stages of rehabilitation activity that occur over the life of a mine:

1. Progressive rehabilitation;
2. Closure rehabilitation; and
3. Post-closure monitoring and treatment.

Progressive rehabilitation involves rehabilitation that is completed, where possible or practical, throughout the mine operation stage and prior to closure. This will include activities that contribute to the rehabilitation effort that would otherwise necessarily be carried out upon cessation of mining operations, i.e., closure rehabilitation. In some cases, progressive rehabilitation activities and operational activities may occur concurrently.

Closure rehabilitation involves measures undertaken after mining operations, in order to restore or reclaim the Project area, as close as reasonably possible, to its pre-mining condition. This will include demolition and removal of site infrastructure, revegetation and any other activities required to achieve the requirements and goals detailed in the Rehabilitation and Closure Plan.

Upon completion of the closure rehabilitation activities, a period of “post-closure monitoring” is then required to ensure that the rehabilitation activities have been successful in achieving the prescribed goals. Once it can be demonstrated that practical rehabilitation of the site has been successful, the site will be closed-out or released by NLDNR, and an application made to relinquish the land back to the Crown.

20.10.2 Proposed Approach to Rehabilitation and Closure

Ongoing and future Project planning and design activities will include the proactive consideration of future closure issues and requirements. The site design will follow the concept of “designing for closure” for all site structures. Steps to promote the overall rehabilitation process will include the following:

- Terrain, soil and vegetation disturbances will be limited to that which is absolutely necessary to complete the work within the defined Project boundaries;
- Wherever possible, organic soils, mineral soils, glacial till and excavated rock will be stockpiled separately and protected for future rehabilitation work;
- Surface disturbances will be stabilized to limit erosion and promote natural revegetation;
- Natural revegetation of surface disturbances will be encouraged; and
- Kami LP will incorporate environmental measures in contract documents. As such, contract documents will reflect the conditions specified for the construction and operation of the Project. Contractors will be bound contractually to comply with the environmental protection standards set by Kami LP and be compliant with applicable federal and provincial regulatory requirements.

An environmental monitoring program will be conducted as part of the mine development and this data will be utilized to evaluate the progressive rehabilitation program on an ongoing basis. The Project will be planned and designed to minimize the disturbed area of the site, where possible, and to avoid or reduce environmental effects.

20.10.3 Progressive Rehabilitation

Once the mine advances from the development stage to the operational stage, progressive rehabilitation activities can commence. Progressive rehabilitation opportunities for the site during the operational stage may include:

- Rehabilitation of construction related buildings and lay down areas;
- Grading and revegetation of tailings;
- Stabilization and concentrated revegetation of waste rock and overburden dump areas;

- Development and implementation of an integrated Waste Management Plan;
- Installing barricades and signage around sections of the open pit, where required; and
- Completing revegetation studies and trials.

20.10.4 Closure Rehabilitation

Closure rehabilitation activities will be carried out on the mine site with the general approach as previously noted. As required in the *Mining Act* and associated guidelines, the rehabilitation activities are based on the completion of these activities by Kami LP and its contractors. The closure cost estimates provided are based on the Owner default scenario. In this case, the costing is based on others having to carry out and manage this work and, as outlined in the *Mining Act*, credit for salvageable materials and equipment is not accounted for; even though these options will be pursued assuming Kami LP ultimately completes the closure activities. Closure rehabilitation activities planned for the Project will generally include:

- Removal of hazardous chemicals, reagents and other such materials for resale or disposal at an approved facility;
- Equipment will be disconnected, drained and cleaned, disassembled and sold for reuse or to a licensed scrap dealer. This includes tanks, mechanical equipment, electrical switchgear, pipes, pumps, vehicles, equipment and office furniture;
- Any equipment deemed potentially hazardous will be removed from the site and disposed of in accordance with appropriate regulations;
- Dismantling and removal/disposal of all buildings and surface infrastructure;
- Materials with salvage value will be removed and sold;
- Demolishing all concrete foundations to 0.5 m below surface grade, at a minimum, and burial in place if possible or disposal in an appropriate landfill;
- Filling and sealing of any underground openings such as conveyor tunnels;
- Removal and rehabilitation of fuel storage and dispensing facilities;
- Assessing soil and groundwater conditions in areas that warrant assessment (such as fuel dispensing facilities, chemical storage buildings, ore storage areas, effluent treatment ponds, rail line) and implementing remedial measures where necessary;
- Stabilization and revegetation of waste rock and overburden dump areas;
- Installation of egress areas and barricades and signage around the open pit, as required;
- Exposed tailings not covered and/or revegetated during progressive rehabilitation will be revegetated as required. All effluent control, transportation and treatment systems will be removed;
- Following positive water quality testing results, breaching of sedimentation ponds to allow drainage to surrounding vegetated areas for natural filtration;

- Decommissioning of any dewatering wells/groundwater monitoring wells;
- Re-establishment of general site drainage patterns as near as practical to natural, pre-development conditions; and
- Grading and/or scarification of disturbed areas to promote natural revegetation, or the placement and grading of overburden for revegetation in areas where natural revegetation is not sufficiently rapid to control erosion and sedimentation.

20.10.5 Post-Closure and Long Term Monitoring

The post-closure monitoring program will continue for an anticipated period of six to eight years after final closure activities are completed or earlier, should Kami LP and the appropriate regulatory bodies be satisfied that all physical and chemical characteristics are acceptable and stable. When the site is considered physically and chemically stable, the land will be relinquished to the Crown.

The development of detailed post-closure and long term monitoring programs is not practical until Project design and actual development and operations are sufficiently advanced. The monitoring programs will follow directly from the operating monitoring program to ensure continuity of data sources and provide historical data for monitoring sites. It is expected that monitoring will be conducted on a less regular basis (frequency and the number of sites) as site activities cease. Eventually the monitoring requirements will be reduced and then eliminated over time.

NLDNR has recently adjusted its closure requirements with respect to the TMF. It is now required that long term monitoring and maintenance of the TMF be considered in the Rehabilitation and Closure Plan and associated Financial Assurance. Closure cost estimates must now include a cost to complete dam inspections and dam safety reviews, in accordance with Canadian Dam Association Guidelines, and complete general dam maintenance for a period of 100 years post-closure. It is further understood that NLDNR has adopted a new policy regarding sites containing PAG waste, and that the sites, or portions of these sites, will not be permitted to be relinquished back to the Crown. It is noted that a formal policy has not been adopted and that NLDNR is currently evaluating these issues on a case by case basis.

20.10.6 Cost Estimate for Closure

The cost estimate to complete the Kami Iron Ore Mine Rehabilitation and Closure Plan is based on the level of detail available for the Project at the time of writing.

20.10.7 Financial Assurance

As per the *Mining Act*, a lessee shall provide Financial Assurance as part of a Rehabilitation and Closure Plan. The Financial Assurance is based on the cost estimate for closure presented in the Project Rehabilitation and Closure Plan. Financial Assurance of the Project may be proportioned and deferred to later years considering the stages of development and the associated rehabilitation and closure requirements. Progressive financial assurance payments, based on the aforementioned principles, have been included in the Project Economic Analysis.

20.11 Community Relations

20.11.1 Indigenous Consultation

Approach to Engagement

The Kami LP recognizes the importance of building relationships based on mutual trust and respect with Indigenous governments and organizations that may be affected by the Project, and is committed to working constructively and collaboratively with those governments and organizations over the life of the Project in order to achieve mutually beneficial outcomes. In order to ensure that its engagement efforts are consistent with legal and regulatory requirements and that potentially affected Indigenous governments and organizations are appropriately engaged, Kami LP has developed an *Indigenous Relations Policy*, which is based on the following principles:

- Respect for the legal and constitutional rights of Indigenous peoples;
- Respect for the unique history, diverse culture, values and beliefs of Indigenous peoples and their historic attachment to the land;
- Recognition of the need to pursue meaningful engagement with Indigenous governments and organizations;
- Recognition of the importance of collaboration with Indigenous governments and organizations to identify and respond to issues and concerns.

The *Indigenous Relations Policy* is being implemented through the *Indigenous Engagement Strategy and Action Plan*. The action plan describes a range of engagement activities, actions and initiatives that will assist Kami LP in identifying, understanding and addressing any potential effects of the Project on Indigenous governments and organizations and their current land and resource use for traditional purposes.

Identification of Indigenous Governments and Organizations

The Kami LP *Indigenous Relations Policy* requires engagement with those Indigenous governments and organizations who have treaty rights or recognized or asserted Indigenous rights or title, and who may be affected by the Project. Kami LP has canvassed and reviewed all publicly available information, including information directly provided by Indigenous governments and organizations to Kami LP, in order to gain a general understanding of the nature of known Indigenous interests in the Project area and to identify the Indigenous governments, communities and organizations, which will be engaged by Kami LP. Based upon this review, five Indigenous governments and/or organizations that may be affected by the Project have been identified:

1. Innu Nation (representing the Innu of Labrador);
2. NunatuKavut Community Council;
3. Innu Nation of Uashat mak Mani-Utenam;
4. Innu Nation of Matimekush-Lac John;
5. Naskapi Nation of Kawawachikamach.

Engagement Activities

Engagement efforts with each of these Indigenous governments or organizations commenced prior to Project registration and are ongoing. Major engagement activities include the following:

- Information Sharing Initiatives: Kami LP has provided and will continue to provide each group with a wide range of Project-related information, including the Project registration, the EIS, corporate policies, explanatory brochures and permit applications (translated as appropriate). Kami LP has offered and will continue to offer meeting with leadership and community members to provide Project updates and discuss Project information, as necessary.
- Community Engagement Initiatives: Kami LP has made and will continue to make offers to meet with Indigenous leadership to identify appropriate engagement methods and activities. Kami LP has held or offered to hold community meetings to identify and respond to issues and concerns with respect to the Project. Kami LP has also made offers to conclude formal consultation arrangements, supported by capacity funding, and has provided financial and other support for community initiatives.
- Traditional Land and Resource Use Studies: Kami LP has offered to provide funding and technical resources to conduct traditional land and resource use studies and to collect traditional knowledge to augment Kami LP's understanding of Project effects upon traditional activities. One group accepted this offer and the resulting report was incorporated into the EIS and has been taken into account in Project planning and

design. Kami LP has also offered to meet directly with Indigenous elders and to engage directly with particularly affected members of Indigenous groups, such as families with traditional trap lines in the Project footprint.

- Avoidance or Mitigation Initiatives: Kami LP has expressed its willingness to each group to discuss, where and as appropriate, mitigation and avoidance measures to address potential adverse effects upon current use of land and resources for traditional purposes. Kami LP has offered to conclude benefits agreements with those Indigenous groups whose asserted traditional territory overlaps the Project area.

To date, Kami LP has entered into agreements with the following Indigenous governments and organizations:

- On June 24, 2013, the Kami LP entered into a Community Participation Agreement with the Nunatukavut Community Council (“NCC”) and Innu Nation of Labrador (“Innu Nation”) with respect to the development of the Kami Project. The Community Participation Agreement sets out the basic positions of each of the Kami LP and the NCC and addresses such matters as environmental permitting, training and employment, business opportunities and community initiatives. The Kami LP will provide NCC with capacity funding for the review of permits, participation in any follow-up or monitoring programs, and training initiatives. In return, NCC will support the Kami Project and not take any action that would delay or interfere with the Kami Project.
- On January 21, 2014, the Kami LP and the Innu Nation signed an Impacts and Benefits Agreement (“Innu IBA”) with respect to the development of the Kami Project. The Innu IBA is a life-of-mine agreement that establishes the sharing of benefits that will ensure a continued positive relationship between the Innu Nation and the Kami LP. The Innu IBA represents full and final settlement to the Innu Nation. By entering into the Innu IBA, the Innu Nation has given its consent and support to the Kami Project in keeping with the provisions of the Innu IBA. In return, the Innu Nation will benefit through economic opportunities for community members including employment, training, business opportunities and financial benefits. The Innu IBA also provides for various measures to ensure environment and cultural heritage protection, including the establishment of an environmental monitoring committee. The Innu IBA does not contain any restrictions that would prevent the Kami LP from entering into agreements with other Indigenous governments or organizations.

In addition to the above noted agreements currently in place, Kami LP has engaged the Innu Nation of Uashat mak Mani-Utenam, Innu Nation of Matimekush-Lac John, and Naskapi Nation of Kawawachikamach. Benefit agreement negotiations with each of these organizations are currently in varying stages, i.e., draft or memorandum of understanding. It is Kami LP’s objective to continue to pursue positive and constructive relationships with each of the named Indigenous

governments and/or organizations; therefore, will conduct engagement activities throughout the life of the Project through closure and decommissioning. Based on the planned re-scoping of the Project, Kami LP will consult with Indigenous governments and organizations to advise of the planned changes and to receive feedback.

20.11.2 Community Consultation

Approach to Public Consultation

Kami LP is committed to operating within a sustainable development framework. This means integrating economic, environmental and social considerations in the decision-making processes relating to the Project. A key principle of sustainable development is to consult with stakeholders, e.g., members of the public, communities, associations and government regulators, who may have an interest in, or be affected by, the Project in order to build and maintain positive, long-term and mutually beneficial relationships. Kami LP has adopted a 'Life of Project' approach to public consultation and developed a framework within its Project Consultation Plan, which was included in the EIS. This approach involves engaging stakeholders who may be affected by the Project during the construction and operations phases. The principles guiding the Public Consultation Plan are set out in Kami LP's *Communities Relations Policy*:

- Engage stakeholders through meaningful, transparent and respectful communication and consultation;
- Value, acknowledge and give consideration to the cultural diversity, unique traditions, and the needs and aspirations of local people, communities and other stakeholders;
- Develop relationships with local community leaders and provide timely responses to their communications;
- Understand, acknowledge and respond to the concerns of local people, communities and other stakeholders; and
- Provide Project information and updates on a regular basis.

Kami LP has engaged three communities directly affected by the Project: Wabush, Labrador City and Fermont. A list of key community groups and stakeholders is noted below.

Key Community Groups

- Residents of communities in close proximity to the Project - Labrador City, Wabush and Fermont;
- Municipal governing bodies;
- Local businesses;
- Potential municipal, private and academic partners;
- Non-Governmental Organizations (NGOs) and other community groups and associations;
- Self-identified stakeholders, e.g., participants at consultation activities;
- Relevant regulatory agencies; and
- Print, broadcast and news media outlets.

Stakeholders

Kami LP has developed a preliminary stakeholder list, presented in Table 20-7, belonging to the aforementioned community groups and other group stakeholders. It is expected that the list will be dynamic and will be modified and expanded throughout the life of the Project.

Table 20-7: Preliminary Stakeholder List

Category	Sub-Category	Stakeholder Group
Government	Newfoundland and Labrador (NL) Government	Executive Council Department of Advanced Education and Skills (DAES) Department of Finance (DOF), Department of Justice (DOJ) Department of Health and Community Services (DHCS) Department of Tourism, Culture, Industry and Innovation(DTCII) Department of Municipal Affairs and Environment (DMAE) Department of Natural Resources (DNR) Department of Transportation and Works Intergovernmental and Indigenous Affairs Secretariat Provincial Archaeology Office Service NL Women's Policy Office
	Federal Government	Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) Atlantic Canada Opportunities Agency (ACOA) Canadian Environmental Assessment Agency (CEA Agency) Canadian Transportation Agency (CTA) Environment and Climate Change Canada (ECCC) Fisheries and Oceans Canada (DFO)

Category	Sub-Category	Stakeholder Group
		Major Project Management Office (MPMO) Privy Council Office Transport Canada
Municipal	NL Municipal	Town of Wabush and Town of Labrador City
	Québec Municipal	Town of Fermont
Community Groups	Environment	Le Mouvement citoyen de Fermont
	Economic Development	CLD Caniapiscau Conseil de développement économique d'Uashat mak Mani-Utenam Hyron Regional Economic Development Board Innu Business Development Centre Labrador West Chamber of Commerce Labrador West Employment Corporation Destination Labrador NL Organization of Women Entrepreneurs (NLOWE) Town of Labrador City Economic Development Department Women in Resource Development Corporation
	Outfitters and Recreation	Cabin Owners Newfoundland and Labrador Outfitters Association White Wolf Snowmobile Club
	Education, Social Services, and Health	College of the North Atlantic CSSS de L'Hématite Labrador Grenfell Health Labrador Institute Memorial University, Labrador West Campus Labrador West Status of Women Labrador West Indigenous Friendship Association Labrador School Board Newfoundland and Labrador Housing Corporation Provincial Advisory Council on the Status of Women Royal Newfoundland Constabulary

Consultation Activities

Kami LP has and will continue to conduct a wide range of public consultation initiatives to ensure that stakeholders are apprised of the progress of the Project and afforded an opportunity to express any concerns. Information will be disseminated through digital and print media, including Kami LP's website, email, newspaper advertisements and newsletters and public information sessions. Consultation will take place through the following major engagement activities:

- Participation on Multi-Stakeholder Committees: Kami LP has and will be involved in the Labrador West Regional Task Force and the Labrador West Community Advisory Panel

(CAP). The Task Force is a social development group comprised of local mining companies, municipalities and governments.

- Council and Staff Information Briefings: Kami LP has provided appropriate briefings to the Town Councils of Labrador City, Wabush and Fermont to ensure that these municipalities are informed of the Projects' progress. Kami LP will continue to provide regular briefings and will meet with Town Councils on request, in order to discuss issues of concern.
- Stakeholder Consultation Events: Kami LP has engaged and will continue to engage community stakeholders on the Project by holding regular public information sessions in potentially affected communities to present Project-related information and discuss and respond to community issues and concerns.
- Consultation with Educational and Training Institutions: Kami LP has participated in and will continue to participate in focus groups conducted by educational and training institutions, such as the College of the North Atlantic and Memorial University, in order to communicate its expected human resource requirements during the Project's construction and operation periods.
- Information Briefings with Regulators: Kami LP has engaged and will continue to engage relevant provincial and federal government regulators through information briefings about the Project as required. Briefings will include Project updates and will address issues that are relevant to specific departments.
- Media Relations: Kami LP has engaged and will continue to engage the media as the Project unfolds. Newspaper, radio and cable television advertisements will be used to announce upcoming public consultation events and disseminate important information about the Project to the public. As required, designated Kami LP spokespersons will participate in media interviews to provide information about the Project and address issues and concerns.
- Participation in Follow-up and Monitoring Committees: Kami LP will participate in Project follow-up and monitoring activities including the establishment of committees, as appropriate, with the communities potentially affected by the Project, including Labrador City, Wabush and Fermont.

Kami LP has engaged, and continues to engage, relevant community and government groups on all aspects of the Project.

Agreements

The following agreements are currently in place:

- While not defined as a permit, a major condition of the Provincial EA Release is the establishment of a Benefits Agreement. On May 27, 2014, the Kami LP signed a Benefits Agreement (the “Benefits Agreement”) with the Province of Newfoundland and Labrador with respect to the development of the Kami Project. The Benefits Agreement covers the entire life of the Kami Project including construction, operation and decommissioning. The Benefits Agreement sets out employment, procurement and training benefits. Under the terms of the Benefits Agreement, the Kami LP has committed to provide full and fair opportunity and first consideration for Provincial residents and suppliers. The Kami LP has also agreed to establish an education and training fund commencing after the Kami Project achieves commercial production. The Benefits Agreement also includes a Gender Equity and Diversity Plan. The Gender Equity and Diversity Plan addresses, among other matters, employment and business access for four under-represented groups – women, visible minorities, Indigenous peoples and persons with disabilities. The Kami LP will also implement policies and procedures designed to ensure its worksite is free of discrimination, bias and harassment, and that the worksite embraces the principles of inclusion and diversity.
- On January 21, 2014, the Kami LP signed an Agreement (the “Labrador City Agreement”) with the Town of Labrador City (“Labrador City”) with respect to the development of the Kami Project. A portion of the mining operations for the Kami Project fall within the Municipal Planning Area for Labrador City, an area outside stated town or city limits that has been established in conjunction with the Provincial Department of Municipal Affairs and Environment and the Town Council of Labrador City. The area is part of Labrador City’s development plan. The Town Council exercises full control of the development within the Municipal Planning Area, however, the Town Council does not have the same authority to levy business taxes as they would if the business was located within the town boundary. Under the terms of the Labrador City Agreement, the Kami LP will pay to Labrador City an annual grant based on the Kami Project mining operations that will be located in the Municipal Planning Area of Labrador City. The Limited Partnership will not be required to pay municipal or other taxes except with respect to such assets and business of the Kami LP as may be located from time to time within the town boundary of Labrador City. The Labrador City Agreement is consistent with Labrador City’s approach to all businesses operating within their Municipal Planning Area.
- On March 4, 2014, Kami LP signed a Stewardship Agreement with the Town of Labrador City with respect to development of the Project. A portion of the Project overlaps a Management Unit. Both parties agreed that Kami LP will mitigate the effects of the

Project on the Management Unit in accordance with the terms of the Stewardship Agreement.

- On March 25, 2014 the Kami LP signed a Grant-in-lieu of Municipal Taxes Agreement (the “Wabush Agreement”) with the Town of Wabush (“Wabush”) with respect to the development of the Kami Project. Under the terms of the Wabush Agreement, the Kami LP will pay to Wabush an annual grant-in-lieu of municipal taxes on the Kami Project mining operations that will be located within the boundaries of Wabush. The Kami LP will also provide a capital projects disbursement to Wabush, with the funds going towards required infrastructure needs. Payments under the Wabush Agreement will commence after initial production occurs at the Kami Project. As long as the Company makes the payments required under the Wabush Agreement, Wabush will not seek to charge or assess the Kami LP for any municipal taxes in relation to the Kami Project or the business carried on by the Kami LP on the Kami Project. At the municipal level, Labrador City and Wabush municipal plan amendments to rezone lands when the Kami Project has been completed. The footprint of the Kami Project’s operations in Labrador is located entirely within the municipal planning areas of Labrador City and Wabush. The towns published these amendments in the March 14, 2014 edition of the Newfoundland and Labrador Gazette following their registration by the Provincial Department of Municipal Affairs. These amendments were necessary to permit mineral extraction and mineral workings within the Kami Project area.
- There are 41 cabins located in or near the Project area. Kami LP has engaged with the owners of all 41 cabins with a view to mitigating potential effects from the Project by purchasing these cabins. The following summarizes Kami LP’s negotiations to date:
 - o Kami LP has concluded 23 cabin agreements and, with the exception of one, the associated land interests have been transferred;
 - o Of the remaining 18 cabins, Kami LP previously signed agreements with 16. However, these agreements have lapsed and Kami LP will have to revisit these agreements as the Project advances.

It is Kami LP’s objective to continue to pursue positive and constructive relationships with all relevant community and government groups; therefore, will conduct engagement activities throughout the life of the Project until closure and decommissioning.

21. CAPITAL AND OPERATING COSTS

The Kami Iron Ore Project scope covered in this Feasibility Study is based on the construction of a facility having a nominal annual production capacity of 7.84 Mt of concentrate. The capital cost estimate for the construction of the mine, mineral processing plant and site infrastructure was developed by Duro Felguera (DF) and reviewed by BBA. The capital cost estimate developed by DF was in accordance with the memorandum of understanding between the Kami LP and DF, as described in Chapter 19 of this Report, and was based on an EPC (Engineering, Procurement and Construction) project execution mode. Additional initial capital costs, excluded from the DF scope of supply, were estimated by BBA. Sustaining capital requirements and operating costs were estimated as follows:

- The sustaining capital and operating cost estimates to support mining operations over the life of mine were developed by the BBA mining team based on the mine plan presented in Chapter 16 of this Report;
- The sustaining capital and operating cost estimates related to mineral processing, site maintenance, environmental management, and rail and port services were estimated by the BBA process group;
- Capital costs for the TMF (initial and sustaining) were estimated by DF and were based on quantities provided by Golder, as per its LOM tailings deposition plan. Operating costs related to managing the TMF deposition plan (excluding costs for pumping tailings which are included in mineral processing) were provided by Golder.

Table 21-1 presents a summary of total estimated capital cost for the Kami Project, as updated in the present Feasibility Study.

Table 21-1: Estimated Capital Costs (M US \$)

Estimated Capital Costs (M\$ US)	
Mine (including Contracted Pre-stripping)	\$72.20
Mineral Processing Areas	\$302.81
TMF (Initial Dyke Construction)	\$23.66
Site Infrastructure and Utilities	\$309.90
General (Indirects, Other EPC Related Costs)	\$192.17
TOTAL EPC COSTS (including indirects and contingency)	\$900.74
Pre-stripping Waste Rock Mining By Kami	\$23.79
Capitalized Portion of Mining Equipment Lease	\$26.90
Owner's Costs	\$30.98
TOTAL	\$982.41

The total EPC cost indicated takes into account amounts that Kami LP has paid for purchase of certain equipment such as the AG mill and ball mill. The EPC cost includes the complete scope of supply assigned to DF with typical indirect costs, contingency and profit incorporated. The total Project capital cost, including the Project construction costs, pre-stripping of waste rock by Kami, pre-operational capitalized costs as well as Owner's costs was estimated to be **US \$982.41M**. This capital cost estimate is expressed in constant Q3-2018 US Dollars with an exchange rate of 1.00 CND = 0.77 USD. This preceding estimate table does not include the following items:

- Total cost of the initial mining equipment fleet required for pre-production and Year 1 mining activities, with an estimated value of US \$98.7M, and railcars with an estimated value of US \$55.4M, which will be leased. As such, annual lease payments over the life of the leases are included in operating costs, except for payments that are made in the pre-production years, which are capitalized and included in the total aforementioned capital cost estimate.
- Sustaining capital costs estimated at US \$449.1M (capital expenses incurred from Year 1 of production to the end of the mine life), which includes items such as mine equipment fleet additions and replacements, facilities additions and improvements and costs related to phasing of the TMF dam construction and tailings pumping.
- Costs related to closure and rehabilitation of the mine site in the form of a series of financial security payments. These costs are included in the Project Economic Analysis presented in Chapter 22 of this Report.

Table 21-2 presents a summary of total estimated average, Life-of-Mine (LOM) operating costs, in US \$/t of dry concentrate produced.

Table 21-2: Total Estimated Average LOM Operating Cost (US \$/t Dry Concentrate)

Estimated Average LOM Operating Costs (US \$/t Dry Concentrate)	
Mining	\$11.25
Mineral Processing	\$5.72
General Site	\$0.50
General Administration	\$2.26
Environmental and Tailings Management	\$0.37
Rail Transportation and Port Services	\$10.62
TOTAL	\$30.72

The total estimated operating costs are **US \$30.72/t** of dry concentrate produced. Operating costs include the estimated costs of leased equipment (equipment cost plus interest) over the life of the leases.

Royalties and working capital are not included in the operating cost estimate presented but are treated separately in the Economic Analysis presented in Chapter 22 of this Report.

21.1 Basis of Estimate

The capital cost estimate presented herewith, with the exception of costs related to excavation and hauling of waste rock during pre-production, mining equipment and Owner's costs, was developed by DF and reviewed by BBA. It covers the preparation and pre-stripping of overburden of the open pit mine, the initial construction of the TMF dam and the construction of all infrastructure at the mine and crusher area, the concentrator area and the overland conveyors, rail and road infrastructure. DF developed its capital cost estimate largely based on equipment lists and engineering quantities developed by or provided to DF during the course of detailed engineering and adjusted for the updated Project, as described in this Study.

21.1.1 Type and Accuracy of Estimate

The capital cost estimate has been developed according to DF common practices and standards. The estimate is classified as a Feasibility Study Estimate with a +/-15% accuracy. It is based on an EPC Project execution strategy.

21.1.2 Estimation Methodology

The Cost Estimation Methodology implemented by DF is mainly based on the definition of the Project Work Breakdown Structure ("WBS") and is aligned with that used in detailed engineering. The WBS captures the different areas of the Project to be considered in the estimation and allows the definition of the Scope of Work. Table 21-3 shows the structure used by DF to develop its cost estimate for this FS. For this Report, some of the areas have been grouped for simplification.

Table 21-3: Project WBS

WBS Code	Description
K1	Mining Activities
K2	Processing Areas
K3	TMF Area
K4	Kami Rail
K5	Site Infrastructure
K9	Indirect and Other Costs

- **K1 – Mine Activities:** Includes the costs associated with the development of the Rose Pit pre-production works, which is mainly excavation and hauling of overburden and associated temporary construction facilities and aggregate preparation for construction.
- **K2 – Processing Areas:** Includes the costs associated with the supply and installation of crushing station, conveying equipment, grinding plant, spiral plant, magnetite plant, tailings system, railcar load out, and process utilities.
- **K3 – TMF Area:** Includes the costs associated with the development of the initial stage of construction of the TMF dykes based on MTO's provided by Golder.
- **K4 – Kami Rail:** Includes the costs associated with the development of the rail loop and railway connecting to QNS&L.
- **K5 – On-Site Infrastructure:** Includes the costs associated with the development of buildings, facilities, site, utilities, high voltage transmission/substations from the Nalcor battery limit, surface water management, firewater, roads and bridges, tank farm, etc.
- **K9 – Indirect and Other Costs:** Includes costs for detailed engineering, procurement, other EPC related costs and services, site indirects (such as maintenance and operations of the construction site, etc.) and costs related to off-site accommodations.

During the previous detailed engineering phase, the Project scope of work captured in the WBS was analyzed from a constructability point of view and work packages were developed accordingly. In most cases, the packages defined were developed as Requests for Quotation ("RFQs") and incorporated into the tender process. This approach thus allowed DF to develop its May 2015 EPC proposal to Kami LP. DF defined a total of about 150 packages to develop its EPC, lump-sum price for the Kami Project. The packages included the following:

- Internal Services;
- External Services;
- Detailed Engineering, Procurement, Fabrication and Equipment Supply;
- Construction Packages.

This aforementioned EPC proposal serves as the basis to estimate the capital cost of the Project for this FS. Flowsheet, scope of supply and quantities that were modified in this FS were adjusted within the DF packages (such as the TMF design and tailings dewatering and pumping systems).

In order to update package prices from the 2015 RFQs for this FS, DF engaged vendors of major packages and requested a price update of their proposals. A total of 34 packages, representing 65% of the total direct cost, were updated by vendors. The remaining direct costs were attributed an assumed escalation of 3%.

21.1.3 Assumptions

This capital cost estimate is based on the construction of a facility having a nominal capacity to produce 7.84 Mtpa of concentrate. The design of the facility considered in this FS has largely been based on the information available from detailed engineering developed prior to the Project being suspended, with adjustments described previously in this Report.

The site plan presented in Chapter 18 of this Report, the drawings and 3-D model developed during detailed engineering have been used by DF to estimate and/or revise quantities and generate Material Take-Offs ("MTOs").

Thus, for this FS, DF has developed its capital cost estimate based on the following general assumptions and estimation methodology:

- Mine – Costs associated with surface clearing and pre-stripping of overburden were included in DF's civil works package based on the mine plan presented in Chapter 16 of this Report.
- TMF Area – Costs for the initial dyke construction required for start-up of operations were developed by DF based on MTOs provided by Golder. Unit costs are supported by vendor quotes in the civil works package. Waste rock is delivered to the TMF by Kami mine personnel and related costs are excluded from DF's estimate but included in mining costs.
- Site Buildings – The following modular/prefabricated permanent buildings are considered in the capital cost estimate: mine maintenance shop, garage and warehouse, primary crusher maintenance buildings, mine employee facilities and mine area offices, process plant employee facilities, administration office, auxiliary services buildings, and guard-houses. Drawings and specifications were used to develop this package that was subjected to the tender process.
- Site Works – Excavation volumes and MTOs were derived from detailed engineering.

- Concrete – Quantities were derived from drawings and the 3-D model developed during detailed engineering.
- Structural Steel – MTOs were developed based on the 3-D model.
- Architectural – Siding and roofing quantities were estimated from the 3-D model.
- Mechanical and Process Equipment – A detailed equipment list was developed based on PFDs and P&IDs available from detailed engineering. This was complemented with vendor information obtained from proposals received.
- Mechanical Bulk Quantities – A platework list was developed with sizing, weights and surface areas including lining requirements from the 3-D model.
- Piping, Valves and Insulation – A line list was developed from P&IDs. Most of the quantities were measured from the 3-D model. Initial lengths of reclaim water lines and tailings slurry lines were estimated by DF based on information on deposition points provided by Golder.
- Electrical Equipment – An equipment list was developed during detailed engineering with capacities and sizing derived from the single line diagram provided to DF.
- Electrical Bulk – Quantities have been estimated based on DF references and database.
- Automation – Quantities have been estimated based on DF references and database.

Indirect costs, contingency and EPC contractor overhead, risk coverage and profit are included in the capital cost estimate. These costs are part of the EPC capital cost estimate and are applied to individual construction packages. The following items are included:

- Detailed Engineering Services – These have been estimated by DF based on a quotation received from an engineering firm that took into account detailed engineering performed to date.
- Consultants (including vendor representatives) have been estimated by DF based on quotations received and internal database and factors.
- Site Indirects have been estimated by DF based on experience, internal database and factors.
- Off-site Accommodations include the cost of renting and operating a 400-bed facility or facilities and assumes such facilities are available in the region.
- Freight costs from point of origin to the mine site have been estimated by DF based on quotations received from transportation companies as well as from internal database.
- Insurance costs were estimated by DF based on budget quotation from insurance company.
- In its lump sum EPC price, DF included contingency, profit and other financial instruments such as bonds and guaranties. A 7% contingency is included in the DF capital cost estimate.

The following elements, which are not part of the DF scope, are included in the overall Project Capital Cost estimate and were estimated by BBA as follows:

- Owner's costs include items such as Owner's Project management team salaries and expenses, environmental and stakeholder agreements, commissioning and operational readiness, Project financing, etc. These costs were estimated in collaboration with Kami LP management.
- Costs related to the pre-production mining of waste rock and ore, as determined by the mine plan, to satisfy requirements for the construction of the initial TMF dyke.
- Costs related to initial lease payments of mining equipment required for pre-production and first year of mining operations.

21.1.4 Exclusions

The following items are not included in this capital cost estimate:

- Inflation and escalation beyond Q3-2018. The estimate is in constant Q3-2018 USD;
- Costs associated with hedging against currency fluctuations;
- All taxes, duties and levies;
- Working capital (this is included in the Economic Analysis but not in the capital or operating costs);
- Sunk costs.

21.2 Estimated Capital Costs

The capital cost to develop the Project to an annual production capacity of 7.84 Mtpa is estimated to be **US \$982.41M**. This cost includes EPC costs of US \$900.74M, as estimated by DF for its scope of supply, Owner's costs of US \$30.98M as estimated by BBA in collaboration with Kami LP, pre-production mining of waste rock for TMF construction totaling US \$23.79M and capitalized pre-operation costs of US \$26.90M. This cost excludes the value of leased equipment and sustaining capital required after start-up of operations, as well as the initial security payment related to site restoration and closure costs.

21.2.1 Mine Area EPC Costs

The mine area EPC costs are mainly comprised of pre-production costs related to mining operations, incurred prior to start of production, totaling **US \$72.20M**. These costs were developed by DF based on bids received from heavy civil contractors. These costs relate primarily to clearing and grubbing and overburden removal during pre-production. These costs also include construction development for mine site infrastructure and a plant for producing aggregate for the Project.

21.2.2 Mineral Processing Plant EPC Costs

The mineral processing area EPC costs are estimated at **US \$302.81M**. Included in this area are the crusher station, the overland conveyor, the crushed ore stockpile and ore reclaim system, primary grinding and screening, the spiral plant, the magnetic separation plant, the concentrate conveying system and load-out, and the tailings dewatering and pumping system.

During the previous detailed engineering phase, Kami LP purchased long lead items including the AG and ball mills. Downpayments were also made for other major processing equipment. The amounts already paid for equipment have been deducted from the capital costs. Other process equipment, which is covered under the Metso LCSA, has also been excluded from the capital cost as these costs are included in operating costs.

21.2.3 Tailings Management Facility (Initial Dyke Construction)

The EPC costs related to the TMF initial construction are estimated at **US \$23.66M**. These costs are for the construction of the initial dyke including placement and compaction of waste rock that is delivered to the TMF area from the Rose Pit, by Kami mining personnel and equipment. These costs were developed by DF based on bids received from heavy civil contractors. Quantities and MTOs were provided by Golder based on its TMF design.

21.2.4 Site Infrastructure and Utilities EPC Costs

Site infrastructure and utilities EPC costs are estimated at **US \$309.90M**. Included in this item are site development civil works, buildings and facilities, roads and bridges, rail loop and connecting railway, utilities, on-site power transmission, waste management, water management, fire water and fuel storage, service buildings, etc.

21.2.5 Other EPC Costs (Indirects, Guaranties, Insurance)

Other EPC costs for the Project are estimated at **US \$192.17M**. Indirect costs include costs for EPC services, detailed engineering, procurement, site indirects (such as maintenance and operations of the construction site, temporary facilities, etc.), costs related to off-site accommodations for workers and freight for transporting equipment and materials to site.

21.2.6 Pre-stripping of Waste Rock by Kami

Pre-stripping of waste rock for construction of the TMF as well as for other site construction requirements will be performed by Kami with its mining personnel and equipment, and is therefore excluded from the DF scope of supply and from its EPC capital cost estimate. The

total amount estimated for this activity is **US \$23.79M**. This cost was estimated as part of the mining costs related to the mine plan presented in Chapter 16 of this Report.

21.2.7 Pre-operational Capitalized Costs

These costs consist of the lease payments for leased pre-production and first year mining equipment and amount to **US \$26.90M**. Mining equipment required for pre-production and for the first year of commercial production is assumed to be leased by Kami LP and the value of this equipment is therefore not included in the capital cost but annual lease payments are included in mining operating costs. The value of the mining equipment required for start-up of mining operations is estimated at US \$98.7M.

21.2.8 Owner's Costs

Owner's costs are not part of the EPC scope of supply and have been estimated at **US \$30.98M**. These costs have been previously described in this chapter and have been estimated by BBA in collaboration with Kami LP management.

21.2.9 Sustaining Capital Costs

Sustaining capital comprises capital expenditures required to support operations after start-up. These costs have been estimated at US \$449.1M. Of these, US \$231.3M is associated with additions and replacements to the mining fleet over the life of mine. Other major items included in sustaining capital include:

- Progressive construction of the tailings dykes based on the tailings deposition and TMF development plan over the LOM, based on Golder's TMF design.
- Progressive additions of tailings pumping stations and pipeline as well as reclaim water equipment based on the evolution in pumping distances and elevations, as required by the tailings deposition plan.
- Additions to mine area infrastructure based on evolution of the mine plan (truck wash, maintenance bays, mine area water management, mine electrical loop).

21.2.10 Rehabilitation and Mine Closure Costs

Rehabilitation and mine closure costs have been estimated by Gemtec at US \$42.7M. Disbursements are assumed to be made in a series of financial assurance payments as described in Chapter 20 of this Report. This amount includes an initial security payment of US \$28.0M. These costs are excluded from the total capital and sustaining capital cost estimates previously described.

21.3 Estimated Operating Costs

Average operating costs for the LOM have been estimated at **US \$30.72/t** of dry concentrate produced. This cost represents the cost of concentrate production, rail transportation to the port terminal and loading into a shipping vessel at Pointe-Noire Terminal (i.e. FOB Port of Sept-Îles). Operating costs include annual lease payments related to the purchase of the initial mining equipment fleet and railcars, over the life of the leases. Mining costs vary from year to year based on the mine plan.

Operating costs are based on electricity cost of US \$0.0347/kWh and diesel fuel costs of US \$0.655/litre. It should be noted that the impact from an eventual carbon tax, as announced by the Federal Government, has not been analyzed in this Study.

Operating costs exclude sustaining capital, royalties and working capital which are treated separately in the Economic Analysis presented in Chapter 22 of this Report.

21.3.1 Mining Operating Costs

Mining operating costs have been developed based on the annual mine plan presented in Chapter 16 of this Report. Pre-stripping quantities of ore, waste rock and overburden have been estimated in the mine plan and costs related to pre-stripping activities have been either included in DF's scope of supply and, hence, in capital cost estimate or in capitalized pre-production costs. Mining operating costs are therefore applicable to the LOM starting with the first year of concentrate production, Year 1. Mining operating costs, averaged over the life of the operations, have been estimated at **US \$11.25/t** of dry concentrate or US \$1.74/t of material mined. These include equipment leasing costs.

Table 21-4 presents a breakdown of mining costs.

Table 21-4: Breakdown of the Mining Costs

Category	US \$/t mined	US \$/t concentrate
Equipment Operating Cost	\$0.57	\$3.66
Fuel and Electricity	\$0.32	\$2.04
Blasting	\$0.26	\$1.72
Labour	\$0.48	\$3.09
Services	\$0.02	\$0.16
Total Mine Operating Cost (excluding leasing costs)	\$1.65	\$10.67
Equipment lease	\$0.09	\$0.58
Total Mine Operating Cost (including leasing costs)	\$1.74	\$11.25

Equipment Operating Costs

These costs consist mainly of maintenance costs, which have been estimated by BBA based on experience and 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.

Equipment Fuel and Electricity

Diesel fuel is used to operate mine trucks, loaders, dozers and other mine equipment. Fuel consumption was estimated for each year of operation based on equipment specifications and equipment utilization.

Electric power is supplied to the open pit by a power loop and is used to operate the shovels, drills and mine dewatering pumps. Power consumption was estimated for each year of operation based on equipment specifications and equipment utilization.

Blasting

Blasting costs for ore and waste rock have been estimated based on parameters and powder factors presented in Chapter 16 of this Report. Blasting unit costs were estimated based on an emulsion unit cost of US \$65.50 per 100 kg. Blasting costs also include contractor labour costs for mixing, delivering explosives to the blastholes and loading explosives into the blastholes.

Labour

Labour requirements have been estimated to support the mine plan developed in this Study, as outlined in Chapter 16 of this Report. Labour costs have been estimated based on regional Collective Bargaining Agreements for hourly personnel and competitive wages and benefits for salaried personnel.

Services and Miscellaneous

This element includes costs for items such as clearing and topsoil removal, an allowance for mine dewatering and an allowance for reclaiming of the ore stockpile.

Equipment Leasing

It is assumed that all mine equipment required for pre-production and first year of operation will be leased by the Kami LP. The value of the equipment to be leased was estimated at US \$98.7M. Annual lease payments were calculated based on a 7% interest rate and lease duration of seven years. These lease terms have been estimated based on experience on other projects. It has been assumed that at the end of the lease, the equipment will belong to the Kami LP.

21.3.2 Processing Operating Costs

Table 21-5 presents the LOM average mineral processing operating cost that has been estimated at **US \$5.72/t** of dry concentrate. This is the average operating cost associated with converting ROM material from the crusher to concentrate loaded into railcars at the mine site. Electricity costs increase over the life of the mine, as tailings are pumped to increasing elevations and distances.

Table 21-5: Kami Processing Operating Cost Estimate

Category	US \$/t concentrate
Labour (including Metso LCSA Personnel)	\$1.45
Grinding Media and Metso LCSA Wear Parts and Fixed Assets	\$1.11
Reagents (Allowance)	\$0.21
Electricity (including Site Services)	\$2.42
Maintenance and General Supplies (Allowance)	\$0.53
TOTAL CONCENTRATOR OPERATING COSTS	\$5.72

Labour

The estimated labour costs include costs related to both Kami LP employees and mechanical maintenance employees provided through the Metso LCSA, as described in Chapter 19 of this Report. Labour costs for the Kami LP employees have been estimated based on regional Collective Bargaining Agreements for hourly personnel and competitive wages and benefits for salaried personnel. Kami LP labour count (excluding Metso LCSA) has been estimated at 83 employees, including technical, salaried and hourly personnel.

Grinding Media and Metso LCSA Components

Grinding media consumption and unit prices were estimated by BBA using a variety of sources including recent experience on similar projects. Costs for wear parts for crusher and mills as well as costs related to the Metso fixed asset payment are derived from the Metso LCSA described in Chapter 19 of this Report.

Reagents

Consumptions and unit prices were estimated by BBA using a variety of sources including experience on similar projects, operating data and vendor information.

Electricity

The estimated electric power requirements and consumption for the Kami operation have been presented in Chapter 18 of this Report and allocated to the appropriate areas and activities. This included electricity for grinding, process equipment, electric boilers and services such as HVAC and lighting.

Maintenance

Maintenance costs (excluding maintenance labour) were estimated as a factor of 3% of equipment capital cost. These costs include maintenance supplies and materials.

21.3.3 General Site Infrastructure Operating Costs

An allowance for maintaining roads and facilities has been estimated at **US \$0.50/t** of dry concentrate.

21.3.4 Sales, General and Administration

The Sales, General and Administration ("SG&A") element of operating costs was estimated at **US \$2.26/t** of dry concentrate. This 'all-in' cost estimate was provided by the Kami LP based on the corporate structure envisioned to support operations and includes costs for the Kami on-site administrative and support staff composed of an estimated 25 people. Furthermore, these costs include components related to various agreements with communities, stakeholders and the Impact and Benefits Agreement ("IBA") described in Chapter 20 of this Report.

21.3.5 Tailings and Water Management and Environmental

Annual operating costs averaged over the LOM related to tailings and water management have been estimated at **US \$0.37/t** of dry concentrate. These costs exclude coarse tailings dyke compaction costs which are included in sustaining capital.

21.3.6 Concentrate Rail Transportation, Handling and Shiploading

Concentrate transportation by rail from the Kami rail loop to the Pointe-Noire common terminal facility, unloading and ship loading have been estimated at **US \$10.62/t** of dry concentrate. This includes the costs associated with leasing of 720 railcars for a lease period of 10 years at an assumed interest rate of 7%. This cost was based on information provided by Kami LP as described in Chapter 19 of this Report.

22. ECONOMIC ANALYSIS

The Economic Analysis of the Kami Iron Ore Project was performed using a discounted cash flow model on both a pre-tax and post-tax basis. The Capital and Operating Cost Estimates presented in Chapter 21 of this Report were based on the mining and processing plan developed in this Study to produce an average 7.84 Mt of concentrate annually over the life of the mine ("LOM"). The Internal Rate of Return ("IRR") on total investment was calculated based on 100% equity financing, even though Kami LP may decide to finance part of the Project with debt financing. The Net Present Value ("NPV") was calculated for discounting rates between 0% and 10%, resulting from the net cash flow estimated to be 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 presented. Furthermore, a sensitivity analysis was also performed for the pre-tax Base Case to assess the impact of a +/-25% variation of the Project capital cost, annual operating costs and price of iron ore concentrate. The Economic Analysis was performed with the following assumptions and basis:

- The Project Execution Schedule developed by DF, considering key Project milestones;
- The Economic Analysis was performed for the LOM for the Mineral Reserves estimated in this Study. Operations are estimated to span over a period of approximately 23 years;
- The price of concentrate loaded in ship (FOB) at Port of Sept-Îles assumed in this Economic Analysis is **US \$73.17/dmt**. This price was derived based on the methodology presented in Chapter 19 of this Report and considers the following:
 - o The benchmark reference price is the Platts IODEX 62% Fe, CFR North China. The 3-year trailing average price of US \$63.30/dmt was used.
 - o The Fe premium of US \$27.52/dmt was used for the Kami concentrate grading 65.2% Fe. This was based on the spot price difference between the benchmark Platts IODEX of 65% Fe and 62% Fe, on June 26, 2018, of US \$90.50/dmt and US \$64.70/dmt, CFR North China, respectively.
 - o A price discount of 5% was applied to 60% of the sales volume, in accordance with the HBIS Agreement, as discussed in Chapter 19 of this Report, and no other product quality premiums or penalties were applied on this volume.
 - o A price discount of 2% was applied to the remaining 40% of the sales volume, in accordance with the Glencore Agreement, as discussed in Chapter 19 of this Report. A US \$5.87/dmt premium was applied in consideration of product quality parameters (%SiO₂, %Al₂O₃ and %P) for the Kami concentrate.
 - o Shipping costs from the Port of Sept-Îles to the Chinese port are estimated at US \$16.50/t of dry concentrate. This estimate was based on a study conducted on behalf of the Kami LP by a specialized consultant (SSY Consultancy & Research Ltd., 2016).

- All of the concentrate is sold in the same year of production;
- All cost and sales estimates are in constant Q3-2018 dollars;
- The Economic Analysis includes working capital.
- All sunk costs are not considered in this Economic Analysis;
- A 3% gross sales royalty is payable to Altius.

Table 22-1 presents the undiscounted, pre-tax cash flow projection for the Project. BBA assumed that the initial capital cost disbursement is distributed 28%-56%-16% in Years PP2 and PP1, and Year 1, respectively. This is an assumption that was based on a preliminary disbursement analysis by DF; however, the actual distribution of capital costs may be different.



Table 22-1: Kami Project Table of Undiscounted, Pre-Tax, Cash Flow (M\$ US)

Year	PP2	PP1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Total
Concentrate Production (Mt)			6.44	7.90	7.43	7.73	8.17	8.19	8.13	8.30	7.35	7.45	7.48	7.78	7.96	7.60	8.25	8.18	7.89	8.51	7.74	7.44	7.65	7.95	4.61	176.1
Concentrate Selling Price (\$/t)			\$73.17	\$73.17	\$73.17	\$73.17	\$73.17	\$73.17	\$73.17	\$73.17	\$73.17	\$73.17	\$73.17	\$73.17	\$73.17	\$73.17	\$73.17	\$73.17	\$73.17	\$73.17	\$73.17	\$73.17	\$73.17	\$73.17	\$73.17	\$73.17
Gross Revenue from Sales			\$470.9	\$578.1	\$543.9	\$565.6	\$597.6	\$599.1	\$595.0	\$607.6	\$538.0	\$544.9	\$547.6	\$569.3	\$582.1	\$556.4	\$603.6	\$598.2	\$577.5	\$622.8	\$566.1	\$544.2	\$559.4	\$581.6	\$337.3	\$12 887
Operating Costs			\$205.0	\$236.7	\$244.7	\$251.0	\$262.9	\$260.9	\$257.6	\$262.5	\$255.1	\$263.4	\$259.9	\$269.5	\$265.2	\$246.0	\$241.9	\$221.4	\$218.3	\$221.4	\$215.7	\$212.3	\$209.4	\$207.9	\$121.3	\$5 410
Royalties			\$14.1	\$17.3	\$16.3	\$17.0	\$17.9	\$18.0	\$17.8	\$18.2	\$16.1	\$16.3	\$16.4	\$17.1	\$17.5	\$16.7	\$18.1	\$17.9	\$17.3	\$18.7	\$17.0	\$16.3	\$16.8	\$17.4	\$10.1	\$386.6
Capital Costs	\$8.59	\$973.82	\$40.1	\$36.0	\$33.2	\$13.4	\$9.0	\$47.0	\$61.4	\$0.0	\$36.3	\$15.3	\$53.2	\$42.3	\$26.4	\$2.2	\$0.8	\$1.3	\$15.1	\$10.2	\$1.2	\$1.3	\$1.2	\$1.2	\$1.2	\$1 431.6
Rehabilitation and Closure Costs		\$28.00							\$2.9		\$9.0		\$2.8													\$42.7
Cash Flow (Undiscounted)																										
Total Operating Expenses + Royalties	\$-	\$-	\$219.1	\$254.0	\$261.0	\$268.0	\$280.8	\$278.8	\$275.5	\$280.7	\$271.3	\$279.8	\$276.3	\$286.6	\$282.7	\$262.7	\$260.0	\$239.3	\$235.6	\$240.1	\$232.7	\$228.6	\$226.2	\$225.4	\$131.4	\$5 796
CAPEX Disbursement Incl. Rehab	\$269.5	\$591.9	\$189.2	\$36.0	\$33.2	\$13.4	\$9.0	\$47.0	\$64.3	\$-	\$45.3	\$15.3	\$55.9	\$42.3	\$26.4	\$2.2	\$0.8	\$1.3	\$15.1	\$10.2	\$1.2	\$1.3	\$1.2	\$1.2	\$1.2	\$1 474.2
Working Capital			\$24.3	\$6.3	\$(3.5)	\$1.3	\$1.7	\$(0.4)	\$(0.9)	\$0.7	\$(5.2)	\$(0.1)	\$ (0.1)	\$1.0	\$1.4	\$(0.5)	\$4.3	\$1.3	\$(1.5)	\$3.5	\$(4.3)	\$(1.5)	\$1.5	\$2.0	\$(31.1)	\$-
Annual Cash Flow	\$(269.5)	\$(591.9)	\$38.2	\$281.8	\$253.2	\$282.9	\$306.1	\$273.6	\$256.1	\$326.3	\$226.6	\$249.9	\$215.5	\$239.4	\$271.6	\$292.1	\$338.5	\$356.3	\$328.3	\$369.1	\$336.5	\$315.9	\$330.6	\$353.1	\$235.9	\$5 616.1
Cumulative Cash Flow	\$(269.5)	\$(861.3)	\$(823.1)	\$(541.3)	\$(288.1)	\$(5.2)	\$300.9	\$574.5	\$830.6	\$1 156.9	\$1 383.5	\$1 633.4	\$1 848.9	\$2 088.3	\$2 359.9	\$2 652.0	\$2 990.5	\$3 346.8	\$3 675.1	\$4 044.2	\$4 380.6	\$4 696.5	\$5 027.1	\$5 380.1	\$5 616.1	

PP = Pre-production



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%, 5%, 8% and 10%. The Base Case NPV was assumed at a discount rate of 8% following discussions with Kami LP. Table 22-2 presents the results of the Economic Analysis for the Project, based on the assumptions and cash flow projections presented previously.

Table 22-2: Economic Analysis Results (Pre-Tax)

IRR =24.6%	NPV (M\$)
Payback = 4.0 years	
Discount Rate	
0%	\$5 616 M
5%	\$2 626 M
8%	\$1 698 M
10%	\$1 270 M

22.1 Taxation

The Project is subject to three levels of taxation, including federal income tax, provincial income tax and provincial mining taxes. The following information regarding Project taxation was provided by Alderon and was not verified by BBA:

- Income tax is payable to the Federal Government of Canada pursuant to the *Income Tax Act (Canada)*. The applicable federal income tax rate is 15% of taxable income;
- Income tax is payable to the Government of Newfoundland and Labrador under the *Income Tax Act, 2000 (Newfoundland and Labrador)*. The applicable provincial income tax rate in Newfoundland and Labrador is 15% of taxable income;
- Part VII of the *Revenue Administration Act (Newfoundland and Labrador)* imposes the following taxes on operators of mines in Newfoundland and Labrador:
 - o A 15% tax on taxable income;
 - o Taxable income of the operator is calculated as net income, less the greater of 20% of the net income (if positive) or amounts paid to a person who receives royalties subject to the mineral rights tax. The applicable tax rate is 15%. Net income is the gross revenue of the taxpayer less all expenses reasonably incurred in mining operations, processing, and smelting. Operators can also claim allowances for depreciation and processing. This processing allowance is the lesser of 8% of the cost of the processing facility and 65% of the net income before the processing allowance. A credit is available against the 15% tax on mining taxable income for a

- year. The credit applies for ten (10) consecutive years beginning in the following year in which commercial production is achieved. The cumulative amount of the credit cannot exceed \$20 million. The amount of the credit for a year is the lesser of \$2 million and corporate income tax payable under the *Income Tax Act, 2000 (Newfoundland and Labrador)* in the preceding year;
- o A 20% tax on amounts taxable;
 - o A 20% tax applies to amounts taxable, which are calculated as 20% of the net income (as determined above under “Tax on Taxable Income”), if positive, minus amounts paid to a person who receives royalties subject to the mineral rights tax;
 - o A 20% mineral rights tax;
 - o Mineral rights tax is applicable 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 under the *Mineral Act (Newfoundland and Labrador)*. The annual tax is 20% of the net revenue received in the year in excess of \$199,999. Where the consideration received is from an operator and the net revenue of the person in that year is \$100,000 or less, no mineral rights tax is payable. Where net revenue in a year is greater than \$100,000 and less than \$200,000, the tax payable is 40% of net revenue in excess of \$100,000;
 - o The Kami Project is owned by a limited partnership entity that is not directly subject to federal or provincial income tax. The partnership is subject to mineral tax. The after-tax analysis applies corporate income tax rates on the basis that all partners are corporate entities subject to income tax in Canada. The after-tax analysis does not attempt to reflect any future changes in the partnership structure or property ownership;
 - o 100% equity financing and therefore does not consider interest and financing expenses;
 - o The gross sales royalty and offtake sales fee are treated as royalties subject to deduction for provincial tax purposes;
 - o Actual taxes payable will be affected by corporate activities and current and future tax benefits have not been considered;
 - o Tax attributes accumulated by the corporate partners prior to the effective date of the analysis have not been considered.

Table 22-3 presents the results of the post-tax financial analysis. Annual taxation amounts were provided by Alderon’s taxation consultant.

Table 22-3: Post Tax Economic Analysis Results

IRR =18.2% Payback = 4.9 years	NPV (M\$)
Discount Rate	
0%	\$3,298M
5%	\$1,445M
8%	\$866M
10%	\$598M

22.2 Sensitivity Analysis

A sensitivity analysis was performed whereby initial capital cost, annual operating costs and product selling price were individually varied between +/-25% to determine the impact on Project IRR and NPV at an 8% discount rate. Results are presented in Table 22-4, as well as graphically in Figure 22-1 and Figure 22-2.

Table 22-4: Sensitivity Analysis Table (Pre-Tax)

	Base Case	Initial CAPEX \$982.4M		Selling Price \$73.17/dmt		OPEX \$30.72/t con	
		+25%	-25%	+25%	-25%	+25%	-25%
		\$1,228M	\$737M	\$91.46/t	\$54.88/t	\$38.40/t	\$23.04/t
IRR	24.6%	20.0%	31.7%	35.7%	12.3%	19.1%	29.8%
	NPV	NPV	NPV	NPV	NPV	NPV	NPV
0%	\$5,616M	\$5,370M	\$5,862M	\$8,722M	\$2,510M	\$4,264M	\$6,969M
5%	\$2,626M	\$2,390M	\$2,861M	\$4,359M	\$892M	\$1,855M	\$3,397M
8%	\$1,698M	\$1,468M	\$1,928M	\$2,991M	\$405M	\$1,117M	\$2,278M
10%	\$1,270M	\$1,044M	\$1,496M	\$2,355M	\$185M	\$781M	\$1,760M

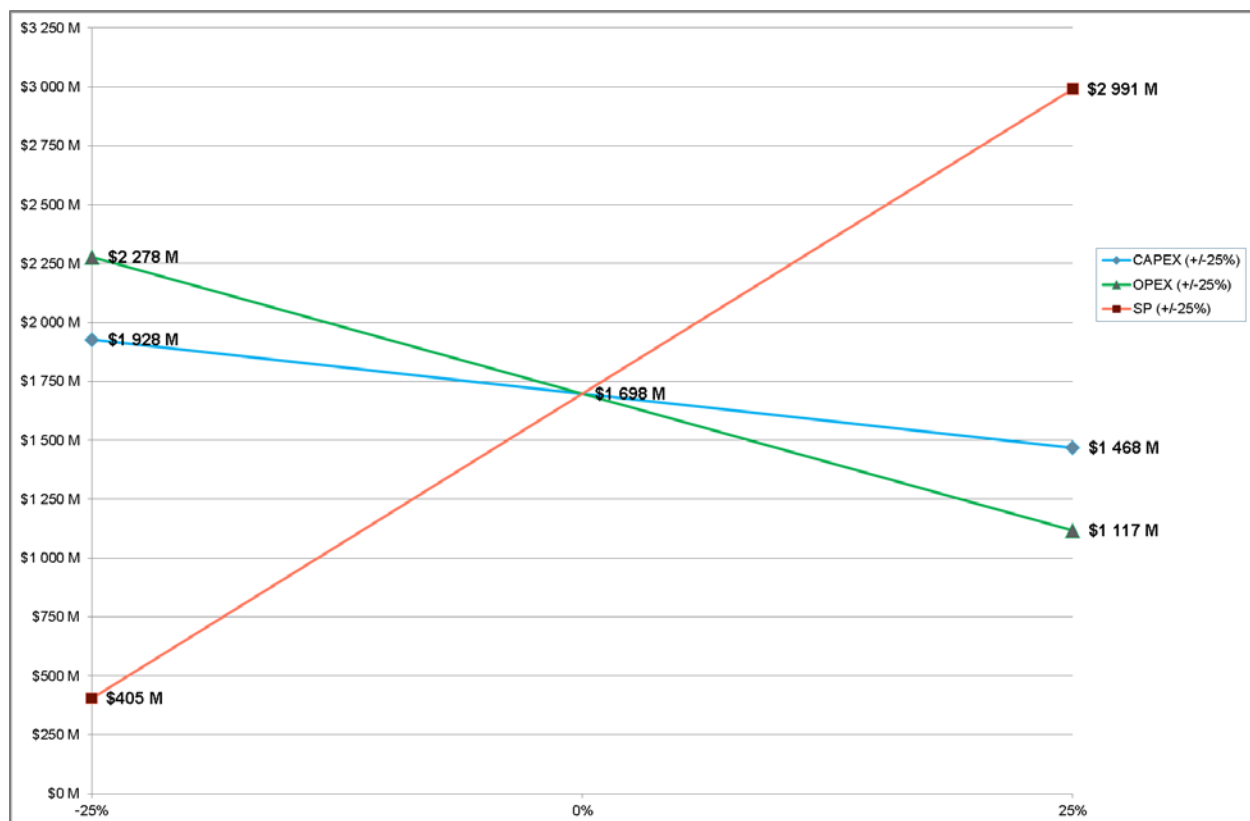


Figure 22-1: Sensitivity Analysis Graph for NPV

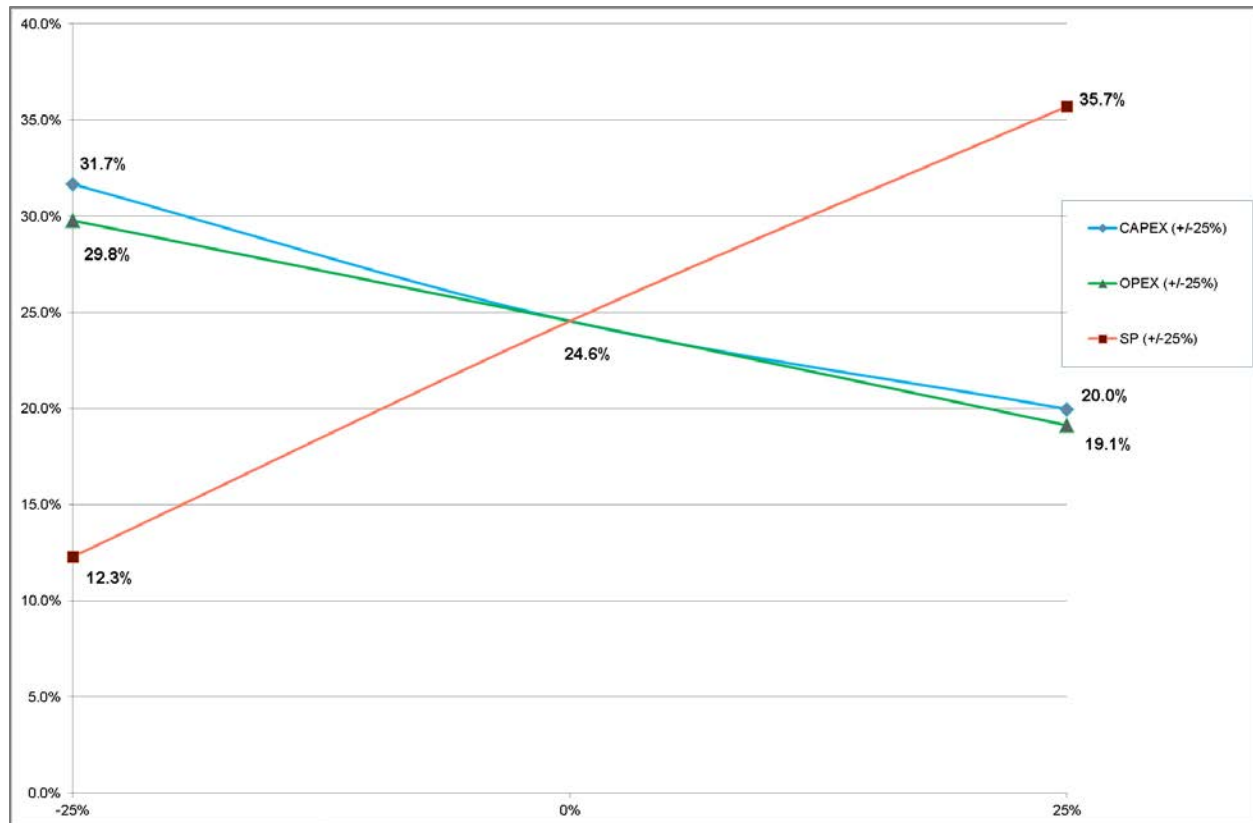


Figure 22-2: Sensitivity Analysis Graph for IRR

23. ADJACENT PROPERTIES

The Kami Property is located in proximity to the mining towns of Wabush, Labrador City and Fermont, and surrounded by deposits of similar iron mineralization as found on the Property, although showing some variations in geology and the character of the mineralization.

Set out below is a brief description of the operations in the area. The information in this section has not been independently verified by the QPs who have prepared this Report and the information is not necessarily indicative of mineralization on the Kami Property.

23.1 Iron Ore Company of Canada – Carol Lake

Located north of the Kami Property, the Iron Ore Company of Canada (“IOC”) is a Canadian producer of iron ore concentrate and iron ore pellets that serves customers worldwide. Operation began in 1962 and IOC has processed over 1 billion tonnes of crude ore since. The company operates a mine, a concentrator and a pelletizing plant in Labrador City, as well as deep-water port facilities in Sept-Iles, Québec. Through its ownership of the QNS&L railway, it also operates a 418 km railroad that links the mine to the port. Managed by the Rio Tinto Iron Ore group, IOC is a joint venture between Rio Tinto (58.7%), Mitsubishi (26.2%) and the Labrador Iron Ore Royalty Income Corporation (15.1%). IOC currently employs more than 2,500 employees and has the capacity to produce approximately 23.3 Mtpa of iron ore concentrate, out of which 12.5 Mtpa can be pelletized. In 2015, IOC received government approval to move forward with the Wabush 3 Project, an additional open pit located southeast of the existing Luce Pit which will expand IOC’s iron ore resources to feed existing production. The project was, however, put on hold in 2016.

23.2 Tacora – Formerly Wabush Mines (Scully)

The Scully deposit is located directly to the north of the Kami deposit. Operations began in 1965 but were idled in 2014. Mining and concentrating took place in Wabush, while pelletizing was done at the Pointe-Noire plant, near Sept-Iles, Québec. The Scully mineralization consists primarily of hematite with minor magnetite content.

23.3 ArcelorMittal Mines Canada – Mont-Wright

Located west of the Kami Property, on the Québec side of the border, ArcelorMittal Mines Canada (“AMMC”) operates the Mont-Wright iron ore property. AMMC is a Canadian supplier of iron ore products for the national and global steel market. Operation at Mont-Wright began in 1975. Receiving ore from an extensive deposit in Mont-Wright and its mine in Fire Lake, the Mont-Wright mining complex also includes a crusher, concentrator and a vast array of supporting infrastructure. Concentrate is transported via AMMC’s 420-kilometre railroad to Port-Cartier. Managed by ArcelorMittal, AMMC is 85% held by ArcelorMittal, while the POSCO and China Steel Corporation hold a minority interest of 15%. AMMC currently employs some 2,300 employees and has the capacity to produce approximately 24 Mtpa of iron ore concentrate part of which is pelletized in its pellet plant which has a capacity of 10 Mtpa. The Mont-Wright mineral resources amount to 5.6 billion metric tons of ore and the current mining plan runs to 2045.

23.4 Québec Iron Ore – Bloom Lake

Located northwest of the Kami Property, on the Québec side of the border, Bloom Lake started commercial production in 2010 but was idled late 2014. Operations consist of open pit mining, crushing and grinding and gravity concentration. In 2016, Champion Iron Mines, through its subsidiary Québec Iron Ore (“QIO”), acquired the Bloom Lake assets from Cliffs. Ressources Québec holds a 36.8% equity interest in QIO, with Champion owning the remainder. Currently under care and maintenance, QIO has been preparing to restart operations with the implementation of a new mine plan as well as process improvements.

24. OTHER RELEVANT DATA AND INFORMATION

24.1 Project Execution Plan

The capital cost estimate for the EPC portion of the Project, as developed by DF and described previously in this Report, was based on a project execution plan (PEP) developed at a high level by DF as part of its 2015 EPC proposal to Kami LP. It includes key elements of the Project control plan.

Following this Feasibility Study, the Kami LP plans to quickly undertake project financing activities. Once project financing is secured, it will be followed by a resumption of project execution activities including detailed engineering, procurement and permitting followed by construction activities. The Project Schedule key milestones is presented in Table 24-1 and covers the period of pre-construction activities as well as summarizes the key milestones found in DF's project schedule from start of construction to project handover to operations.

Table 24-1: Key Project Milestones

Major Milestones	Month
Assemble Owner's Team	M -11
Award of EPC Contract and Resume Detailed Engineering	M -7
Permit to Start Construction Available	M0
Start Construction	M0
First Concrete	M8
First Structural Steel at Concentrator	M12
Construction Completed	M26
POV Completed	M27
Commissioning Completed and Full Handover to Operations	M29

The major assumptions driving key milestones in the project schedule are as follows:

- All the permits and assessment processes needed for the start of the construction period will be issued on a timely basis;
- Some tree-cutting and preparation work can begin in January but heavy construction is planned to start in the month of April (Month 1), as soon as the permit is issued and the preparation works are completed. A construction schedule of 26 months is envisaged to be followed by gradual operations start-up including Pre-operational Verifications ("POV") and commissioning followed by handover to operations (3-month period).

- It is assumed that the temporary camp facility for construction workers to be located off-site will be an existing and available facility that will be rented by the EPC contractor.

To support the construction schedule, EPC activities need to be executed as follows:

- The main EPC services contractor will have to be selected at least 7 months in advance of start of construction. Procurement activities are based on delivery of remaining long lead items that have not been advanced in the previous detailed engineering phase.
- Construction activities, including mine pre-stripping and preparation, are part of the construction plan and are in part dependent on the Owner's mining fleet. As such, Owner construction activities need to be coordinated with those of the EPC contractor.
- Procurement of Owner's mining equipment to support construction and first year of mining activities needs to be done on a timely basis in order to assure that operations can begin as scheduled. This should be addressed early in the EPC mandate by the Owner's team who will be responsible for procurement of mining equipment. The Owner will also need to expedite activities related to power availability to the site as per the agreement with NLH. This includes the supply of 46 kV power required for construction.

Engineering and Procurement

Detailed engineering needs to resume at least seven months before start of construction, with the revision of the existing engineering and confirmation of the procurement specifications for the major equipment, including but not limited to mechanical and electrical long lead equipment, prioritizing equipment that is critical to plant layout and structural design. This will allow resumption and completion of the major equipment orders in the first months of the construction period.

Design changes brought about in this FS, especially those related to tailings dewatering and pumping need to be given top priority and need to be integrated within the plant design developed previously during detailed engineering. Value engineering, as recommended in Chapter 26 of this Report should also be undertaken, preferably before detailed engineering begins.

The first engineering drawings and specifications that will be issued for construction are for access roads, electric power lines within the Kami mine site, site preparation and concrete.

Construction Camp

Kami LP does not expect to construct a temporary construction camp. Local contractors providing construction workers for civil earthworks and concrete will not require room and board. EPC staff, contractor's supervision and Owner's team will be residing within the municipalities.

Other contractors providing workers on a fly-in-fly-out basis will require room and board. DF prepared a preliminary manpower curve for such workers, which is presented in Figure 24-1. For this FS, it is assumed that lodging and cafeteria services for these workers will be available within the municipalities of Labrador West and Fermont.

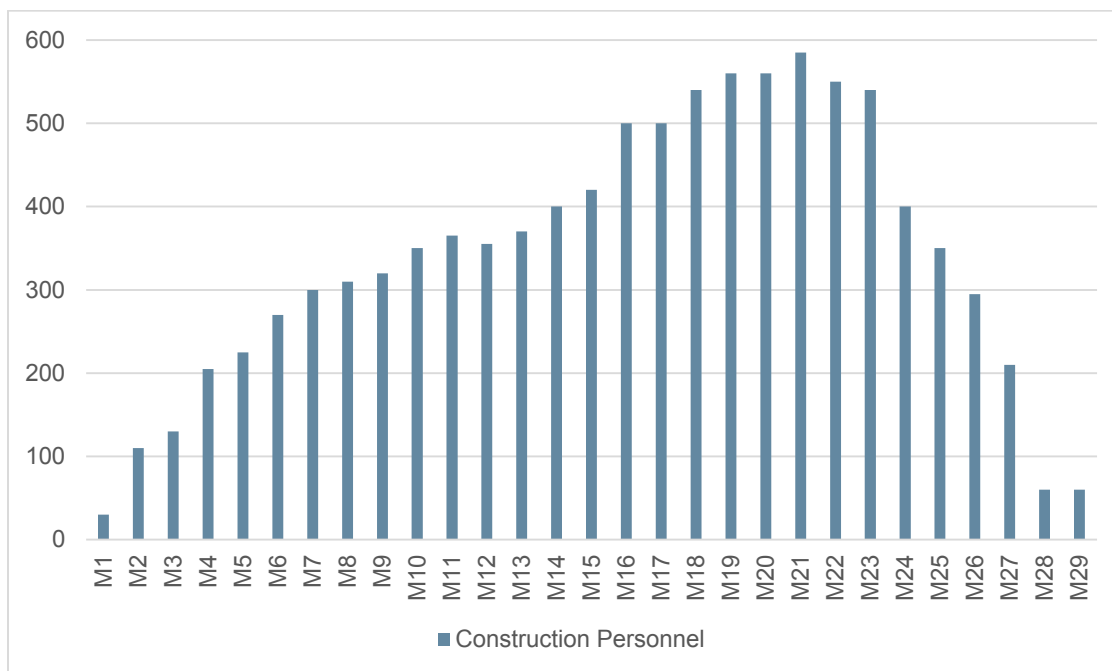


Figure 24-1: Preliminary Construction Manpower Curve

Construction

Construction will start with the development of the east and west access roads. This will provide independent initial access to both sides of the Property until the Waldorf bridge crossing is completed. Two mobile crushers (aggregate plants) will be installed, one at the mine site and the other at the concentrator site, in order to supply appropriate material for construction.

Site preparation work, i.e., clearing, grubbing, and top soil removal, will begin in each area as they become accessible. When the Rose deposit area will be accessible by the west access road, the mine pre-development activities will begin, which also include clearing, grubbing, top soil removal and mine pre-stripping.

Civil work contractors will initially use generators until a hook-up to the 46 kV powerline is available to provide required power for construction. The construction of the permanent power lines and site distribution will be done once power from NLH is available. Power will be distributed as required to the crusher and the mine facilities area.

Concrete work in winter conditions will be minimized. The majority of the Project concrete work will take place before and after the first winter season. The concrete supply will be from a portable concrete batch plant installed between the crusher and the concentrator area. The overland conveyor will be installed over sleepers.

The process systems will be commissioned starting at the crusher. Sequentially, the conveying, stockpile and reclaim, grinding circuit, gravity circuits, tailings and concentrate handling systems will be commissioned and transferred to operations. The commissioning process is scheduled to occur until full handover, which is planned for month 29.

24.2 Initial Capital Reduction Strategies

In an effort to try to reduce initial capital requirements in order to facilitate project financing, a high level analysis to evaluate separately and jointly, the following two specific strategies were performed.

- Construct the concentrator from the discharge of the AG mill to the concentrate conveyor at only half capacity with the second half line added to be operational for the fourth year of operation, thus delaying a portion of the required capital by three years.
- Construct the gravity circuit to full capacity but delay construction of the magnetic separation plant by three years and having it available for the fourth year of operation.

The analysis demonstrated that the potential initial capital savings were relatively small and yielded a disproportionate loss of revenue. As such, this strategy was not pursued further.

25. INTERPRETATION AND CONCLUSIONS

This FS is based on the proposed mining and processing strategy of the Kami Rose deposit. The NI 43-101 Guidelines require that relevant results and interpretations be discussed, as well as risks that could affect the reliability or confidence in the exploration information.

25.1 Geology and Mineral Resources

WGM believes that the current block model resource estimate and its classification are to NI 43-101 and CIM standards and definitions and adequately represent the mineralization in the Kami Rose deposit. Table 25-1 presents the Mineral Resource Estimate for the Kami Property.

Table 25-1: Categorized Mineral Resource Estimate for Kami Iron Ore Project (Cut-Off of 15% TFe)

Zone	Category	Tonnes (Million)	Density	TFe%	magFe%	hmFe%	Mn%
Rose Central	Measured	249.9	3.46	29.4	17.6	8.1	1.60
	Indicated	<u>294.5</u>	<u>3.44</u>	<u>28.5</u>	<u>17.7</u>	<u>5.9</u>	<u>1.28</u>
	Total M&I	544.4	3.45	28.9	17.7	6.9	1.43
	Inferred	160.7	3.45	28.9	16.9	7.1	1.44
Rose North	Measured	236.3	3.48	30.3	13.0	14.7	0.87
	Indicated	<u>312.5</u>	<u>3.49</u>	<u>30.5</u>	<u>11.8</u>	<u>17.1</u>	<u>0.96</u>
	Total M&I	548.8	3.49	30.4	12.3	16.1	0.92
	Inferred	287.1	3.42	29.8	12.5	15.5	0.76
Mills Lake	Measured	50.7	3.58	30.5	21.5	7.0	0.97
	Indicated	<u>130.6</u>	<u>3.55</u>	<u>29.5</u>	<u>20.9</u>	<u>3.9</u>	<u>0.80</u>
	Total M&I	181.3	3.56	29.8	21.1	4.8	0.85
	Inferred	74.8	3.55	29.3	20.3	2.7	0.67

25.2 Mineral Reserves

The 2012 FS block model for the Rose deposit was used by BBA to establish the Proven and Probable Mineral Reserves for the Rose deposit.

A pit optimization analysis was conducted to determine the cut-off grade and to what extent the deposit can be mined profitably. The pit optimization was done using the MS-Economic Planner module of MineSight. The optimizer uses the 3-D Lerchs-Grossman algorithm to determine the economic pit limits based on input of mining and processing costs, revenue per block and operational parameters such as the Fe recovery, pit slopes and other imposed constraints. Since this Study is at an FS level, NI 43-101 guidelines do not allow Inferred Mineral Resources to be used in the pit optimization analysis and mine plan. A series of pit optimization runs were performed for variable concentrate selling prices and the NPV of each of the pit shells was calculated at a discount rate of 10% to identify the optimal pit based on discounted NPV.

The milling cut-off grade (“COG”) used for this Study is 15% TFe. The optimized pit shell at 15% COG was then used to develop the engineered pit where operational and design parameters such as ramp grades, surface constraints, bench angles and other ramp details were incorporated. Mining dilution was estimated at 3.4% and ore loss at 2.5%. Table 25-2 presents the estimated Proven and Probable Mineral Reserves. At the nominal processing rate, the life of mine will be just over 23 years.

Table 25-2: Rose Deposit Mineral Reserves (Effective as of August 12, 2018)

Material	Tonnage (Mt)	TFe (%)	WREC (%)	MagFe (%)	Mag (%)	Mn (%)
Proven	392.7	29.0	34.7	15.0	20.8	1.20
Probable	124.5	28.2	32.0	11.1	15.3	1.07
Total Proven and Probable	517.2	28.8	34.1	14.1	19.4	1.17
Overburden	92.3					
Waste Rock	522.5					
Total Stripping	644.8					
Stripping Ratio	1.25					

25.3 Metallurgy and Mineral Processing

Process development for the Kami Project has been based on testwork performed during the 2012 FS and validated during detailed engineering. As such, metallurgical performance has been established with a relatively high degree of confidence. Results from the testwork were used to determine process performance parameters such as throughput, Fe and weight recoveries, final concentrate grade (including key elements such as Fe, SiO₂, and Mn) and product particle size. These results were also used for determining final equipment sizing during detailed engineering. Some major equipment has already been purchased by Kami LP.

It should be noted that for this FS, the tailings deposition plan has been based on managing coarse and fine tailings separately. As such, the tailings dewatering and the tailings pumping areas of the flowsheet and plant design developed during the previous detailed engineering work have been modified accordingly and are reflected in the capital and operating costs of the Project.

25.4 Environmental Permitting

Following release from the EA review process, numerous approvals, permits and authorizations are required from municipal, provincial, and federal regulators, prior to Project initiation. In addition, throughout Project construction and operation, compliance with terms and conditions of approval, various standards contained in federal and provincial legislation, regulations and guidelines are required. Kami LP received numerous regulatory permits and approvals subsequent to EA Release in early 2014, primarily related to early construction activities at the Kami Property. The long-lead and key permits and approvals have been maintained by Kami LP, however many 'smaller' permits have been allowed to expire. These expired permits can be obtained in a relatively short period of time when pre-development activities recommence.

Kami LP should continue its efforts to maintain existing long-lead key permits obtained for the Kami Property and should consult with regulators and stakeholders regarding Project status and advise of any proposed or potential changes to the Project.

Permits, approvals and authorizations generally contain conditions which, combined with other regulatory requirements and environmental constraints, make up commitments that Kami LP will need to address through Project design and during the development, operation and closure phases. The aforementioned conditions/commitment register for the Kami Property will need to be considered during the remaining design, construction, operations and closure phases of the mine.

25.5 Project Economic Analysis

The results of the pre-tax and post-tax Economic Analysis are presented in Table 25-3 and Table 25-4.

Table 25-3: Pre-tax Economic Analysis Results

IRR =24.6% Payback = 4.0 years	NPV (M\$)
Discount Rate	
0%	\$5 616 M
5%	\$2 626 M
8%	\$1 698 M
10%	\$1 270 M

Table 25-4: Post-tax Economic Analysis Results

IRR =18.2% Payback = 4.9 years	NPV (M\$)
Discount Rate	
0%	\$3,298M
5%	\$1,445M
8%	\$866M
10%	\$598M

25.6 Conclusions

The FS for the Kami Project demonstrates that Project economics remain robust. The most compelling argument for proceeding with the Project remains the fact that the superior concentrate quality produced by the Kami Project attracts significant price premiums compared to the standard 62% Fe iron ore products. This is expected to continue as Chinese steelmakers seek to improve their operating performance, reduce costs and reduce greenhouse gas emissions.

The Project has already been relatively well defined during the detailed engineering phase completed in 2014 where most of the technical risks were addressed. The following risks do, however, remain:

- Electric power availability – NLH may not have the required power available when the Project proceeds to construction and production. With the planned restart of the Scully mine, the new power transmission line from Churchill Falls will most likely be required.
- Port terminal access and services – SFPPN may not have the facilities ready to provide port terminal services to the Kami Project. Also, final commercial terms may have an impact on initial capital disbursement requirements and/or on operating costs.
- Assessment / Permits / Approvals – Changing regulations and requirements over time (substantial federal and provincial regulatory review ongoing) may impact capital and operating costs as well as the execution schedule.
- Environmental Assessments, Releases – The NL EA Release is valid only by annual extension until January 2020. By this date, the Kami LP must start construction or risk the requirement for a new assessment. There is no legislated deadline for the start of construction with respect to the Federal EA Release.
- Carbon Tax – The announced carbon tax may affect operating costs as well as capital costs with respect to potential need to purchase state of the art equipment for carbon minimization or reduction.

During the course of this FS, some opportunities have also been identified which may enhance project economics. They are outlined as follows:

- The possibility of using waste rock from nearby historical piles for the construction of the TMF should be analyzed. This would allow for a more optimized mine plan as only waste rock for ore liberation would be excavated and would be available for use in construction.
- The orientation of the AG mill in the layout should be reviewed as having the mill at 90° to the feed conveyor (instead of in straight line) can potentially reduce the size of the building and allow for improved operability and maintainability by providing more efficient use of the floor space around the mill.
- The design parameters for sizing the magnetic recovery plant developed in detailed engineering should be reviewed to make sure it is aligned with the new mine plan and the testwork results.

26. RECOMMENDATIONS

Based on the results of this Feasibility Study, BBA is of the opinion that the Project is technically and financially sufficiently robust to warrant proceeding with the resumption of detailed engineering and proceeding with the Project on an EPC or EPCM mode, whichever aligns best with Alderon's project development strategy. Although the Project was previously developed in detailed engineering, BBA recommends the following:

- Ahead of detailed engineering, value engineering should be performed to optimize the layout in the areas of tailings dewatering and pumping, as the coarse and fine tailings are required to be pumped separately. In conjunction with this, the progressive implementation (as outlined within sustaining capital) of the tailings pumping system should be developed in more detail to align with the tailings deposition plan.
- Regarding pumping of coarse and fine tailings separately, value engineering for optimization of pump selection, number of pumping stages and pipe diameter should be performed.
- The opportunities in Section 25.6 of this Report should be considered and acted upon.
- Kami LP needs to engage in discussions early with NLH in order to ensure that the required infrastructure is constructed and ready to deliver power to the Project on a timely basis.
- Kami LP needs to engage in discussions early with SFPPN in order to put in place a commercial agreement and to ensure that the required infrastructure is constructed and ready to receive concentrate for shipping on a timely basis.
- Kami LP should decide on the Project execution strategy it wants to adopt (EPC or EPCM or other) and engage its service providers early enough to ensure a smooth transition from feasibility study to detailed engineering.
- The hydrological data collected and analyzed with respect to the design of water management features and infrastructure around the site is based on field and historical data prior to 2014, and in some cases earlier. It is recommended that the hydrological normals and averages should be assessed along with the current standards associated with climate change data to determine if the water management features and infrastructure are adequately designed.

Concerning the development of the TMF to more detailed design, Golder made a number of recommendations in its feasibility study report (Golder 2018), which are summarized as follows:

- Update the meteorological data for the site;
- Develop a site-specific seismic hazard potential and de-aggregation analyses;
- Conduct laboratory tests on coarse and fine tailings samples aimed at evaluating the potential for earthquake-induced tailings liquefaction;

- Evaluate sources of TMF construction materials and ensure compliance with requirements;
- Complete thermal modelling for the TMF to evaluate water freezing patterns based on freeze/thaw cycles as water tied up in ice can reduce storage capacity and potentially affect dam stability;
- Evaluate alternatives to reduce potential dusting during operations;
- Develop a detailed construction sequencing plan to fully understand the scope and risk of upstream stacking and the impacts of a limited construction season during non-freezing periods.

26.1 Environmental and Stakeholder Engagement

Kami LP has developed a conditions/commitments registry based on the EA releases and permits obtained and these conditions/commitments should be used as a planning and design tool to advance the updated Project.

Kami LP should continue efforts to maintain existing long-lead key permits obtained for the Kami Property. Kami LP should also consult with regulators and stakeholders regarding the status and any potential changes to the Project.

A substantial hydrogeological assessment is required to fulfill the commitment to NRCAN prior to commencement of mining. This assessment may take several seasons of study and should be planned for early works as the Project advances.

For the Waste Rock Dumps at the Kami Property:

- The ARD/ML Adaptive Management Plan partially developed during detailed engineering should be advanced and used in the planning and design of the Rose South Dump;
- The Rose South Dump design should be optimized based on the significant reduction in the waste rock produced from the open pit and the existence of a rare plant species near the southern end of the dump.

Federal and provincial regulations pertaining to environmental assessment, fish and fish habitat, and other environmental regulatory aspects have changed since the Kami Project was assessed and some permitting completed. Regulations are continuing to change and substantial changes are expected at the federal level within 2018/19. Kami LP will need to monitor and understand these changes and determine how they can affect the Project going forward.

Kami LP should continue to engage all stakeholders, as required, to provide updates on Project planning and schedule and to ensure existing agreements, permits, and relationships are maintained.

27. REFERENCES

- Alderon, September 2012. Environmental Impact Statement, Kami Iron Ore Project, prepared by Alderon Iron Ore Corp.
- Avison, A.T., Alcock, P.W., Poisson, P., Connell, E., 1984. Assessment Report on Geological, Geochemical and Geophysical Exploration for 1983 Submission on Labrador Mining and Exploration Company Limited Blocks 4, 8 to 18, 20, 21, 26 to 31, 33, 43, 44, 45, 53, 55, 57, 63, 68, 78, 79, 80, 84 to 87, 92, 94, 95, 96, 100, 103 to 108, 110, 115 to 118, 120 to 125, 127 to 131, 134, 136, 138, 139, 140 and 142 in the Labrador City and Schefferville Areas, Labrador, 4 reports. Newfoundland and Labrador Geological Survey, Assessment File LAB/0666, 1984, 520 p.
- Bulled, D., 2014. An Investigation Into Further Forecast Study for Kami Iron Ore Project, prepared by SGS Minerals Services, Project 12489-010 – Draft Final Report.
- Brown, D., Rivers, T. and Calon, T., 1992. A Structural Analysis of a Metamorphic Fold-Thrust Belt, Northeast Gagnon Terrane, Grenville Province, Canadian Journal of Earth Science 29, pp. 1915-1927.
- Brown, I.C., 1967. Groundwater in Canada. Geological Survey of Canada Economic Geology Report 24. In: Geology and Economic Minerals of Canada 5th Edition. J. W. Douglas, Ed. GSC Economic Geology Report No. 1. Chap 13, p. 765 791. Ottawa. 1970.
- Crouse, R.A., 1954. Report on the Mills Lake Dispute Lake Area, Labrador, Iron Ore Company of Canada, Newfoundland and Labrador Geological Survey Assessment File 23B/0006, 22 p.
- Davenport, P.H. and Butler, A. J., 1983. Regional Geochemical Surveys, In Current Research, Edited by M. J. Murray, P. D. Saunders, W. D. Boyce and R. V. Gibbons, Newfoundland and Labrador Geological Survey, Report 83~01, pp. 121~125.
- Davies, T., Imeson, D., December, 2012. The Grindability and Beneficiation Characteristics of Samples from the Kamistiatussat Deposit, prepared for Alderon Iron Ore Corp., prepared by SGS Minerals Services, Project 12489-006A–Bench-Scale Report.

- Davies, T., Imeson, D., December, 2012. Mineral Release Curves of Samples from the Kamistiatusset Deposit, prepared for Alderon Iron Ore Corp., prepared by SGS Minerals Services, Project 12489-002/003/004–Addendum Report.
- Davies, T., Imeson, D., May, 2012. An Investigation Into the Concentrate Production of a Further Single Composite from the Kamistiatusset Deposit, prepared by SGS Minerals Services, Project 13873-003–Final Report Revision 1.
- Davies, T., Lascelles, D., September, 2011. An Investigation into the Grindability and Mineralogical Characteristics of Samples from the Kamistiatusset Deposit, prepared for Alderon Resource Corp., prepared by SGS Minerals Services, Project 12489-005–Final Report.
- Davies, T., Lascelles, D., August, 2011. An Investigation into the Gravity and Magnetic Separation Characteristics of Samples from the Kamistiatusset Deposit, prepared for Alderon Resource Corp., prepared by SGS Minerals Services, Project 12489-002/003/004–Final Report.
- Ernst, R.E., 2004. Ca. 1880 Ma Circum-Superior LIP, May 2004 LIP of the Month, Geological Survey of Canada.
- Golder, September 2018. Tailings Management Facility Feasibility Level Design. Prepared for Alderon, File Number 1899058.
- Grant, J.M., 1979. Drill Report on Block 57 in the Wabush Area, Labrador. Labrador Mining and Exploration Company Limited, Iron Ore Company of Canada. Newfoundland and Labrador Geological Survey, Assessment File 23B/14/0121, 1979, 6 p.
- Gross, G.A., 1996. Lake Superior-type Iron Formation: In *Geology of Canadian Mineral Deposit Types*, (ed.) O.R. Eckstrand, W.D. Sinclair, and R.I. Thorpe; Geological Survey of Canada, *Geology of Canada*, No. 8, pp. 54-66 (also Geological Society of America, *the Geology of North America*, v. P-1).
- Gross, G.A., 1996. Stratiform Iron: In *Geology of Canadian Mineral Deposit Types*, (ed.) O.R. Eckstrand, W.D. Sinclair, and R.I. Thorpe; Geological Survey of Canada, *Geology of Canada*, No. 8, pp. 41-54 (also Geological Society of America, *the Geology of North America*, v. P-1).
- Gross, G.A., 1993. Industrial and Genetic Models for Iron Ore in Iron Formations in *Geological Survey of Canada, Special Paper 40*, pp. 151-170.

- Gross, G.A., Glazier, W., Kruechi, G., Nichols L. and O'Leary, J., 1972. Iron Ranges of the Labrador Trough and Northern Québec, 24th International Geological Congress, Montréal Québec Canada, Guidebook Excursion A55, 66 p.
- Hatch, July, 2018. Memo on Kami Fines Market Price, addressed to Tayfun Eldem.
- Hird, J.M., 1960. Report on the Wabush Iron Ore Deposits, Michigan College of Mining Technology and Iron Ore Company of Canada, Newfoundland Labrador Geological Survey, Internal Report, 35 023B/0033].
- Kelly, R.G., Stubbins, J.B., 1983. Assessment Report on Topographic Mapping Program for the Carol Project for 1982 Submission on Lease Blocks 22, 22~5 and 22~6 and Licence Blocks 23, 24, 25, 32, 34 to 38, 41, 42, 60 and 61 in the Labrador City Area, Labrador, Iron Ore Company of Canada and Labrador Mining and Exploration Company Limited, Newfoundland and Labrador Geological Survey, Assessment File LAB/0633, 27 p.
- Kennedy, G.W., Garroway, K.G., Finnlayson-Bourque, D.S., 2010. Estimation of Regional Groundwater Budgets in Nova Scotia. Nova Scotia Department of Natural Resources Open File Illustration ME 2010-2.
- Larbi, K., Starkey, J., October, 2012. Alderon Kami Iron Ore Project Phase I & II SAG Design Comminution Circuit & Throughput Analysis, prepared for BBA on behalf of Alderon Iron Ore Corp., prepared by Starkey & Associates, Project S98– Report Rev 0.
- Lee, N., November, 2012. IGS Forecast Study for the Kami Iron Ore Project, prepared for Alderon Iron Ore Corp., prepared by SGS Minerals Services, Project 12489-006A/008A–Final Report.
- Macdonald, R.D., 1960. Report of Operations for 1959 in Labrador, Iron Ore Company of Canada and Labrador Mining and Exploration Company Limited, Newfoundland and Labrador Geological Survey, Assessment File LAB/0263, 14p.
- Mathieson, R.D., 1957. Report of Exploratory Drilling of the Wabush Project in the Duley Lake-Mills Lake Area, Labrador, Iron Ore Company of Canada, Newfoundland and Labrador Geological Survey Assessment File 23B/0011.
- McConnell, J., 1984. Reconnaissance and Detailed Geochemical Surveys for Base Metals in Labrador, Government of Newfoundland and Labrador, Department of Mines and Energy, Mineral Development Division, Report 84~02, 122 p.

- McKen, A., Wagner, R., September, 2009. An Investigation into the Beneficiation Characteristics of One Sample from the Kamistatusset Deposit, prepared for Thibault & Associates Inc. on behalf of Altius Resources Inc., prepared by SGS Minerals Services, Project 12209-001 – Final Report.
- Neal, H.E., 1951. Exploration Report on the Wabush Lake-Shabogamo Lake Area, Labrador Iron Ore Company of Canada, Newfoundland and Labrador Geological Survey Assessment File 23G/0004, 47 p.
- Price, J.B., 1979. Report on a Ground Magnetometer Survey on Block 24, Labrador, Labrador Mining and Exploration Company Limited, Newfoundland and Labrador Geological Survey, Assessment File 23B/0107.
- Rivers, T., Clarke, M., 1980. Geological Map of Flora Lake, Government of Newfoundland and Labrador, Department of Mines and Energy, Mineral Development Division, Map 80~282.
- Carol, S., Churchill, R., Winter, L., O'Driscoll, J., 2009. First and Fourth Year Assessment Report Covering Diamond Drilling, Line Cutting and Ground Geophysical Surveys (Gravity and Total Field Magnetic Field) for Map Staked Licences 14957M (1st Yr), 14962M (1st Yr), 14967M (1st Yr), 14968M (1st Yr) and 15037M (4th Yr), Kamistatusset Property, Western Labrador, NTS 23B14 and 23B15 prepared for Altius Resources Inc.
- School of Metallurgical and Geological Engineering, June, 2014. Technical Report About Sintering Experiment of Alderon Concentrate from Alderon Iron Ore Company, Version for Company 1 and Version for Company 2.
- Simpson, H.J., Poisson, P., McLachlan, C., 1985. Assessment Report on Geological, Geochemical and Geophysical Exploration for 1985 Submission on Labrador Mining and Exploration Company Limited Blocks 1, 2, 3, 5, 6, 7, 15, 17, 19, 19~1, 19~2, 19~3, 20, 21, 22, 22~4, 22~5, 22~6, 22~9, 22~10, 23 to 38, 41, 42, 51 to 54, 57 to 68, 72 to 76, 82, 84, 85, 86, 88, 89, 90, 92, 99, 101, 102, 111, 112, 116, 118, 121 and 128 in the Labrador City and Schefferville Areas, Labrador, 4 Volumes, Labrador Mining and Exploration Company Limited, Newfoundland and Labrador Geological Survey, Assessment File LAB/0723, 900 p.

- Smith, P.J.R., Stubbins, J.B., Avison, A.T., Grant, J.M., Hallof, P.G., 1981. Assessment Report on Geological, Geochemical, Geophysical and Diamond Drilling Exploration for the Carol Project for 1981 Submission on Labrador Mining and Exploration Company Limited Blocks 22 to 42, 22~1 to 22~10, 64~1, 64~2, 51 to 101, 103 to 108, 110, 115 to 118, 120 to 125, 127 to 131 and 133 to 143 in the Wabush, Labrador City and Schefferville Areas, Western Labrador, 49 Reports, Iron Ore Company of Canada (option holder) and Labrador Mining and Exploration Company Limited (owner of property), Newfoundland and Labrador Geological Survey, Assessment File LAB/0600, 777 p.
- SSY Consultancy & Research Ltd., January, 2016. Iron Ore Freight Costs Review and Outlook, A Private & Confidential Report for the Kami Mine Limited Partnership.
- Stantec, September, 2012. Feasibility Level Rehabilitation and Closure Study Report, Kami Iron Ore Project, prepared by Stantec Consulting Ltd., prepared for Alderon Iron Ore Corp., Final Report, File No. 121614000.319.
- Stantec, September, 2012. Hydrology Feasibility Report, Kami Iron Ore Project, prepared by Stantec Consulting Ltd, prepared for Alderon Iron Corp., Final Report, File No. 12164000.312.
- Stantec, September, 2012. Pit Slope Design Rose Pit, Kami Iron Ore Project, prepared by Stantec Consulting Ltd., prepared for Alderon Iron Ore Corp., Final Report, File No. 121614000.305.
- Stantec, September, 2012. Site Wide Geotechnical Investigations Feasibility Study, Kami Iron Ore Project, prepared by Stantec Consulting Ltd., prepared for Alderon Iron Ore Corp., Final Report, File No. 121614000.301.
- Stantec, September, 2012. Overburden and Waste Rock Stockpiles Feasibility Level Design Report, Kami Iron Ore Project, prepared by Golder Associates Ltd. for Stantec Consulting Ltd., prepared for Alderon Iron Ore Corp., Final Report, File No. 12-1118-0016 (7000).
- Stantec, January, 2013. Pit Slope Design Rose Pit–Supplementary Report, Kami Iron Ore Project, prepared by Stantec Consulting Ltd., prepared for Alderon Iron Ore Corp., Final Report, File No. 121614000.305.
- Stantec, May, 2013. Preliminary Groundwater Flow Model, Kami Iron Ore Mine, prepared by Stantec Consulting Ltd, prepared for the Kami Mine Limited Partnership, Final Report, File No. 121614000

Stantec, April, 2014. Kami Iron Ore Project Rehabilitation and Closure Plan, Kami Iron Ore Mine, prepared by Stantec Consulting Ltd, prepared for the Kami Mine Limited Partnership, Draft Report, Revision 1

Stubbins, J.B., 1973. Report for the Year Ending 1972 for the Labrador City and Schefferville Area, Labrador, Labrador Mining and Exploration Company Limited, Newfoundland and Labrador Geological Survey, Assessment File LAB/0180.

The Kami Mine Limited Partnership, November 2013. Kami Iron Ore Project Rehabilitation and Closure Plan, Draft Report.

The Kami Mine Limited Partnership, April 2014. Kami Iron Ore Project Abridged Development and Rehabilitation and Closure Plan – Early Works Activities, Final Report.

The Kami Mine Limited Partnership, February, April and June, 2013. Responses to Information Requests [from Provincial and Federal Regulators] Regarding the Kami Iron Ore Project Environmental Impact Statement - Various Documents and Correspondence.