

APPENDIX 1C

FINAL EIS MASTER TABLE OF CONTENTS

VOLUME 1 – MAIN DOCUMENT

TABLE OF CONTENTS

	PAGE
EXECUTIVE SUMMARY - INUKTITUT VERSION	
EXECUTIVE SUMMARY - ENGLISH VERSION	
EXECUTIVE SUMMARY - FRENCH VERSION	
DOCUMENT STRUCTURE	
PROJECT FACT SHEET	
TABLE OF CONTENTS	i
SECTION 1.0 - INTRODUCTION	1
1.1 PROJECT SETTING	1
1.2 THE PROPONENT - BAFFINLAND IRON MINES CORPORATION	3
1.2.1 ArcelorMittal.....	3
1.2.2 Corporate Governance	4
1.2.3 Exploration and Bulk Sampling Programs.....	5
1.2.4 Baffinland's Record of Community Engagement.....	5
1.2.5 Negotiating an Inuit Impact and Benefit Agreement.....	6
1.2.6 The Company Moving Forward to Develop the Mary River Project	6
1.3 PURPOSE OF AND NEED FOR THE PROJECT.....	6
1.4 GENERAL ECONOMIC FEASIBILITY AND BENEFITS OF THE PROJECT	7
SECTION 2.0 - PROJECT DESCRIPTION	9
2.1 OVERVIEW	9
2.2 SCOPE	14
2.3 CONSTRUCTION PHASE	14
2.3.1 Milne Port.....	16
2.3.2 Milne Inlet Tote Road	16
2.3.3 Mine Site	16
2.3.4 Railway	20
2.3.5 Steensby Port	20
2.4 OPERATION PHASE	27
2.5 SHIPPING.....	33
2.5.1 Milne Port.....	33
2.5.2 Steensby Port	33
2.6 PRELIMINARY CLOSURE AND POST CLOSURE.....	34
2.7 POTENTIAL FOR FUTURE DEVELOPMENT	34

2.8	WORKFORCE AND HUMAN RESOURCES	35
SECTION 3.0 - ALTERNATIVES		36
3.1	EVALUATION CRITERIA FOR PROJECT ALTERNATIVES	36
3.1.1	Technical Feasibility	36
3.1.2	Environmental Acceptability	36
3.1.3	Social Acceptability	37
3.1.4	Economic Viability	37
3.2	ASSESSMENT OF ECONOMIC VIABILITY FOR ALTERNATIVES TO MEET CUSTOMER REQUIREMENTS	38
3.2.1	Market Conditions	38
3.2.2	Alternatives Considered	39
3.3	PORT SITE LOCATION	40
3.3.1	East and North Coast of Baffin Island	41
3.3.2	Ore Transportation Alternatives from Mine Site to Port Location	43
3.3.3	Port Locations Accessible via Foxe Basin	44
3.3.4	Alternative Railway Routing Between the Mine Site and Steensby Port	46
3.3.5	Conclusions Related to Overland Transportation Corridor and Port Site	47
3.3.6	Shipping Route Alternatives Through the Foxe Basin	48
SECTION 4.0 - PUBLIC CONSULTATION		51
4.1	OBJECTIVES	51
4.2	COMMUNITIES AND THEIR RELATIONSHIP TO THE PROJECT	52
4.2.1	Category 1 Communities	52
4.2.2	Category 2 Communities	52
4.2.3	Category 3 Community	54
4.3	CONSULTATION METHODS AND ACTIVITIES	54
4.3.1	Community Liaison Offices	55
4.3.2	Meetings with Community and Local Stakeholders	55
4.3.3	Inuit Knowledge Working Groups	56
4.3.4	Individual Interviews with Elders	57
4.3.5	Focus Sessions	57
4.3.6	Site Visits	58
4.3.7	Radio Call-in Shows and Printed Media	58
4.3.8	Participation in Environmental Studies	58
4.3.9	Meetings with Government and Inuit Organizations	58
4.3.10	Public and Other Stakeholders	58
4.3.11	Post-DEIS Consultation with Inuit Organizations and Communities	59
4.4	KEY OUTCOMES OF THE PUBLIC CONSULTATION PROCESS	59
4.5	HOW RESULTS OF PUBLIC FEEDBACK INFLUENCED THE PROJECT	61
SECTION 5.0 - BASELINE STUDIES		62
5.1	SOCIO-ECONOMIC SETTING	62

5.1.1	Socio-economic Baseline Studies	63
5.1.2	Population Characteristics.....	63
5.1.3	Education and Training.....	65
5.1.4	Livelihood and Employment	66
5.1.5	Human Health and Well-Being	67
5.1.6	Economic Development and Self-Reliance	69
5.2	BIOPHYSICAL TERRESTRIAL ENVIRONMENT	72
5.2.1	Meteorology and Climate.....	73
5.2.2	Air Quality, Noise and Vibration	73
5.2.3	Landforms, Soils and Permafrost.....	74
5.2.4	Vegetation	75
5.2.5	Ecological Land Classification	75
5.2.6	Terrestrial Wildlife and Habitat	76
5.2.7	Birds.....	76
5.2.8	Hydrology and Hydrogeology	77
5.2.9	Surface and Groundwater Quality	77
5.2.10	Freshwater Biota and Habitat.....	78
5.3	MARINE ENVIRONMENT	79
5.3.1	Marine Physical Environment.....	79
5.3.2	Marine Water and Sediment Quality	79
5.3.3	Marine Biological Environment.....	80
5.3.4	Marine Wildlife and Marine Habitat	81
SECTION 6.0 - RESIDUAL EFFECTS ASSESSMENT		87
6.1	BOUNDARIES	87
6.1.1	Temporal Boundaries	88
6.2	BASELINE STUDIES	88
6.3	INUIT KNOWLEDGE STUDIES	89
6.4	ISSUES IDENTIFICATION.....	90
6.4.1	Identification of Valued Components.....	90
6.4.2	Measurable Parameters and Thresholds	91
6.4.3	Interactions, Key Issues and Subjects of Note.....	91
6.5	EFFECTS ASSESSMENT.....	92
6.5.1	Assessment Methodology	92
6.5.2	Effect Categories	93
6.6	MITIGATION MEASURES	93
6.7	DETERMINING SIGNIFICANCE OF RESIDUAL EFFECTS	94
6.7.1	Rating Criteria for Residual Socio-Economic Impacts	94
6.7.2	Overall Evaluation of Significance	94
6.8	MITIGATION AND MONITORING PLAN	95
6.9	PROJECT RESIDUAL EFFECTS	95

SECTION 7.0 - ACCIDENTS AND MALFUNCTIONS	96
7.1 EMERGENCY RESPONSE PLAN	97
7.2 DIESEL SPILL	99
7.2.1 Worst Case Spill Scenario	100
7.2.2 Diesel Spill Along the Northern Shipping Route	100
7.2.3 Diesel Spill Along the Southern Shipping Route	101
7.2.4 Effects Assessment of a Major Diesel Spill Along the Shipping Lane	101
7.2.5 Possible Significant Effects	102
SECTION 8.0 - EFFECTS OF THE ENVIRONMENT ON THE PROJECT	103
SECTION 9.0 - CUMULATIVE EFFECTS	106
SECTION 10.0 - TRANSBOUNDARY EFFECTS	110
10.1 DEFINITION AND APPROACH	110
10.2 SHIPPING	110
10.2.1 Large Fuel Spill Along the Shipping Lane	110
10.2.2 Marine Mammals	111
10.2.3 Introduction of Invasive Species	111
10.3 AIR EMISSIONS	111
SECTION 11.0 - ENVIRONMENTAL MANAGEMENT SYSTEM	112
11.1 ENVIRONMENTAL HEALTH, SAFETY MANAGEMENT FRAMEWORK	112
11.1.1 Code of Business Conduct and Ethics	112
11.1.2 Environmental, Health and Safety Committee Charter	112
11.2 ENVIRONMENTAL, HEALTH AND SAFETY MANAGEMENT SYSTEM	112
11.2.1 Environmental Aspect Management	113
11.2.2 Continuous Improvement and Adaptive Management	114
11.2.3 Environmental and Social Impact Assessment (ESIA)	114
11.2.4 Inuit Knowledge	114
11.3 ENVIRONMENTAL DESIGN GUIDELINES	115
11.4 ENVIRONMENTAL PROTECTION PLAN (EPP)	115
11.5 HAZARD IDENTIFICATION AND RISK MANAGEMENT	115
11.5.1 Emergency Response and Spill Contingency Plan	116
11.5.2 Oil Pollution Emergency Plans (OPEP)	116
11.5.3 Explosives Management Plan	116
11.5.4 Hazardous Material Management Plan	117
11.6 ENVIRONMENTAL MITIGATION AND MONITORING PLAN	117
11.6.1 Environmental Management Plan	117
11.7 ENVIRONMENTAL EFFECTS MANAGEMENT FRAMEWORK (EEMF)	118
11.8 ENVIRONMENTAL EFFECTS MONITORING (MMER)	121
11.9 HEALTH AND SAFETY MANAGEMENT PLAN	121

11.10	SOCIO-ECONOMIC MANAGEMENT PLAN.....	121
11.10.1	Stakeholder Engagement Plan.....	121
11.10.2	Cultural and Heritage Resource Protection Plan (CHRPP)	122
11.10.3	Human Resources Management Plan (HRMP)	122
11.11	AUDITS, MANAGEMENT REVIEWS AND ASSURANCE.....	122
11.12	RESOURCES.....	122
11.13	RESPONSIBILITIES.....	122
SECTION 12.0 - STATEMENT OF RESIDUAL EFFECTS		124
SECTION 13.0 - ABANDONMENT AND RECLAMATION		141
SECTION 14.0 - OPTIMIZATION OF BENEFITS.....		143
14.1	SUSTAINABLE DEVELOPMENT AND PRECAUTIONARY PRINCIPLE.....	143
14.2	INUIT PARTICIPATION.....	143
14.3	MAXIMIZING INUIT BENEFITS	144
14.3.1	Inuit Employment Strategy	144
14.3.2	Education and Training.....	145
14.3.3	Contracting and Subcontracting	146
14.3.4	Capacity Building	146
14.4	SUPPORT FOR COMMUNITIES.....	146
14.4.1	Ilagiiktunut Nunalinnullu Pivalliajutisait Kiinaujat	147
SECTION 15.0 - LAND TENURE AND APPROVALS REQUIRED FOR DEVELOPMENT		148
15.1	MINERAL LEASES.....	148
15.2	LAND USE PLANNING AND ENVIRONMENTAL ASSESSMENT PROCESSES	149
15.3	REQUIRED PERMIT, LICENCES AND AUTHORIZATIONS	149
SECTION 16.0 - INDEX OF SUPPORTING DOCUMENTATION AND APPENDICES FOR VOLUME 1		150
SECTION 17.0 - LIST OF CONTRIBUTORS		156
SECTION 18.0 - DISTRIBUTION		161
SECTION 19.0 - REFERENCES		162
SECTION 20.0 - ABBREVIATIONS.....		164

LIST OF TABLES

Table 1-2.1	Key Project Facts	9
Table 1-3.1	Key Findings of Cockburn Lake – Nuvuit Coastal Rail Link Feasibility Report	45
Table 1-3.2	Comparison of Railway Routing Alternatives to Steensby Port.....	47

Table 1-4.1	Types of Community Engagement.....	55
Table 1-4.2	Key Community Concerns and Baffinland Response.....	59
Table 1-7.1	Likelihood.....	97
Table 1-8.1	Project Design Measures to Account for Climate Change.....	104
Table 1-11.1	Environmental Mitigation and Monitoring Plans and Targeted VECs.....	118
Table 1-12.1	Summary of Residual Biophysical Effects	125
Table 1-12.2	Summary of Residual Socio-economic Effects.....	135
Table 1-17.1	List of Contributors	156

LIST OF FIGURES

Figure 1-1.1	Project Location	2
Figure 1-1.2	ArcelorMittal's Key Operations.....	3
Figure 1-2.1	Location of Project Activities	13
Figure 1-2.2	Project Schedule	15
Figure 1-2.3	Milne Port Layout	17
Figure 1-2.4	Milne Inlet Tote Road	18
Figure 1-2.5	Mine Site Layout	19
Figure 1-2.6	Railway Layout Construction Phase	21
Figure 1-2.7	Railway Construction Potential Development Area (Sheet 1 of 4)	22
Figure 1-2.8	Railway Construction Potential Development Area (Sheet 2 of 4)	23
Figure 1-2.9	Railway Construction Potential Development Area (Sheet 3 of 4)	24
Figure 1-2.10	Railway Construction Potential Development Area (Sheet 4 of 4)	25
Figure 1-2.11	Steensby Port Layout.....	26
Figure 1-2.12	Overall Process Flow Diagram	28
Figure 1-2.13	Material Handling at the Mine Site	29
Figure 1-2.14	Mine Site Primary and Secondary Crushing	29
Figure 1-2.15	Mine Site Ore Stock Yard	30
Figure 1-2.16	Example Railway Locomotive and Ore Car	31
Figure 1-2.17	Ice Breaking Ore Carrier Conceptual Design	32
Figure 1-3.1	Potential Port Locations	41
Figure 1-3.2	Alternative Rail Routes Between Mine Site and Steensby Port	46
Figure 1-3.3	Shipping Route Alternatives.....	50
Figure 1-4.1	Communities in the Vicinity of the Mary River Project	53
Figure 1-11.1	EHS Management System.....	113

APPENDICES

Appendix 1A	Popular Summary
Appendix 1A-1	Popular Summary - Inuktitut Version
Appendix 1A-2	Popular Summary - English Version
Appendix 1A-3	Popular Summary - French Version
Appendix 1B	Tables of Concordance
Appendix 1B-1	Concordance with EIS Guidelines

Appendix 1B-2	Concordance with EIS Guideline Appendix B - Appendices J and K of North Baffin Regional Land Use Plan
Appendix 1B-3	Concordance with EIS Guideline Appendix C - NWB Information Requirements
Appendix 1B-4	Concordance with PHC Report Section 3.3.4
Appendix 1B-5	Concordance with PHC Report Appendix 1
Appendix 1B-6	Concordance with PHC Report Appendix 2 (NPC Appendix J and K)
Appendix 1B-7	Concordance with PHC Report Appendix 3
Appendix 1B-8	NIRB Determinations
Appendix 1B-8-1	Screening Decision
Appendix 1B-8-2	EIS Guidelines
Appendix 1C	EIS Master Table of Contents
Appendix 1D	Glossary
Appendix 1E	Plain Language Summaries

VOLUME 2 – CONSULTATION, REGULATORY FRAMEWORK AND ASSESSMENT METHODOLOGY

TABLE OF CONTENTS

	PAGE
DOCUMENT STRUCTURE	
PROJECT FACT SHEET	
TABLE OF CONTENTS	i
SECTION 1.0 - CONSULTATION.....	1
1.1 CONTEXT.....	1
1.2 OBJECTIVES	1
1.3 THE PROPONENT – BAFFINLAND IRON MINES CORPORATION.....	1
1.4 POTENTIALLY AFFECTED COMMUNITIES	6
1.5 CONSULTATION METHODS AND ACTIVITIES	9
1.5.1 Baffinland Community Liaison Offices.....	10
1.5.2 Meetings with Community and Local Stakeholders	10
1.5.3 Inuit Knowledge Working Groups.....	11
1.5.4 Individual Interviews with Elders	12
1.5.5 Pre-DEIS Focus Sessions	13
1.5.6 Site Visits	13
1.5.7 Radio Call-in Shows and Printed Media.....	14
1.5.8 Participation in Environmental Studies	14
1.5.9 Meetings with Government and Inuit Organizations	14
1.5.10 Public and Other Stakeholders.....	15
1.5.11 Post-DEIS Consultation with Inuit Organizations and Communities	15
1.6 KEY OUTCOMES.....	15
SECTION 2.0 - REGULATORY FRAMEWORK	19
2.1 EXISTING MINERAL TITLES AND LAND ACCESS	19
2.2 REGULATORY PROCESS OVERVIEW.....	26
2.2.1 Conformance with Land Use Plans	26
2.2.2 Nunavut Environmental Assessment	29
2.2.3 Inuit Impact and Benefit Agreement	30
2.2.4 Water Compensation Agreement.....	30
2.2.5 Permits, Approvals and Licences	30
2.2.6 Water Licence Application	31
2.2.7 Application for Use of Inuit-Owned Land.....	31
2.2.8 Application for Use of Crown Land.....	31
2.2.9 Application for Fisheries Authorization for Harmful Alteration, Disruption, or Destruction (HADD) of Fish or Fish Habitat	32
2.2.10 Other Authorizations.....	32
2.3 EXISTING AUTHORIZATIONS GOVERNING EXPLORATION	32
2.4 TAX OBLIGATIONS	33
SECTION 3.0 - ASSESSMENT METHODOLOGY.....	34

3.1	INTRODUCTION	34
3.2	BOUNDARIES	34
3.2.1	Spatial Boundaries	34
3.2.2	Temporal Boundaries	36
3.3	BASELINE STUDIES	36
3.3.1	Overview of Baseline Studies.....	36
3.3.2	Challenges and Gaps in Baseline Data Collection.....	37
3.3.3	New Baseline Data Incorporated since the DEIS.....	39
3.4	INUIT KNOWLEDGE STUDIES	39
3.5	ISSUES IDENTIFICATION	40
3.5.1	Identification of Valued Components (VCs)	42
3.5.2	Measurable Parameters and Thresholds	45
3.5.3	Interactions, Key Issues, and Subjects of Note	45
3.6	EFFECTS ASSESSMENT.....	46
3.6.1	Assessment Methodology	46
3.6.2	Effect Categories	47
3.7	MITIGATION MEASURES	47
3.8	DETERMINING SIGNIFICANCE OF RESIDUAL EFFECTS	48
3.8.1	Rating of Residual Biophysical Impacts	50
3.8.2	Rating Criteria for Residual Socio-Economic Impacts	53
3.8.3	Overall Evaluation of Significance	54
3.9	ENVIRONMENTAL HEALTH AND SAFETY MANAGEMENT SYSTEM.....	56
3.10	CONCORDANCE WITH THE GUIDELINES.....	57
SECTION 4.0 - LIST OF CONTRIBUTORS		58
SECTION 5.0 - REFERENCES		63
SECTION 6.0 - DEFINITIONS AND ABBREVIATIONS		64
6.1	DEFINITIONS.....	64
6.2	ABBREVIATIONS.....	71

LIST OF TABLES

Table 2-1.1	Baffinland Officer's Register	2
Table 2-1.2	Types of Community Engagement.....	10
Table 2-1.3	Key Community Concerns and Baffinland Response.....	16
Table 2-2.1	Applicable Acts, Regulations and Guidelines	22
Table 2-2.2	Federal and Territorial Approvals.....	27
Table 2-2.3	Current Authorizations Governing Exploration Activities	33
Table 2-3.1	Baseline Study Components.....	37
Table 2-3.2	Valued Components, Key Indicators, and Rationale for Selection	43
Table 2-3.3	Attributes Used to Evaluate Significance of Residual Effects.....	48
Table 2-3.4	Ratings for Evaluating Residual Biophysical Effects	50
Table 2-3.5	Effects Assessment Summary for Selected VEC/Key Indicator	51

Table 2-3.6	Significance of Potential Residual Biophysical Effects	52
Table 2-3.7	Rating Criteria for Evaluating Residual Socio-Economic Impacts	54
Table 2-4.1	List of Contributors	58

LIST OF FIGURES

Figure 2-1.1	ArcelorMittal's Key Operations.....	5
Figure 2-1.2	Communities in the Vicinity of the Mary River Project	8
Figure 2-2.1	Regional Land Ownership and Administrative Boundaries.....	20
Figure 2-2.2	Current Mary River Site Layout Showing Land Ownership and Lease Boundaries	21
Figure 2-3.1	Environmental Assessment Process	35
Figure 2-3.2	Methods of Incorporating IQ into the EIS.....	41

APPENDICES

Appendix 2A	Public Consultation Record
Appendix 2A-1	Lists of Meetings (Tables 2A-1.1 to 2A-1.4)
Appendix 2A-2	Public Consultation Database
Appendix 2A-3	QIA Community Consultation Database
Appendix 2B	Summary of Community Based Research Undertaken for the Mary River Project
Appendix 2C	Effects Interaction Matrices

VOLUME 3 – PROJECT DESCRIPTION

TABLE OF CONTENTS

	PAGE
DOCUMENT STRUCTURE	
PROJECT FACT SHEET	
TABLE OF CONTENTS	i
SECTION 1.0 - INTRODUCTION	1
1.1 PROJECT DESCRIPTION OVERVIEW	1
1.2 SCOPE AND SCHEDULING	7
1.3 NEED AND PURPOSE OF THE PROJECT	9
1.3.1 Benefits of the Project	9
1.3.2 Project Accommodation for Concurrent Uses	10
1.4 POTENTIAL FOR FUTURE DEVELOPMENT	10
1.5 COMPLIANCE WITH REGULATIONS AND AUTHORIZATIONS	11
SECTION 2.0 - PROJECT DESCRIPTION - CONSTRUCTION PHASE	12
2.1 CONSTRUCTION OVERVIEW	12
2.1.1 Site Capture	12
2.1.2 Mobilization and Re-Supply	13
2.1.3 Shipping Activities during Construction	13
2.1.4 Types of Construction Activities	13
2.1.5 Equipment Fleet and Fuel Consumption	14
2.1.6 Strategy for Sourcing Aggregate	14
2.1.7 Strategy for Temporary and Permanent Support Infrastructure	15
2.1.8 Fuel Supply, Storage and Distribution	25
2.1.9 Explosives Manufacture, Storage, Transportation and Use	27
2.1.10 Waste Management	29
2.1.11 Communications	32
2.1.12 Security	32
2.1.13 Ongoing Geotechnical and Geophysical Survey Programs and Environmental Studies	33
2.2 MILNE PORT - CONSTRUCTION PHASE	33
2.2.1 Overview	33
2.2.2 Temporary Facilities Additional to Existing Facilities	34
2.2.3 Permanent Facilities at Milne Port	34
2.2.4 Freight Dock	35
2.3 MILNE INLET TOTE ROAD – CONSTRUCTION PHASE	35
2.3.1 Road Operation During Construction	35
2.4 MINE SITE - CONSTRUCTION PHASE	36
2.4.1 Overview	36
2.4.2 Temporary Facilities	37
2.4.3 Water Supply	37

2.4.4	Power Supply	38
2.4.5	Wastewater Treatment	39
2.4.6	Permanent Facilities	39
2.4.7	Air Strip	41
2.4.8	Stockpile Development.....	41
2.4.9	Site Access Roads	41
2.5	RAILWAY - CONSTRUCTION PHASE	41
2.5.1	Overview.....	41
2.5.2	Design Considerations	43
2.5.3	Railway Embankment.....	46
2.5.4	Rock Cuts and Tunnels	47
2.5.5	Disposal of Waste Rock and Soil Spoils	47
2.5.6	Watercourse and Drainage Crossings	48
2.5.7	Construction Access Road	49
2.5.8	Temporary Airstrips and Air Traffic.....	49
2.5.9	Aggregate Sources.....	50
2.5.10	Explosives Storage and Use	50
2.5.11	Construction Camps and Related Facilities	50
2.6	STEENSBY PORT - CONSTRUCTION PHASE.....	52
2.6.1	Overview.....	52
2.6.2	Siting Considerations.....	53
2.6.3	Port Facilities	53
2.6.4	Construction Docks	54
2.6.5	Aggregate Sources and Concrete Production.....	54
2.6.6	Construction Camps and Related Facilities	54
2.6.7	Water Supply	55
2.6.8	Power Supply	55
2.6.9	Wastewater Treatment	56
2.6.10	Ore Dock.....	56
2.6.11	Freight Dock	56
2.6.12	Crossing to Island.....	57
2.6.13	Site Roads	57
2.6.14	Laydown Areas and Shops.....	57
2.6.15	Ore Stockpile	57
2.7	AIRSTRIPS AND AIR TRAFFIC.....	57
SECTION 3.0 - PROJECT DESCRIPTION – OPERATION PHASE.....		61
3.1	OPERATION SUMMARY	61
3.2	MILNE PORT- OPERATION PHASE.....	61
3.3	MILNE INLET TOTE ROAD – OPERATION PHASE.....	63
3.3.1	Milne Inlet Tote Road Operation	63
3.4	MINE SITE - OPERATION PHASE	64
3.4.1	Open-pit Operations	64
3.4.2	Explosives Manufacture and Storage.....	67
3.4.3	Ore Crushing/Screening and Conveyance.....	67

3.4.4	Ore Stockpiles	67
3.4.5	Waste Rock Stockpile.....	68
3.4.6	Mine Site Support Facilities	71
3.5	RAILWAY - OPERATION PHASE.....	75
3.5.1	Overview.....	75
3.5.2	Railway Components.....	75
3.5.3	Railway Operation and Maintenance	80
3.6	STEENSBY PORT SITE – OPERATION PHASE.....	82
3.6.1	Ore Handling Operations.....	83
3.6.2	Ore Shipping Fleet.....	84
3.6.3	Shipping and Port Operations	87
3.6.4	Sea-lift Re-supply Operations	90
3.6.5	Port Site Support Facilities	91
3.7	OFF-SITE FACILITIES SUPPORTING THE PROJECT	93
SECTION 4.0 - CLOSURE.....		94
SECTION 5.0 - WORKFORCE AND HUMAN RESOURCES		96
5.1	WORKFORCE REQUIREMENTS.....	96
5.1.1	Workforce – Construction Phase.....	96
5.1.2	Workforce - Operation Phase	98
5.1.3	Contract Opportunities and Associated Workforce Demand.....	102
5.1.4	Transportation of the Workforce	103
5.2	RESOURCING STRATEGY	103
5.3	HUMAN RESOURCES TRAINING AND CAPACITY DEVELOPMENT	104
5.3.1	Training Program Overview.....	104
5.3.2	Job-Specific Training For Operations.....	106
5.3.3	Previous Education and Training Initiatives	108
SECTION 6.0 - ALTERNATIVES		110
6.1	EVALUATION CRITERIA FOR PROJECT ALTERNATIVES	110
6.1.1	Technical Feasibility	110
6.1.2	Environmental Acceptability	111
6.1.3	Social Acceptability.....	111
6.1.4	Economic Viability	111
6.2	ASSESSMENT OF ECONOMIC VIABILITY FOR ALTERNATIVES TO MEET CUSTOMER REQUIREMENTS.....	112
6.2.1	Market Conditions.....	112
6.2.2	Alternatives Considered	113
6.3	ORE CARRIER CAPACITY.....	115
6.4	PORT SITE LOCATION	116
6.4.1	East and North Coast of Baffin Island	117
6.5	SHIPPING VIA FOXE BASIN	118
6.5.1	Ore Transportation Alternatives from Mine Site to Port Location.....	118
6.5.2	Alternative Port Locations accessible via Foxe Basin.....	119

6.5.3	Alternative Railway Routing Between the Mine Site and Steensby Port	121
6.5.4	Conclusions Related to Overland Transportation Corridor and Port Site	124
6.5.5	Shipping Route Alternatives Through the Foxe Basin	126
6.6	PROJECT FEASIBILITY	126
6.6.1	Project Go/No-Go Decision	127
6.6.2	Decreased Production Rates.....	128
6.6.3	Increased Production Rates	128
6.7	ASSESSMENT OF ALTERNATIVES WITHIN THE PROJECT	128
6.7.1	Production Rate	128
6.7.2	Trucking of 3 Mt/a via Milne Inlet.....	129
6.7.3	Rail Transport to Milne Port.....	129
6.7.4	Mining Methods	129
6.7.5	Power Supply	130
6.7.6	On-site Accommodations and Worker-Related Issues	130
6.7.7	Airstrip Locations	131
6.7.8	Steensby Ore Dock and Freight Dock Location and Configuration	131
6.7.9	Ice Management at Steensby Port	131
6.7.10	Ore Crushing Optimization	132
6.7.11	Waste Rock Disposal	132
6.7.12	Closure and Reclamation Alternatives	133
SECTION 7.0 - REFERENCES		134
SECTION 8.0 - DEFINITIONS AND ABBREVIATIONS		137
8.1	GLOSSARY	137
8.2	ABBREVIATIONS.....	147

LIST OF TABLES

Table 3-1.1	Key Project Facts	4
Table 3-2.1	Major Project Components	24
Table 3-3.1	Preliminary Schedule of Waste Rock Production	68
Table 3-5.1	Diversity of Jobs at a "Typical" Iron Mine Construction Project	97
Table 3-5.2	Estimated Operations Team Workforce by Skill Level and Location	98
Table 3-5.3	Diversity of Jobs at a "Typical" Operating Iron Mine Project.....	99
Table 3-5.4	Examples of Potential Contract Opportunities and Associated Jobs.....	102
Table 3-6.1	Capital Costs Attributed to the Seasonal Shipping Alternative	115
Table 3-6.2	Ore Carrier Capacity Configuration Alternatives.....	115
Table 3-6.3	Key Findings of Cockburn Lake – Nuvuit Coastal Rail Link Feasibility Report.....	120
Table 3-6.4	Comparison of Railway Routing Alternatives to Steensby Port.....	123

LIST OF FIGURES

Figure 3-1.1	Project Location Map	2
--------------	----------------------------	---

Figure 3-1.2	Location of Project Activities	3
Figure 3-1.3	Life of Project Schedule	8
Figure 3-2.1	Milne Port Layout	16
Figure 3-2.2	Milne Inlet Tote Road	17
Figure 3-2.3	Mine Site Layout	18
Figure 3-2.4	Railway Layout - Construction Phase	19
Figure 3-2.5	Railway Construction Potential Development Area (Sheet 1 of 4)	20
Figure 3-2.6	Railway Construction Potential Development Area (Sheet 2 of 4)	21
Figure 3-2.7	Railway Construction Potential Development Area (Sheet 3 of 4)	22
Figure 3-2.8	Railway Construction Potential Development Area (Sheet 4 of 4)	23
Figure 3-2.9	Steensby Port Layout.....	30
Figure 3-2.10	Project Air Traffic Patterns	58
Figure 3-3.1	Overall Process Flow Diagram	62
Figure 3-3.2	Material Handling	65
Figure 3-3.3	Mine Site Primary and Secondary Crushing	65
Figure 3-3.4	Mine Site Ore Stock Yard	66
Figure 3-3.5	Example Railway Locomotive and Ore Car	77
Figure 3-3.6	Railway Terminal Layouts	78
Figure 3-3.7	Icebreaking Ore Carrier - Conceptual Design.....	86
Figure 3-5.1	'Life-Cycle' for Operations Training Program.....	105
Figure 3-6.1	Potential Port Locations	116
Figure 3-6.2	Alternative Rail Routes Between Mine Site and Steensby Port	122
Figure 3-6.3	Shipping Route Alternatives.....	125

APPENDICES

Appendix 3A	Site Layout and Drawings
Appendix 3B	Type A Water License Application
Appendix 3C	Mobile Equipment Lists
Appendix 3D	Mine Site Documents
Appendix 3E	Railway Information
Appendix 3F	Steensby Documents
Appendix 3G	Ice and Marine Shipping Assessment
Appendix 3H	Trade Off Studies
Appendix 3I	2012 Work Plan

VOLUME 4 – HUMAN ENVIRONMENT

TABLE OF CONTENTS

	PAGE
DOCUMENT STRUCTURE	
PROJECT FACT SHEET	
TABLE OF CONTENTS	i
SECTION 1.0 - INTRODUCTION	1
1.1 SOCIO-ECONOMIC ZONE OF INFLUENCE AND STUDY AREA DETERMINATION.....	1
1.2 ISSUES SCOPING AND VSEC DETERMINATION	4
1.3 KEY INDICATORS	5
1.4 SUBJECTS OF NOTE.....	7
1.5 VSEC ASSESSMENT OVERVIEW	8
SECTION 2.0 - POPULATION DEMOGRAPHICS.....	9
2.1 BASELINE SUMMARY.....	9
2.1.1 Baseline Conditions.....	9
2.1.2 Expected Trends in the Absence of the Project	11
2.2 ISSUES SCOPING	12
2.3 DEMOGRAPHIC STABILITY (“COMMUNITY FABRIC - DIMENSION I”)	13
2.3.1 Assessment Methodology	13
2.3.2 Potential Effects and Proposed Mitigation.....	14
2.3.3 Assessment of Residual Effects.....	15
2.3.4 Prediction Confidence and Risk Analysis.....	17
2.3.5 Follow-up	18
2.4 SUBJECTS OF NOTE.....	18
2.5 IMPACT STATEMENT	22
SECTION 3.0 - EDUCATION AND TRAINING	23
3.1 BASELINE SUMMARY.....	23
3.1.1 Baseline Conditions.....	23
3.1.2 Expected Trends in the Absence of the Project	25
3.2 ISSUES SCOPING	26
3.3 LIFESKILLS	29
3.3.1 Assessment Methodology	29
3.3.2 Potential Effects and Proposed Mitigation.....	29
3.3.3 Assessment of Residual Effects.....	30
3.3.4 Prediction Confidence and Risk Analysis.....	31
3.3.5 Follow-up	32
3.4 EDUCATION AND SKILLS.....	32
3.4.1 Assessment Methodology	32
3.4.2 Potential Effects and Proposed Mitigation.....	32
3.4.3 Assessment of Residual Effects.....	36

3.4.4	Prediction Confidence and Risk Analysis.....	38
3.4.5	Follow-up	38
3.5	SUBJECTS OF NOTE.....	39
3.6	IMPACT STATEMENT	42
SECTION 4.0 - LIVELIHOOD AND EMPLOYMENT		44
4.1	BASELINE SUMMARY.....	44
4.1.1	Baseline Conditions.....	44
4.1.2	Expected Trends in the Absence of the Project	46
4.2	ISSUES SCOPING	47
4.3	INUIT HARVESTING LIVELIHOODS – COMBINED EFFECTS.....	50
4.3.1	A Framework for Understanding Changes to Harvest Patterns and Culture	56
4.3.2	How the Project May Directly Affect Harvesting Dimensions.....	57
4.3.3	Combined Effects of the Project on Harvesting.....	61
4.3.4	Implications for the Impact Assessment.....	61
4.3.5	Follow-up Monitoring Related To Harvesting	62
4.4	WAGE EMPLOYMENT	62
4.4.1	Assessment Methods	62
4.4.2	Project Effects and Proposed Mitigation	63
4.4.3	Assessment of Residual Effects.....	69
4.4.4	Prediction Confidence and Risk Analysis.....	71
4.4.5	Follow-up	72
4.5	JOB PROGRESSION AND CAREER ADVANCEMENT	72
4.5.1	Assessment Methodology	72
4.5.2	Potential Effects and Proposed Mitigation.....	73
4.5.3	Assessment of Residual Effects.....	75
4.5.4	Prediction Confidence and Risk Analysis.....	76
4.5.5	Follow-up	77
4.6	SUBJECTS OF NOTE.....	77
4.6.1	Employment of Specific Demographic Groups.....	77
4.6.2	Employment Of Individuals From Outside LSA Points-of-hire	77
4.6.3	“Boom”, “Bust” and Closure Effects.....	78
4.6.4	Indirect Job Creation	80
4.7	IMPACT STATEMENT	81
SECTION 5.0 - ECONOMIC DEVELOPMENT AND SELF-RELIANCE.....		82
5.1	BASELINE SUMMARY.....	82
5.1.1	Baseline Conditions.....	82
5.1.2	Expected trends in the absence of the Project.....	85
5.2	ISSUES SCOPING	85
5.3	GENERAL SUBJECT OF NOTE: ANALYSIS OF CONSOLIDATED EFFECTS ON ECONOMIC DEVELOPMENT.....	86
5.3.1	Project Effects on the Foundations of Nunavut's Economy	86
5.3.2	Putting it all Together.....	88
5.3.3	Sustainable Development – Risk analysis	93

5.4	ECONOMIC DEVELOPMENT AND SELF-RELIANCE.....	94
5.4.1	Assessment Methodology	94
5.4.2	Potential Effects and Proposed Mitigation.....	95
5.5	SUBJECTS OF NOTE.....	98
5.6	IMPACT STATEMENT	100
SECTION 6.0 - HUMAN HEALTH AND WELL-BEING		101
6.1	BASELINE SUMMARY.....	101
6.1.1	Baseline Conditions.....	101
6.1.2	Expected Trends in the Absence of the Project	108
6.2	ISSUES SCOPING	108
6.2.1	Effects of Fly-In/Fly-Out Work on Children, Families, Communities	109
6.2.2	Alcohol and Drug Abuse.....	120
6.2.3	Food Security	121
6.2.4	Summary of Issues and their Treatment in the Assessment.....	121
6.3	WELL-BEING OF CHILDREN	122
6.3.1	Assessment Methods	122
6.3.2	Project Effects and Proposed Mitigation	123
6.3.3	Assessment of Residual Effects.....	128
6.3.4	Prediction Confidence and Risk Analysis.....	131
6.3.5	Follow-Up.....	132
6.4	SUBSTANCE ABUSE	132
6.4.1	Assessment Methods	132
6.4.2	Potential Effects and Proposed Mitigation.....	134
6.4.3	Assessment of Residual Effects.....	136
6.4.4	Follow-up	140
6.5	COMMUNITY SOCIAL STABILITY ("COMMUNITY FABRIC - DIMENSION II").....	140
6.5.1	Assessment Methods	140
6.5.2	Potential Effects and Proposed Mitigation.....	141
6.5.3	Assessment of Residual Effects.....	141
6.5.4	Prediction Confidence and Risk Analysis.....	142
6.5.5	Follow-up	142
6.6	SUBJECTS OF NOTE.....	142
6.6.1	Household Income and Money Management.....	142
6.6.2	Food Security	143
6.6.3	Change in Household Composition	144
6.6.4	Safety and Security	144
6.6.5	Human Health.....	146
6.6.6	Distribution of impacts and benefits within and between communities	146
6.7	IMPACT STATEMENT	148
SECTION 7.0 - COMMUNITY INFRASTRUCTURE AND PUBLIC SERVICES		149
7.1	BASELINE SUMMARY.....	149
7.1.1	Baseline Conditions.....	149
7.1.2	Expected Trends in the Absence of the Project	150

7.2	ISSUES SCOPING	150
7.3	RECRUITMENT AND RETENTION OF HAMLET WORKERS	151
7.3.1	Assessment Methodology	151
7.3.2	Potential Effects and Proposed Mitigation.....	152
7.3.3	Assessment of Residual Effects.....	152
7.3.4	Prediction Confidence and Risk Analysis.....	154
7.3.5	Follow-up	154
7.4	SUBJECTS OF NOTE.....	154
7.4.1	Synergies.....	154
7.4.2	Demand for and Investment in Hamlet Infrastructure and Services.....	154
7.5	IMPACT STATEMENT	157
SECTION 8.0 - CONTRACTING AND BUSINESS OPPORTUNITIES		158
8.1	BASELINE SUMMARY.....	158
8.1.1	Baseline Conditions.....	158
8.1.2	Expected Trends in the Absence of the Project	159
8.2	ISSUES SCOPING	160
8.3	OPPORTUNITIES FOR BUSINESS	161
8.3.1	Assessment Methodology	161
8.3.2	Potential Effects and Proposed Mitigation.....	161
8.3.3	Assessment of Residual Effects.....	164
8.3.4	Prediction Confidence and Risk Analysis.....	166
8.3.5	Follow-up	167
8.4	SUBJECTS OF NOTE.....	167
8.5	IMPACT STATEMENT	168
SECTION 9.0 - CULTURAL RESOURCES		169
9.1	BASELINE SUMMARY.....	169
9.1.1	Regional Context	169
9.1.2	Project Specific Archaeological Findings	176
9.2	ISSUES SCOPING	182
9.3	SUBJECTS OF NOTE.....	183
9.3.1	Wolf Trap	183
9.3.2	Heritage Value of Archaeological Sites	183
9.4	GENERIC IMPACTS TO CULTURAL RESOURCES	184
9.5	GENERIC MITIGATION APPLICABLE TO CULTURAL RESOURCES	184
9.6	ARCHAEOLOGICAL SITES.....	185
9.6.1	Assessment Methods	185
9.6.2	Potential Effects and Proposed Mitigation.....	185
9.6.3	Assessment of Residual Effects.....	187
9.6.4	Follow-up	192
9.7	IMPACT STATEMENT	192
SECTION 10.0 - RESOURCES AND LAND-USE		193
10.1	BASELINE SUMMARY.....	193

10.2	ISSUES SCOPING	201
10.3	SUBJECTS OF NOTE.....	202
10.4	WILDLIFE HARVESTING BY INUIT	207
10.4.1	Assessment Methods	207
10.4.2	Potential Effects and Proposed Mitigation.....	208
10.4.3	Assessment of Residual Effects.....	211
10.4.4	Prediction Confidence and Risk Analysis.....	212
10.4.5	Follow-up	212
10.5	TRAVEL AND CAMPS	213
10.5.1	Assessment Methods	213
10.5.2	Potential Effects and Proposed Mitigation.....	213
10.5.3	Assessment of Residual Effects.....	217
10.5.4	Prediction Confidence and Risk Analysis.....	221
10.5.5	Follow-up	221
10.6	IMPACT STATEMENT	221
SECTION 11.0 - CULTURAL WELL-BEING.....		223
11.1	BASELINE SUMMARY.....	223
11.2	ISSUES SCOPING	224
11.3	CULTURAL WELL-BEING	224
11.4	IMPACT STATEMENT	228
SECTION 12.0 - BENEFITS, ROYALTY, AND TAXATION.....		229
12.1	BASELINE SUMMARY.....	229
12.1.1	Baseline Conditions.....	229
12.1.2	Expected Future Conditions	229
12.2	ISSUES SCOPING	229
12.3	TERRITORIAL GOVERNMENT OWN-SOURCE REVENUES	230
12.3.1	Project Effects	230
12.3.2	Prediction Confidence	232
12.3.3	Follow-up	232
12.4	SUBJECTS OF NOTE.....	232
12.4.1	Resource Revenues to Inuit	232
12.4.2	Support to Communities	233
12.4.3	Government Social Expenditures and Development Partnership Opportunities	234
12.5	IMPACT STATEMENT	237
SECTION 13.0 - GOVERNMENT AND LEADERSHIP		238
13.1	STRATEGIC VALUE OF THE PROJECT	238
13.2	PROJECT AGREEMENT GOVERNANCE REGIME	238
13.3	CONTRIBUTION TO SOCIO-ECONOMIC MONITORING	239
13.4	IMPACT STATEMENT	239
SECTION 14.0 - SOCIO-ECONOMIC IMPACT SUMMARY AND CONCLUSIONS.....		240
14.1	IMPACT STATEMENTS.....	240
14.1.1	Summary of Impact Statements for VSECs	240

14.1.2	Summary of Project Effects on Key Indicators	242
SECTION 15.0	SOCIO-ECONOMIC MONITORING	246
15.1	PERFORMANCE SPECIFICATIONS	246
15.2	MONITORING INUIT PARTICIPATION & IIBA IMPLEMENTATION.....	246
15.3	PROJECT PERFORMANCE MONITORING	247
15.3.1	Direct Project-generated VSEC indicators	247
15.3.2	Direct Project-generated VEC indicators that influence VSECs	248
15.4	COLLABORATIVE MONITORING — COMMUNITY, REGIONAL, TERRITORIAL	249
15.4.1	Issues where collaborative monitoring is anticipated	250
15.4.2	Summary of Collaborative Monitoring Approach.....	252
15.5	MONITORING TO SUPPORT MANAGEMENT SYSTEM AND ADAPTIVE PROCESSES	254
15.6	MONITORING TO UNDERSTAND SOCIO-ECONOMIC PROCESSES.....	256
15.7	COMPLIANCE MONITORING	256
15.8	IMPLEMENTATION CONSIDERATIONS	257
15.8.1	Community & Inuit Engagement In Monitoring and Mitigation Planning	257
15.8.2	Process for Indicator Development and Analysis.....	257
15.9	REPORTING	258
15.9.1	Annual Socio-economic Report to NIRB	258
15.9.2	Presentations to Collaborative Partners Such as Q-SEMC, Communities, Departments	258
15.9.3	IIBA - Periodic Reports from Baffinland – Economic Provisions	259
15.9.4	Periodic Reports from Baffinland – IIBA Environmental Provisions	259
15.9.5	IIBA - Annual Implementation Report.....	259
15.9.6	IIBA - Inuit Participation Report	259
15.9.7	IIBA - Workplace Initiatives.....	260
15.9.8	Frequency of reporting	261
SECTION 16.0	CONCLUSIONS	262
SECTION 17.0	AUTHORS	264
SECTION 18.0	REFERENCES	265
SECTION 19.0	DEFINITIONS AND ABBREVIATIONS	270
19.1	DEFINITIONS.....	270
19.2	ABBREVIATIONS.....	271

LIST OF TABLES

Table 4-1.1	Key Indicators for Socio-economic Impact Assessment.....	5
Table 4-1.2	Subjects of Note for Socio-economic Impact Assessment	7
Table 4-2.1	Population Demographics VSEC: Demographic Stability.....	16
Table 4-3.1	Effects Assessment Summary: Life skills	31
Table 4-3.2	Effects Assessment Summary: Education and Skills	37
Table 4-3.3	Diversity of Job Classifications at a “Typical” Operating Iron Mine Project	40

Table 4-4.1	Summary of Project Interactions with Inuit Harvesting	50
Table 4-4.2	A Conceptual Framework to Assist in Understanding Changes in Harvest Activities	56
Table 4-4.3	Factors Determining Employment of LSA Residents.....	66
Table 4-4.4	Effects Assessment Summary - Wage Employment	70
Table 4-4.5	Effects Assessment Summary - Job Progression and Career Advancement	75
Table 4-6.1	Effects Assessment Summary - Well-Being of Children.....	129
Table 4-6.2	Effects Assessment Summary - Substance Abuse	137
Table 4-6.3	Effects Assessment Summary - Community Social Stability.....	142
Table 4-7.1	Effects Assessment Summary - Hamlet Staff Recruitment and Retention.....	153
Table 4-8.1	Procurement by Baffinland during Exploration and Bulk Sample Activities.....	160
Table 4-8.2	Contract Opportunities and Associated Jobs.....	162
Table 4-8.3	Effects Assessment Summary - Business Opportunities.....	166
Table 4-9.1	Types of Disturbance Potentially Affecting Cultural Resources	185
Table 4-9.2	Effects Summary for Archaeological Sites.....	189
Table 4-10.1	Effects Assessment Summary for Harvesting	211
Table 4-10.2	Effects Assessment Summary for Travel and Camps	219
Table 4-11.1	The Project in the Context of IQ Guiding Principles	225
Table 4-12.1	Baffinland Required Payments of Benefits, Royalty And Taxes	230
Table 4-12.2	Nunavut Mining Royalty	233
Table 4-12.3	Effect of the Project on Social Expenditure Trends	234
Table 4-14.1	Summary of Project Effects on the Key Indicators	243
Table 4-15.1	Project Socio-economic Performance Indicators	248
Table 4-15.2	Indicators and Indicator Clusters	252
Table 4-15.3	Conceptual Analysis of Project – Harvesting Interactions	253
Table 4-15.3	Conceptual Analysis of Project – Harvesting Interactions	254
Table 4-15.4	Reporting Frequency.....	261

LIST OF FIGURES

Figure 4-1.1	Communities in the Vicinity of the Mary River Project	3
Figure 4-4.1	Total Labour Demand by Project Phase (hours of labour per year)	64
Figure 4-4.2	Total Labour Demand by Skill Level (hours of labour per year)	65
Figure 4-9.1	Paleo-Eskimo Site in the Pond Inlet Area (from Mary-Rousselière 1976).....	171
Figure 4-9.2	Distribution of Paleo-Eskimo Sites in northern Foxe Basin (from Crowe, 1970)	172
Figure 4-9.3	Location of Archaeological Sites Recorded on Jens Munk Island (from Savelle 2004)	173
Figure 4-9.4	The Core Area of Occupation (from Maxwell, 1985)	174
Figure 4-9.5	Location of Main Settlement Areas 1900-1970 (from Vestey, 1974).....	175
Figure 4-9.6	Archaeological Sites.....	177
Figure 4-9.7	Special Places - North Baffin Region (Workshop Results)	178
Figure 4-9.8	Historical Sites – North Baffin Region (Workshop results)	179
Figure 4-9.9	Gravesites – North Baffin Region (Workshop Results).....	180
Figure 4-10.1	Land-use Study Area	194
Figure 4-10.2	Marine Harvesting Patterns - North Baffin	195

Figure 4-10.3	Marine Harvesting Patterns - South Baffin	196
Figure 4-10.4	Travel Routes - North Baffin Region (Workshop Results)	197
Figure 4-10.5	Travel Routes - South Baffin Region (Workshop Results).....	198
Figure 4-10.6	Camping Locations - North Baffin Region (Workshop Results).....	199
Figure 4-10.7	Camping Locations - South Baffin Region (Workshop Results)	200
Figure 4-10.8	Study Area for the Proposed Lancaster Sound National Marine Conservation Area (from Parks Canada, 2010b)	205
Figure 4-10.9	Cross Section of Snowmobile/ATV Railway	216
Figure 4-10.10	Potential Detour Around Ship Tracks in Steensby Inlet.....	218

APPENDICES

Appendix 4A	Socio-Economic Baseline Report
Appendix 4B	Economic Impact Model
Appendix 4C	Land-use Report
Appendix 4D	Preliminary Archeological Mitigation Plan

VOLUME 5 – ATMOSPHERIC ENVIRONMENT

TABLE OF CONTENTS

	PAGE
DOCUMENT STRUCTURE	
PROJECT FACT SUMMARY	
EIS DOCUMENT STRUCTURE	i
SECTION 1.0 - CLIMATE	1
1.1 BASELINE SUMMARY	1
1.1.1 Climate Setting	1
1.1.2 Air Temperature	2
1.1.3 Precipitation	2
1.1.4 Wind-blown Snowfall	3
1.1.5 Evaporation	3
1.1.6 Wind Speed and Direction	4
1.1.7 Solar Measurements	5
1.1.8 Atmospheric Moisture	5
1.2 CLIMATE CHANGE FORECASTS	5
1.2.1 Prediction Methods	5
1.2.2 Historical Climate Data	6
1.2.3 Global Climate Models	6
1.2.4 Extreme Events Analysis	20
1.2.5 Conclusion	21
1.3 GREENHOUSE GAS EMISSIONS ESTIMATED FOR THE PROJECT	22
1.4 AUTHORS	23
SECTION 2.0 - AIR QUALITY (VEC)	24
2.1 BASELINE SUMMARY	24
2.2 ISSUES SCOPING	26
2.3 AIR EMISSION SOURCES DURING CONSTRUCTION PHASE	29
2.4 AIR EMISSION SOURCES DURING OPERATION PHASE	30
2.5 REGULATORY CONTEXT AND AIR QUALITY THRESHOLDS	31
2.6 AIR QUALITY	35
2.6.1 Assessment Methodology	35
2.6.2 Potential Effects and Proposed Mitigation - Construction Phase	37
2.6.3 Potential Effects and Proposed Mitigation - Operations	39
2.6.4 Potential Effects and Proposed Mitigation - Closure/Post-closure	56
2.6.5 Assessment of Residual Effects	56
2.6.6 Prediction Confidence	59
2.6.7 Follow Up	61
2.7 IMPACT STATEMENT	61
2.8 AUTHORS	61
SECTION 3.0 - NOISE AND VIBRATION	62
3.1 BASELINE SUMMARY	62
3.2 ISSUES SCOPING	67

3.3	NOISE.....	68
3.3.1	Assessment Methods	68
3.3.2	Potential Effects and Proposed Mitigation - Construction Phase.....	73
3.3.3	Potential Effects and Proposed Mitigation - Operation Phase	76
3.3.4	Assessment of Residual Effects.....	84
3.3.5	Prediction Confidence	84
3.3.6	Follow-Up.....	90
3.4	VIBRATION	90
3.4.1	Assessment Methods	90
3.4.2	Potential Effects and Proposed Mitigation - Construction and Closure Phases	91
3.4.3	Potential Effects and Proposed Mitigation - Operations.....	93
3.4.4	Steensby Port	95
3.4.5	Railway	95
3.4.6	Assessment of Residual Effects.....	96
3.4.7	Prediction Confidence	97
3.4.8	Follow-Up.....	97
3.5	IMPACT STATEMENT	97
3.6	AUTHORS	98
SECTION 4.0 - REFERENCES		99
SECTION 5.0 - DEFINITIONS AND ABBREVIATIONS		102
5.1	DEFINITIONS.....	102
5.2	ABBREVIATIONS.....	118

LIST OF TABLES

Table 5-1.1	Comparison of 1971 to 2000 Climate Normals to GCM-Predicted Climate Variables	7
Table 5-1.2	Climate Forecasts - 2011 to 2040 (2020s)	9
Table 5-1.3	Climate Forecasts - 2041 to 2070 (2050s)	9
Table 5-1.4	Climate Forecasts - 2071 to 2100 (2080s)	11
Table 5-1.5	Summary of Climate Forecasts.....	11
Table 5-1.6	20-Year Return Extreme Minimum and Maximum Temperatures (in °C) Calculated from 1976-2006 Observations and Predicted Changes (in °C) for SRES A1B Emissions Scenario Relative to 1981-2000	21
Table 5-2.1	Measured Baseline Concentrations	26
Table 5-2.2	Baseline Dustfall Deposition Rates.....	26
Table 5-2.3	Baseline Metals Deposition Rates for Select Metals	26
Table 5-2.4	Key Issues for Air Quality.....	26
Table 5-2.5	Ambient Air Quality Criteria, Standards, and Objectives	32
Table 5-2.6	Ambient Air Quality Criteria for Metals.....	33
Table 5-2.7	Dust Deposition Criteria	33
Table 5-2.8	Thresholds for Potential Acid Input Loads	34
Table 5-2.9	Air Quality Effects Assessment Approach	35
Table 5-2.11	Emission Sources and Estimated Annual Emissions Due to the Mine Site ¹	39
Table 5-2.12	Emission Sources and Estimated Annual Emissions due to Steensby Port.....	49

Table 5-2.13	Residual Effect Rating Criteria used for the Air Quality Assessment	57
Table 5-2.14	Effects Assessment Summary: Air Quality	58
Table 5-2.15	Significance of Residual Air Quality Effects	59
Table 5-3.1	Baseline Noise Monitoring Results	62
Table 5-3.2	Key Issues for Noise and Vibration	67
Table 5-3.3	Summary of Noise and Vibration Key Indicators	68
Table 5-3.4	Modelling Parameters Used in the Analysis	69
Table 5-3.5	Noise Assessment Approach	70
Table 5-3.6	Typical Ranges of Commonly Encountered Sound Levels	71
Table 5-3.7	Mine Site Modelled Noise Levels - Operation Phase	77
Table 5-3.8	Mine Site Modelled Indoor Noise Levels - Operation Phase	77
Table 5-3.9	Operational Noise Levels - Steensby Port	80
Table 5-3.10	Steensby Port Modelled Indoor Noise Levels - Operation Phase	80
Table 5-3.11	Effects Assessment Summary: Noise	89
Table 5-3.12	Significance of Residual Noise Effects	89
Table 5-3.13	Vibration Assessment Approach	90
Table 5-3.14	Vibration Levels - Mine Site Operation Phase	94
Table 5-3.15	Effects Assessment Summary: Vibration	96
Table 5-3.16	Significance of Residual Vibration Effects	97

LIST OF FIGURES

Figure 5-2.1	Predicted Maximum 24-hour TSP Concentrations - Mine Site	41
Figure 5-2.2	Predicted Annual TSP Deposition - Mine Site	42
Figure 5-2.3	Predicted Maximum 24-hour PM ₁₀ Concentrations - Mine Site	43
Figure 5-2.4	Predicted Maximum 24-hour PM _{2.5} Concentrations - Mine Site	44
Figure 5-2.5	Predicted Maximum 1-hour NO ₂ Concentrations - Mine Site	45
Figure 5-2.6	Predicted Maximum 24-hour TSP Concentrations - Steensby Port	51
Figure 5-2.7	Predicted Annual TSP Deposition - Steensby Port	52
Figure 5-2.8	Predicted Maximum 24-Hour PM ₁₀ Concentrations - Steensby Port	53
Figure 5-2.9	Predicted Maximum 24-Hour PM _{2.5} Concentrations - Steensby Port	54
Figure 5-2.10	Predicted Maximum 1-Hour NO ₂ Concentrations - Steensby Port	55
Figure 5-3.1	Noise Baseline Measurement Sites	63
Figure 5-3.2	Noise Local Study Area - Mine Site	65
Figure 5-3.3	Noise Local Study Area - Steensby Inlet	66
Figure 5-3.4	Mine Site Noise Contour Plot - Operation Phase – Summer	78
Figure 5-3.5	Mine Site Noise Contour Plot - Operation Phase - Winter	79
Figure 5-3.6	Steensby Port Noise Contour Plot - Operation Phase - Summer	81
Figure 5-3.7	Steensby Port Noise Contour Plot - Operation Phase - Winter	82
Figure 5-3.8	Rail Noise Levels vs. Distance from Track Centre-line	83
Figure 5-3.9	Mine Site Noise Exposure Forecast, Eastward takeoffs	85
Figure 5-3.10	Mine Site Noise Exposure Forecast, Westward takeoffs	86
Figure 5-3.11	Steensby Port Noise Exposure Forecast, Eastward takeoffs	87
Figure 5-3.12	Steensby Port Noise Exposure Forecast, Westward takeoffs	88
Figure 5-3.13	Vibration Levels Resulting from Blasting in the Open Pit	94

Figure 5-3.14	Predicted Rail Vibration vs. Distance from Track Centre-line.....	95
---------------	---	----

APPENDICES

Appendix 5A	Baseline Meteorological Report and Meteorological Instruments Report
Appendix 5B	Greenhouse Gas Assessment
Appendix 5C	Air Quality
Appendix 5C-1	Air Quality Baseline Report
Appendix 5C-2	Air Quality Monitoring During Bulk Sampling Preparations 2007, Milne Inlet
Appendix 5C-3	Air Quality Monitoring During Bulk Sampling Operations 2008, Mary River
Appendix 5C-4	Air Emission Inventory
Appendix 5C-5	Air Quality Modelling Contour Plots
Appendix 5D	Noise
Appendix 5D-1	Noise Baseline Report
Appendix 5D-2	Noise Emission Inventory

VOLUME 6 – TERRESTRIAL ENVIRONMENT

TABLE OF CONTENTS

	PAGE
DOCUMENT STRUCTURE	
PROJECT FACT SHEET	
TABLE OF CONTENTS	i
SECTION 1.0 - INTRODUCTION	1
1.1 REGIONAL TERRESTRIAL SETTING	1
1.2 STUDY AREAS	2
SECTION 2.0 - LANDFORMS, SOILS AND PERMAFROST	4
2.1 BASELINE SUMMARY	4
2.1.1 Landforms and Soils	4
2.1.2 Bedrock Geology	13
2.1.3 Geotechnical and Geomechanical Conditions	16
2.1.4 Geochemistry	25
2.1.5 Groundwater/Hydrogeology	26
2.2 ISSUES SCOPING	27
2.3 SENSITIVE LANDFORMS	27
2.3.1 Assessment Methods	27
2.3.2 Potential Effects and Proposed Mitigation	29
2.3.3 Assessment of Residual Effects	37
2.3.4 Prediction Confidence	38
2.4 SUBJECTS OF NOTE	39
2.4.1 Soils	39
2.4.2 Wetlands and Eskers	40
2.4.3 Aesthetics of Natural Environment	41
2.4.4 Palaeontological Resources	41
2.5 IMPACT STATEMENT	41
2.6 AUTHORS	42
SECTION 3.0 - VEGETATION	43
3.1 ISSUES SCOPING	43
3.2 VEGETATION	45
3.2.1 Assessment Methods	51
3.2.2 Potential Effects and Proposed Mitigation	56
3.2.3 Assessment of Residual Effects	68
3.2.4 Prediction Confidence	70
3.2.5 Follow-up	71
3.3 SUBJECTS OF NOTE	72
3.4 IMPACT STATEMENTS	72
3.4.1 Vegetation Abundance and Diversity	72

3.4.2	Vegetation Health	72
3.4.3	Culturally Valued Vegetation	72
3.5	AUTHORS	72
SECTION 4.0 - MIGRATORY BIRDS AND HABITAT		73
4.1	ISSUES SCOPING	73
4.2	KEY INDICATORS	74
4.2.1	Peregrine Falcon	75
4.2.2	Snow Goose	75
4.2.3	Common and King Eider	76
4.2.4	Red-throated Loon.....	77
4.2.5	Thick-billed Murre	77
4.2.6	Lapland Longspur	78
4.2.7	Species at Risk.....	78
4.3	POTENTIAL PROJECT INTERACTIONS WITH BIRDS	81
4.3.1	Key Issues	82
4.4	ASSESSMENT METHODS	85
4.4.1	Measurable Parameters	85
4.4.2	Thresholds and Adaptive Management.....	86
4.4.3	Assessment of Habitat Loss	88
4.4.4	Assessment of Mortality Risk and Health Risk.....	89
4.5	PEREGRINE FALCON.....	89
4.5.1	Potential Effects and Proposed Mitigation.....	90
4.5.2	Assessment of Residual Effects	97
4.5.3	Prediction Confidence	99
4.5.4	Follow-up	99
4.6	SNOW GOOSE	99
4.6.1	Potential Effects and Proposed Mitigation.....	99
4.6.2	Assessment of Residual Effects.....	102
4.6.3	Prediction Confidence	104
4.6.4	Follow-Up.....	104
4.7	COMMON AND KING EIDER	104
4.7.1	Potential Effects and Proposed Mitigation.....	104
4.7.2	Assessment of Residual Effects	106
4.7.3	Prediction Confidence	108
4.7.4	Follow-up	108
4.8	RED-THROATED LOON.....	108
4.8.1	Potential Effects and Proposed Mitigation.....	108
4.8.2	Assessment of Residual Effects.....	110
4.8.3	Prediction Confidence	110
4.8.4	Follow-Up.....	110
4.9	THICK-BILLED MURRE	112
4.9.1	Potential Effects and Proposed Mitigations.....	112
4.9.2	Assessment of Residual Effects	113
4.9.3	Prediction Confidence	113

4.9.4	Follow-up	113
4.10	LAPLAND LONGSPUR	116
4.10.1	Potential Effects and Proposed Mitigation.....	116
4.10.2	Assessment of Residual Effects.....	117
4.10.3	Prediction Confidence	117
4.10.4	Follow-Up.....	119
4.11	SPECIES AT RISK	119
4.11.1	Harlequin Duck	119
4.11.2	Ross's and Ivory Gulls.....	121
4.11.3	Red Knot.....	122
4.11.4	Short-eared Owl	122
4.11.5	Assessment of Residual Effects.....	123
4.12	ADDITIONAL SUBJECTS OF NOTE	123
4.12.1	General Mitigation Measures for all Bird Species	123
4.12.2	Nest Management Plan.....	124
4.12.3	Important Habitat Areas.....	125
4.12.4	Seabirds and Seabird Colonies.....	125
4.12.5	Potential Increase in Predation Due to Project Development	125
4.12.6	Bird Collision Risk with Communication Towers, Tall Structure and Overhead Wires.....	126
4.12.7	Impact of Aircraft Disturbance on Staging, Nesting and Moulting Birds	126
4.12.8	Impact of Wake on Coastal Foraging and Nesting Habitat	127
4.13	IMPACT STATEMENTS.....	130
4.13.1	Peregrine Falcon	130
4.13.2	Snow Goose	130
4.13.3	Common and King Eider	130
4.13.4	Red-throated Loon.....	130
4.13.5	Thick-billed Murres	130
4.13.6	Lapland Longspur.....	131
4.14	AUTHORS	131
SECTION 5.0 - TERRESTRIAL WILDLIFE AND HABITAT		132
5.1	ISSUES SCOPING	132
5.2	CARIBOU	135
5.2.1	Assessment Methods	139
5.2.2	Potential Effects and Proposed Mitigation.....	148
5.2.3	Assessment of Residual Effects.....	166
5.2.4	Prediction Confidence	169
5.2.5	Follow-Up.....	170
5.3	SUBJECTS OF NOTE.....	170
5.3.1	Lighting	170
5.3.2	Carnivores	171
5.4	IMPACT STATEMENTS.....	172
5.4.1	Caribou Habitat.....	172
5.4.2	Caribou Movement	172

5.4.3	Caribou Mortality	172
5.4.4	Caribou Health.....	172
5.5	AUTHORS	173
SECTION 6.0 - REFERENCES		174
SECTION 7.0 - DEFINITIONS AND ABBREVIATIONS		187
7.1	DEFINITIONS.....	187
7.2	ABBREVIATIONS.....	198

LIST OF TABLES

Table 6-2.1	Total Amounts of Organic Matter and Primary Nutrients in Soils in the Project Area.....	10
Table 6-2.2	Preliminary Seismic Parameters for the Project Area.....	16
Table 6-2.3	Activities That May Destabilize/Degrade Thaw Sensitive Landforms.....	29
Table 6-2.4	Mitigation Measures for Effects/Risks Associated with Sensitive Landforms at the Mine Site	34
Table 6-2.5	Mitigation Measures for Effects/Risks Associated with Sensitive Landforms along the Railway.....	38
Table 6-2.6	Potential Effects on the Aesthetics of the Natural Environment Resulting from Project Components and Activities	41
Table 6-3.1	Dust Deposition Rates and Criteria for Potential Effects on Vegetation Health	53
Table 6-3.2	Vegetation Classes Predicted to be Sensitive to Annual TSP Deposition, NO ₂ Emissions, and Nitrogen Deposition.....	56
Table 6-3.3	Summary of Predicted Loss of the Terrestrial Habitat within and Outside the PDA.....	57
Table 6-3.4	Predicted Loss of Broad Vegetation Community Types as a Result of Disturbance within the PDA	58
Table 6-3.5	The Area Outside the PDA Affected by Annual TSP Deposition on Vegetated ELC Units.....	58
Table 6-3.6	Vegetation Classes Affected by Annual Dust (TSP) Deposition.....	60
Table 6-3.7	Total Predicted Soil Metal Concentration in Comparison to U.S. EPA EcoSSLs and CCME Soil Guidelines Assuming 120 g TSP/m ² /a Deposition Rate	62
Table 6-3.9	The Area Outside of the PDA Affected by Atmospheric Nitrogen Dioxide on Vegetated ELC Units.....	63
Table 6-3.10	Vegetation Classes Outside the PDA Affected by Atmospheric Nitrogen Dioxide (NO ₂) Emissions.....	65
Table 6-3.11	Area Outside the PDA Affected by Nitrogen (N) Deposition on Vegetated ELC Units	65
Table 6-3.12	Vegetation Classes Outside the PDA Affected by Atmospheric Nitrogen (N) Deposition	66
Table 6-3.13	The Expected Effect to Potential Blueberry Cover within the RSA.....	68
Table 6-3.14	Effects Assessment Summary: Vegetation.....	71
Table 6-4.1	Key Indicator Species of Birds Selected for the Mary River Project.....	74
Table 6-4.2	Status of Avian Species at Risk with the Potential occur in the Mary River RSA.....	78
Table 6-4.3	Potential Effects, Measurable Parameters and Thresholds for Key Indicators	86

Table 6-4.4	Distribution of Cliff-nesting Raptor Nest Sites within the Mary River RSA, 2006–2011	91
Table 6-4.5	Change in Effectiveness of Peregrine Nesting and Foraging Habitat within the Terrestrial RSA.....	92
Table 6-4.6	Residual Effects Assessment Summary: Peregrine Falcon	98
Table 6-4.7	Change in Effectiveness of Snow Goose Habitat within the Terrestrial RSA.....	100
Table 6-4.8	Residual Effects Assessment Summary: Snow Goose	103
Table 6-4.9	Change in Effectiveness of Eider Habitat within the Terrestrial RSA	105
Table 6-4.10	Residual Effects Assessment Summary (Terrestrial RSA): Common and King Eider	107
Table 6-4.11	Change in Effectiveness of Red-throated Loon Habitat within the Terrestrial RSA	109
Table 6-4.12	Residual Effects Assessment Summary: Red-throated Loon.....	111
Table 6-4.13	Residual Effects Assessment Summary: Thick-billed Murre	114
Table 6-4.14	Predicted Change in Lapland Longspur Densities within the Terrestrial RSA.....	116
Table 6-4.15	Residual Effects Assessment Summary: Lapland Longspur	118
Table 6-4.16	Recommended Setback Distances for Activity near Bird Nests	124
Table 6-5.1	Summary of the Factor used to Reduce RSPF Values and Calving Site Effectiveness with Distances from the Project.....	142
Table 6-5.2	Change in Effectiveness of Caribou Habitat within the RSA and the North Baffin herd range	148
Table 6-5.3	Yearly location of known calving sites relative to PDA and ZOI for each collared female caribou.....	150
Table 6-5.4	Sections of the Railway that May Impede Caribou Movement	157
Table 6-5.5	Trail-Specific Assessment of Potential Barriers to Movement along the Railway	158
Table 6-5.6	Key and Broad Movement Areas and Railway Barrier Assessment.....	160
Table 6-5.7	Estimate of time that Railway traffic presents a barrier to a single point along the rail line	161
Table 6-5.8	Summary of predicted caribou exposure to annual dust deposition (TSP) within the ZOI	165
Table 6-5.9	Effects Assessment Summary: Caribou	168
Table 6-5.10	Terrestrial Wildlife Impact Statement Summary for the Mary River Project	172

LIST OF FIGURES

Figure 6-1.1	Landforms, Vegetation and Bird Regional Study Area	3
Figure 6-2.1	Relief Map of the North Baffin Region	5
Figure 6-2.2	Surficial Geology in the RSA.....	7
Figure 6-2.3	Surficial Geology in the Mine Site Area	9
Figure 6-2.4	Deep Thermistor Temperature Results.....	12
Figure 6-2.5	Bedrock Geology in the RSA	14
Figure 6-3.1	Vegetation Communities within the Mary River Regional Study Area.....	44
Figure 6-3.2	Vegetation Classes Affected by Annual Dust (TSP) Deposition.....	59
Figure 6-3.3	Vegetation Classes Affected by Annual Nitrogen Emissions	64
Figure 6-3.4	Vegetation Classes Affected by Annual Nitrogen Deposition.....	67
Figure 6-3.5	Blueberry Cover within the Regional Study Area.....	69
Figure 6-4.1	Bird Marine and Terrestrial Study Areas.....	87

Figure 6-4.2	North Region Raptor Cliff-Nest Location 2006 - 2011	94
Figure 6-4.3	South Region Raptor Cliff Nest Locations 2006 – 2011	95
Figure 6-4.4	Thick-billed Murre Observations in the Marine RSA.....	115
Figure 6-4.5	Species at Risk Observations, Mary River Project RSA.....	120
Figure 6-4.6	Conservation Areas, Important Bird Areas (IBAs) and Key Habitat Sites	128
Figure 6-4.7	Airstrip Zone of Influence with Snow Goose Breeding Colonies and Moulting Areas	129
Figure 6-5.1	Regional Study Area and Range of North Baffin Caribou Herd.....	140
Figure 6-5.2	The Zones of Influence of the Project on Caribou Habitat.....	143
Figure 6-5.3	Key Caribou Movement from IQ and Aerial Surveys	145
Figure 6-5.4	Caribou Habitation Selection Probability During the Calving Season	151
Figure 6-5.5	Caribou Habitat Selection Probability During the Summer Season.....	152
Figure 6-5.6	Caribou Habitat Selection Probability During the Winter Season	153
Figure 6-5.7	Caribou Calving Sites.....	154
Figure 6-5.8	Average, maximum and minimum mean monthly snow depth in the north Baffin region (MERRA climate data, 1979–2011).	163
Figure 6-5.9	Number of days a rain-on-snow event or freezing rain occurred during fall months in the north Baffin region from 1979 to 2009 (MERRA climate data, 1979–2011).	163

APPENDICES

Appendix 6A	Palaeontology Report
Appendix 6B	Geochemical Evaluations
Appendix 6B-1	Interim Mine Rock ML/ARD Report, Mary River Project
Appendix 6B-2	Geochemical Evaluation of Tote Road Aggregate Materials
Appendix 6B-3	Geochemical Evaluation of Railway Quarry Materials
Appendix 6C	Vegetation Baseline Report
Appendix 6D	Ecological Land Classification
Appendix 6E	Bird Baseline Report
Appendix 6F	Terrestrial Wildlife Baseline Report
Appendix 6G-1	Evaluation of Exposure Potential from Metals in Dust (2010)
Appendix 6G-2	Evaluation of Exposure Potential from Metals in Dust (2011)
Appendix 6H	Caribou Energetics

VOLUME 7 – FRESHWATER ENVIRONMENT

TABLE OF CONTENTS

	PAGE
DOCUMENT STRUCTURE	
PROJECT FACT SHEET	
TABLE OF CONTENTS	i
SECTION 1.0 - REGIONAL FRESHWATER SETTING	1
1.1 INTRODUCTION	1
1.2 STUDY AREAS	1
SECTION 2.0 - FRESHWATER QUANTITY	12
2.1 BASELINE SUMMARY	12
2.1.1 Introduction	12
2.1.2 Methods	12
2.1.3 Results	13
2.2 ISSUES SCOPING	15
2.2.1 Scoping Completed	15
2.2.2 Valued Ecosystem Components	15
2.2.3 Subjects of Note and Key Issues	16
2.2.4 Subjects of Note	16
2.3 FRESHWATER QUANTITY (KEY INDICATOR)	18
2.3.1 Assessment Methods	18
2.3.2 Potential Effects and Proposed Mitigation	21
2.3.3 Assessment of Residual Effects of Key Issues	28
2.3.4 Prediction Confidence	88
2.3.5 Follow Up	88
2.4 IMPACT STATEMENT	88
2.5 AUTHORS	89
SECTION 3.0 - WATER AND SEDIMENT QUALITY	90
3.1 INTRODUCTION	90
3.1.1 Study Areas	91
3.2 BASELINE SUMMARY	91
3.2.1 Introduction	91
3.2.2 Sampling Locations	91
3.2.3 Sampling Methodology	100
3.2.4 Results	101
3.3 ISSUE SCOPING	106
3.3.1 Scoping Completed	106
3.3.2 Valued Ecosystem Components	106
3.3.3 Subjects of Note	106
3.4 WATER AND SEDIMENT QUALITY	106

3.4.1	Assessment Methods and Criteria	107
3.4.2	Residual Effects Assessment	120
3.4.3	Information Gaps	174
3.4.4	Follow Up	174
3.5	IMPACT STATEMENT	175
3.6	AUTHORS	178
SECTION 4.0 - FRESHWATER AQUATIC BIOTA AND HABITAT		179
4.1	INTRODUCTION	179
4.2	BASELINE SUMMARY	179
4.2.1	Background	179
4.2.2	Methods	180
4.2.3	Milne Port LSA	181
4.2.4	Milne Inlet Tote Road LSA	184
4.2.5	Mine LSA	186
4.2.6	Railway LSA	194
4.2.7	Steensby Port LSA	197
4.3	ISSUES SCOPING	200
4.3.1	Scoping Completed	201
4.4	SUBJECTS OF NOTE	204
4.5	ARCTIC CHAR	206
4.5.1	Assessment Methods	206
4.5.2	Potential Effects and Proposed Mitigation	211
4.5.3	Milne Port LSA	212
4.5.4	Milne Inlet Tote Road LSA	215
4.5.5	Mine Site LSA	217
4.5.6	Railway/Access Road LSA	233
4.5.7	Steensby Port LSA	243
4.5.8	Assessment of Residual Effects	248
4.5.9	Follow Up	261
4.6	IMPACT STATEMENT	263
4.7	AUTHORS	263
SECTION 5.0 - REFERENCES		264
SECTION 6.0 - DEFINITIONS AND ABBREVIATIONS		270
6.1	DEFINITIONS	270
6.2	ABBREVIATIONS	308

LIST OF TABLES

Table 7-2.1	Watercourse Crossing Design Criteria	16
Table 7-2.2:	Magnitude Assessment Locations	19
Table 7-2.3:	Freshwater Quantity VEC Parameters and Thresholds	19
Table 7-2.4	Potential Effects from Key Components per Project Phase for Surface Water Quantity	21

Table 7-2.5	Water Consumption within the Milne Port LSA	23
Table 7-2.6:	Water Consumption within the Mine Site LSA.....	24
Table 7-2.7	Diversion Structures within the Mine Site LSA	24
Table 7-2.8	Effluent Discharge Activities within the Mine Site LSA.....	25
Table 7-2.9:	Water Consumption within the Railway LSA	26
Table 7-2.10:	Water Consumption within the Steensby Port LSA	27
Table 7-2.11	Diversion Activities within the Steensby Port LSA.....	28
Table 7-2.12	Ratings for Evaluating Residual Water Quantity Impacts.....	28
Table 7-2.13	Quantifiable Limits	29
Table 7-2.14	Milne Port LSA Freshwater Quantity Effects Assessment Summary - All Phases	32
Table 7-2.15	Over-Winter Water Withdrawal Volumes in the Milne Port LSA.....	32
Table 7-2.16	Reduction in Flow Downstream of Withdrawal Locations within the Milne Port LSA.....	33
Table 7-2.17	Significance of Potential Residual Environmental Effects on Water Quantity in the Milne Port LSA.....	33
Table 7-2.18	Mine Site LSA Freshwater Quantity Effects Assessment Summary - All Phases.....	36
Table 7-2.19	Water Quantity Diversion and Discharge within the Mine Site LSA	41
Table 7-2.20	Over-Winter Water Withdrawal Volumes in the Mine Site LSA.....	48
Table 7-2.21	Reduction in Flow Downstream of Withdrawal Locations within the Mine Site LSA	50
Table 7-2.22	Changes to Water Quantity in the Mine Site LSA Resulting from a Combination of Key Issues	52
Table 7-2.23	Significance of Potential Residual Environmental Effects on Water Quantity in the Mine Site LSA	66
Table 7-2.24	Railway LSA Freshwater Quantity Effects Assessment Summary - Construction Phase.....	69
Table 7.2-25	Over-Winter Water Withdrawal Volumes in the Railway LSA	70
Table 7-2.26	Reduction in Flow Downstream of Withdrawal Locations within the Railway LSA – Construction Phase Only	72
Table 7-2.27	Significance of Potential Residual Environmental Effects on Water Quantity in the Railway LSA	75
Table 7-2.28	Steensby Port LSA Freshwater Quantity Effects Assessment Summary - All Phases.....	78
Table 7-2.29	Over-Winter Water Withdrawal Volumes in the Steensby Port LSA	80
Table 7-2.30	Reduction in Flow Downstream of Withdrawal Locations within the Steensby Port LSA	80
Table 7-2.31	Change in Flow Downstream of Diversion and Discharge Locations within the Steensby Port LSA	81
Table 7-2.32	Significance of Potential Residual Environmental Effects on Water Quantity in the Steensby Port LSA	87
Table 7-3.1	Water and Sediment Quality Sampling Group Justification.....	99
Table 7-3.2	Surface Water Sampling Programs by Year	100
Table 7-3.3	Sediment Sampling Programs by Year	101
Table 7-3.4	Qualitative Characterization of River Systems	102
Table 7-3.5	Characterization of River Systems in the Project Area	103
Table 7-3.6	Qualitative Characterization of Lake Systems.....	103
Table 7-3.7	Characterization of Lake Systems in the Project Area	104

Table 7-3.8	Key Indicators and Thresholds for Water and Sediment Quality	108
Table 7-3.9	Key Issues for Water and Sediment Quality.....	111
Table 7-3.10	Significance Ratings for Evaluating Residual Water and Sediment Quality Effects	112
Table 7-3.11	Predicted Pit Water Quality	117
Table 7-3.12	Effects Assessment Summary - Aqueous Non-Point Source Emissions	122
Table 7-3.13	Significance of Residual Effects from Non-Point Source Discharges	123
Table 7-3.14	Effects Assessment Summary - Aqueous Point-Source Discharges	141
Table 7-3.15	Significance of Residual Effects from Point Source Discharges	142
Table 7-3.16	Predicted Water Quality in Camp Lake Tributaries and Camp Lake Under Mean Flow Conditions (West Pond Discharge).....	145
Table 7-3.17	Predicted Water Quality in Camp Lake Tributaries and Camp Lake in a Dry Year (West Pond Discharge).....	146
Table 7-3.18	Predicted Water Quality in the Mary River under Mean Flow Conditions (East Pond Discharge).....	149
Table 7-3.19	Predicted Water Quality in the Mary River under 10-Year Dry Conditions (East Pond Discharge).....	150
Table 7-3.20	Predicted Water Quality in the Mary River under Mean Flow Conditions (All Discharges).....	151
Table 7-3.21	Predicted Water Quality in the Mary River under 10-Year Dry Conditions (All Discharges).....	152
Table 7-3.22	Predicted Water Quality in the Mary River During Post-closure Due to Discharges of Pit Water and Waste Rock Stormwater under 10-Year Low Flow Conditions	155
Table 7-3.23	Resulting Water Quality in Sheardown Lake from Sewage Effluent Discharge	158
Table 7-3.24	Resulting Water Quality in Mary River from Sewage Effluent Discharge.....	160
Table 7-3.25	Effects Assessment Summary - Airborne Emissions	162
Table 7-3.26	Significance of Residual Effects from Dust Deposition	163
Table 7-3.27	Thickness of TSP Deposition by TSP Depositional Range at the Mine Site.....	165
Table 7-3.28	Total TSP Depositional Loadings for Key Mine Site Catchments	166
Table 7-3.29	Magnitude Thresholds for TSS in Surface Water	167
Table 7-3.30	Calculated TSS Concentrations in Key Mine Site Catchments Due to Annual Dust Deposition (Without Mitigation).....	167
Table 7-3.31	Magnitude Thresholds for Metals in Dust Affecting Water Quality	168
Table 7-3.32	Estimated Metals Concentrations in Ore Dust Runoff.....	169
Table 7-3.33	Magnitude Thresholds for Sediment Quality	170
Table 7-3.34	Comparison of Ore Dust with Sediment Quality Guidelines.....	172
Table 7-3.35	Management and Monitoring Plans Applicable to Water and Sediment Quality.....	174
Table 7-4.1	Water Withdrawal Locations during Project Construction, Operation and Closure.....	204
Table 7-4.2	Criteria for Determination of the Magnitude of Effect of Changes in Water Quality on Arctic Char Health and Condition	207
Table 7-4.3	Criteria for Determination of the Magnitude of Effect of Changes in Sediment Quality on Arctic Char Health and Condition.....	207
Table 7-4.4	Criteria for Determination of the Magnitude of Effect on Arctic Char Habitat.....	208
Table 7-4.5	Criteria for Determination of the Magnitude of Effect on Direct Mortality of Arctic Char	208

Table 7-4.6	Summary of Aqueous Non-point Sources that May Cause Exceedances of Water Quality Thresholds in the Milne Port LSA and Associated Project Phases.....	213
Table 7-4.7	Summary of Aqueous Non-point Sources that May Cause Exceedances of Water Quality Thresholds in the Milne Inlet Tote Road LSA.....	216
Table 7-4.8	Summary of Aqueous Non-point Sources that may Cause Exceedances of Water Quality Thresholds in the Mine LSA	222
Table 7-4.9	Summary of Aqueous Non-point Sources that may Cause Exceedances of Water Quality Thresholds in the Railway/Access Road LSA	234
Table 7-4.10	Fish Passage Determination Matrix for Railway and Access Road Culvert Crossings of Streams with Juvenile Arctic Char.....	239
Table 7-4.11	Summary of Project Effects related to loss of Arctic Char Habitat in the Railway/Access Road LSA	242
Table 7-4.12	Summary of Aqueous Non-point Sources that may Cause Exceedances of Water Quality Thresholds in the Steensby Port LSA	244
Table 7-4.13	Milne Port LSA - Freshwater Biota and Habitat Effects Assessment Summary - All Phases.....	249
Table 7-4.14	Milne Inlet Tote Road LSA - Freshwater Biota and Habitat Effects Assessment Summary - All Phases	250
Table 7-4.15	Mine LSA - Freshwater Biota and Habitat Effects Assessment Summary - All Phases.....	251
Table 7-4.16	Railway Alignment LSA - Freshwater Biota and Habitat Effects Assessment Summary - All Phases	254
Table 7-4.17	Steensby Port LSA - Freshwater Biota and Habitat Effects Assessment Summary – All Phases.....	255
Table 7-4.18	Significance of Potential Residual Environmental Effects on Arctic Char in the Milne Port LSA.....	256
Table 7-4.19	Significance of Potential Residual Environmental Effects on Arctic Char in the Milne Inlet Tote Road LSA.....	257
Table 7-4.20	Significance of Potential Residual Environmental Effects on Arctic Char in the Mine Site LSA.....	259
Table 7-4.21	Significance of Potential Residual Environmental Effects on Arctic Char in the Railway/Access LSA.....	260
Table 7-4.22	Significance of Potential Residual Environmental Effects on Arctic Char in the Steensby Port LSA	261
Table 7-4.23	Management and Monitoring Plans Applicable to Freshwater Biota and Habitat	261

LIST OF FIGURES

Figure 7-1.1	Freshwater Regional Study Area.....	2
Figure 7-1.2	Milne Port Local Study Area and Milne Tote Road Local Study Area.....	4
Figure 7-1.3	Mine Site Local Study Area	5
Figure 7-1.4	Railway Corridor Local Study Area and Steensby Port Local Study Area	6
Figure 7-1.5	Milne Port LSA Hydrograph Shapes - Station H1	7
Figure 7-1.6	Mine Site LSA Hydrograph Shapes - Stations H2, H3, H4, H5, H6, H7 and H8.....	9

Figure 7-1.7	Railway Corridor LSA Hydrograph Shapes - Stations BR11, BR25, BR96-2 and BR137	10
Figure 7-3.1	Stream and Lake Water Quality Sample Locations in the Freshwater RSA	92
Figure 7-3.2	Stream Water Quality Sample Locations Mine Site	93
Figure 7-3.3	Lake Water Quality Sample Locations Mine Site	94
Figure 7-3.4	Stream and Lake Water Quality Sample Locations Steensby Port	95
Figure 7-3.5	Sediment Sample Locations in the Freshwater RSA	96
Figure 7-3.6	Sediment and Benthic Invertebrates Sample Locations Mine Site	97
Figure 7-3.7	Sediment Sample Locations Steensby Port	98
Figure 7-3.8	TSP Deposition and Catchment Boundaries Mine Site	164
Figure 7-4.1	IQ Study Results - Arctic Char	182
Figure 7-4.2	Arctic Char Distribution in Freshwater at Milne Port	183
Figure 7-4.3	Milne Inlet Tote Road Habitat Crossings	185
Figure 7-4.4	Arctic Char Distribution at Mine Site	190
Figure 7-4.5	Gill Net CPUE for Arctic Char in Mine Site Lakes	191
Figure 7-4.6	Electrofishing CPUE for Arctic Char in Mine Site Lakes	192
Figure 7-4.7	Fish Habitat Interactions along Railway	196
Figure 7-4.8	Arctic Char Distribution in Freshwater at Steensby Port	199
Figure 7-4.9	Linkage Diagram Illustrating Project Activities/Pathways of Potential Effects – Arctic Char	202

APPENDICES

Appendix 7A	Baseline Hydrology Report
Appendix 7B-1	Surface Water and Sediment Quality Baseline Report
Appendix 7B-2	Development of Site Specific Water Quality Objectives for Application in the Final EIS Water Quality Assessment, Mary River project
Appendix 7C	Freshwater Aquatic Habitat and Fish Baseline Report

VOLUME 8 – MARINE ENVIRONMENT

TABLE OF CONTENTS

	PAGE
DOCUMENT STRUCTURE	
PROJECT FACT SHEET	
TABLE OF CONTENTS	
SECTION 1.0 - INTRODUCTION	1
1.1 THE MARY RIVER PROJECT	1
1.2 REGIONAL SETTING	1
1.2.1 Shipping Routes	1
1.2.2 Port Sites	6
1.3 STUDY AREAS	7
1.4 ISSUES SCOPING	7
1.5 VALUED ECOSYSTEM COMPONENTS	8
SECTION 2.0 - SEA ICE	10
2.1 INTRODUCTION	10
2.2 STUDY AREAS	10
2.3 BASELINE SUMMARY	12
2.4 ISSUES SCOPING	13
2.4.1 Valued Ecosystem Components	14
2.4.2 Key Issues and Pathways	14
2.5 SUBJECTS OF NOTE	14
2.5.1 Construction Activities	14
2.5.2 Wastewater Discharge	15
2.5.3 Landfast Ice Disruption Due to Ore Dust Deposition	15
2.5.4 Disruption of Pack Ice	15
2.6 LANDFAST ICE	21
2.6.1 Assessment Methods	21
2.6.2 Potential Effects and Proposed Mitigation	21
2.6.3 Assessment of Residual Effects	26
2.6.4 Prediction Confidence	28
2.6.5 Monitoring and Follow Up	28
2.7 IMPACT STATEMENT	28
2.8 AUTHORS	29
SECTION 3.0 - WATER AND SEDIMENT QUALITY	30
3.1 INTRODUCTION	30
3.1.1 Study Areas	30
3.2 BASELINE SUMMARY	33
3.2.1 Water Quality	33
3.2.2 Sediment Quality	44
3.3 ISSUES SCOPING	52
3.3.1 Valued Ecosystem Components	52
3.3.2 Key Issues and Pathways	52

3.4	SUBJECTS OF NOTE.....	54
3.5	WATER AND SEDIMENT QUALITY EFFECTS ASSESSMENT.....	58
3.5.1	Assessment Methods	58
3.5.2	Potential Effects and Proposed Mitigation.....	61
3.5.3	Assessment of Residual Effects.....	70
3.5.4	Prediction Confidence	78
3.5.5	Monitoring and Follow Up.....	78
3.6	IMPACT STATEMENT	78
3.7	AUTHORS	79
SECTION 4.0 - MARINE HABITAT AND BIOTA		80
4.1	INTRODUCTION	80
4.1.1	Study Areas	80
4.2	BASELINE SUMMARY.....	83
4.2.1	Milne Inlet LSA	83
4.2.2	Steensby Inlet LSA	92
4.3	ISSUES SCOPING	95
4.3.1	Key Issues and Pathways	95
4.4	SUBJECTS OF NOTE.....	97
4.5	MARINE FISH HABITAT	101
4.5.1	Assessment Methods	101
4.5.2	Potential Effects and Proposed Mitigation.....	101
4.5.3	Assessment of Residual Effects.....	114
4.5.4	Prediction Confidence	118
4.5.5	Monitoring and Follow Up.....	118
4.6	ARCTIC CHAR	118
4.6.1	Assessment Methods	119
4.6.2	Potential Effects and Proposed Mitigation.....	120
4.6.3	Assessment of Residual Effects.....	124
4.6.4	Monitoring and Follow Up.....	127
4.7	IMPACT STATEMENT	127
4.8	AUTHORS	128
SECTION 5.0 - MARINE MAMMALS.....		129
5.1	BASELINE SUMMARY.....	129
5.1.1	Ringed Seal	129
5.1.2	Walrus.....	131
5.1.3	Beluga Whale	133
5.1.4	Narwhal.....	135
5.1.5	Bowhead Whale	137
5.1.6	Polar Bear.....	138
5.1.7	Bearded Seal.....	140
5.2	ISSUES SCOPING	141
5.2.1	Key Questions	141
5.3	SUBJECTS OF NOTE.....	142
5.4	PROJECT INTERACTIONS WITH MARINE MAMMALS	142
5.4.1	Noise.....	142

5.4.2	Vessel Collisions	148
5.4.3	Habitat Change.....	148
5.4.4	Change in Prey.....	148
5.4.5	Biological ‘Hotspots’	149
5.5	ASSESSMENT METHODS COMMON TO MARINE MAMMAL INDICATOR SPECIES	149
5.5.1	Acoustic Modelling.....	149
5.5.2	Composite Audiogram and Noise Plots.....	150
5.5.3	Response Criteria.....	150
5.5.4	Estimating Numbers of Marine Mammals	151
5.5.5	Key Assumptions in Assessment Approach.....	151
5.5.6	Sound Levels from Two Ore Carriers and Likely Locations Where Ore Carriers Will Pass	152
5.5.7	Other Analysis Approaches Considered	153
5.6	RINGED SEAL.....	155
5.6.1	Assessment Methods	155
5.6.2	Potential Effects and Proposed Mitigation.....	160
5.6.3	Assessment of Residual Effects.....	173
5.6.4	Prediction Confidence	174
5.6.5	Follow Up.....	174
5.7	WALRUS	175
5.7.1	Assessment Methods	175
5.7.2	Potential Effects and Proposed Mitigation.....	179
5.7.3	Assessment of Residual Effects.....	192
5.7.4	Prediction Confidence	193
5.7.5	Follow Up.....	193
5.8	BELUGA	194
5.8.1	Assessment Methods	194
5.8.2	Potential Effects and Proposed Mitigation.....	198
5.8.3	Assessment of Residual Effects.....	211
5.8.4	Prediction Confidence	212
5.8.5	Follow Up.....	212
5.9	NARWHAL.....	212
5.9.1	Assessment Methods	214
5.9.2	Potential Effects and Proposed Mitigation.....	216
5.9.3	Assessment of Residual Effects.....	225
5.9.4	Prediction Confidence	226
5.9.5	Follow Up.....	226
5.10	BOWHEAD WHALE	226
5.10.1	Assessment Methods	228
5.10.2	Potential Effects and Proposed Mitigation.....	230
5.10.3	Assessment of Residual Effects.....	243
5.10.4	Prediction Confidence	245
5.10.5	Follow Up.....	245
5.11	POLAR BEAR.....	245
5.11.1	Assessment Methods	247

5.11.2	Potential Effects and Proposed Mitigation.....	248
5.11.3	Assessment of Residual Effects.....	256
5.11.4	Prediction Confidence	256
5.11.5	Follow Up.....	257
5.12	BEARDED SEAL	257
5.12.1	Assessment Methods	257
5.12.2	Potential Effects and Proposed Mitigation.....	260
5.12.3	Assessment of Residual Effects.....	271
5.12.4	Prediction Confidence	272
5.12.5	Follow Up.....	272
5.13	IMPACT STATEMENT	273
5.14	INDIRECT EFFECTS ON MARINE MAMMALS IN AREAS BEYOND THE RSA	274
5.15	EFFECTS OF SHIPPING ON MARINE MAMMALS IN DAVIS STRAIT AND THE NORTHERN LABRADOR SEA	274
5.16	AUTHORS	275
SECTION 6.0 - REFERENCES		276
SECTION 7.0 - DEFINITIONS AND ABBREVIATIONS		311
7.1	DEFINITIONS.....	311
7.2	ABBREVIATIONS.....	317

LIST OF TABLES

Table 8-1.1	Temporal Scale of the VEC Key Indicator	9
Table 8-2.1	Mean Monthly Area of Pack Ice within the RSA and Proportion of Disruption Due to Icebreaking.....	16
Table 8-2.2	Characteristics and Number of Ice Pans Estimated to be Struck per Month by Project Vessels	18
Table 8-2.3	Measurable Parameters and Thresholds for the Sea Ice VEC.....	21
Table 8-2.4	Mean Monthly Area of Landfast Ice within the RSA and Steensby Inlet	24
Table 8-2.5	Effects Assessment Summary: Sea Ice, Steensby Inlet.....	27
Table 8-2.6	Significance of Residual Effects on Sea Ice, Steensby Inlet	28
Table 8-3.1	Water Quality Summary Statistics for Milne Inlet, Open-water 2008 and 2010 (Open) and Ice-Cover 2008 (Ice).....	36
Table 8-3.2	Nutrient Concentrations from the Literature (Eastern Canadian Arctic) and the Current Study	37
Table 8-3.3	Water Quality Summary Statistics for Steensby Inlet, Open-water 2007 and 2008 (Open) and Ice-cover 2008 (Ice).....	41
Table 8-3.4	Sediment Quality Summary Statistics for Milne Inlet, 2008 and 2010.....	47
Table 8-3.5	Hydrocarbon Concentrations in Sediments from Milne Inlet, 2008 and 2010	49
Table 8-3.6	Sediment Quality Statistics for Steensby Inlet, 2007, 2008 and 2010.....	51
Table 8-3.7	Maximum Seabed Velocities Anticipated at Depths Along the Proposed Shipping Route for Project Vessels	55
Table 8-3.8	Key Indicators and Thresholds, Water and Sediment Quality VEC.....	59

Table 8-3.9	Criteria for Determination of the Magnitude of Effect of Changes in Water and Sediment Quality.....	60
Table 8-3.10	Chemical Composition of Ore Dust.....	65
Table 8-3.11	Estimation of Direct Aerial Deposition of Total Solid Particulate (TSP) to the Marine Environment in Steensby Inlet	66
Table 8-3.12	Estimation of Aerial Deposition of Total Solid Particulates (TSP) to Land in the Vicinity of Steensby Ore Stockpile	66
Table 8-3.13	Effects Assessment Summary: Water and Sediment Quality, Milne Inlet	71
Table 8-3.14	Effects Assessment Summary: Water and Sediment Quality, Steensby Inlet	73
Table 8-3.15	Significance of Residual Effects on Water and Sediment Quality, Milne Inlet	75
Table 8-3.16	Significance of Residual Effects on Water and Sediment Quality, Steensby Inlet	76
Table 8-4.1	Seabed Habitat Classification in Milne and Steensby Inlets.....	84
Table 8-4.2	Photosynthetic Pigment Concentrations, Milne and Steensby Inlets	85
Table 8-4.3	Zooplankton Summary Statistics, Milne and Steensby Inlets.....	87
Table 8-4.4	Benthic Infauna Summary Statistics, Milne and Steensby Inlets 2010.....	88
Table 8-4.5	Number of Fish Captured and Mean Catch Per Unit Effort (CPUE), Milne and Steensby Inlets.....	89
Table 8-4.6	Mean Concentration of Select Trace Elements in Arctic Char Muscle and Liver Tissue, Steensby (2007 and 2010) and Milne (2010) Inlets	91
Table 8-4.7	Criteria for Determination of the Magnitude of Effect on Marine Fish Habitat.....	101
Table 8-4.8	Effects Assessment Summary: Marine Fish Habitat, Milne Inlet	103
Table 8-4.9	Effects Assessment Summary: Marine Fish Habitat, Steensby Inlet.....	105
Table 8-4.10	Marine Fish Habitat within Project Footprints	108
Table 8-4.11	Marine Fish Habitat Altered or Disturbed Due to Project Activities	112
Table 8-4.12	Significance of Residual Effects on Marine Fish Habitat in Milne Inlet.....	115
Table 8-4.13	Significance of Residual Effects on Marine Fish Habitat in Steensby Inlet	116
Table 8-4.14	Criteria for Determination of the Magnitude of Effect on Arctic Char Health and Condition Due to Changes in Water Quality.....	119
Table 8-4.15	Effects Assessment Summary: Arctic Char Health at Milne Inlet	122
Table 8-4.16	Effects Assessment Summary: Arctic Char Health at Steensby Inlet.....	123
Table 8-4.17	Significance of Residual Effects on Arctic Char Health, Milne Inlet.....	125
Table 8-4.18	Significance of Residual Effects on Arctic Char Health, Steensby Inlet	126
Table 8-5.1	The Status and Regional Distribution of Marine Mammal Species in the RSA and in Baffin Bay and Davis Strait	130
Table 8-5.2	Likely locations where Project ore carriers will pass each other within the RSA during open-water and ice-covered periods	155
Table 8-5.3	Measurable Parameters and Threshold Values for Ringed Seals.....	157
Table 8-5.4	Effects Assessment Summary: Ringed Seals	162
Table 8-5.5	Significance of Residual Effects to Ringed Seals	163
Table 8-5.6	Measurable Parameters and Threshold Values for Walrus.....	177

Table 8-5.7	Distances of Known and Potential Walrus Haul-out Sites to Nominal Ore Carrier Shipping Route in Foxe Basin and Hudson Strait	184
Table 8-5.8	Effects Assessment Summary: Walrus.....	189
Table 8-5.9	Significance of Residual Effects to Walrus	190
Table 8-5.10	Measurable Parameters and Threshold Values for Beluga Whales.....	197
Table 8-5.11	Effects Assessment Summary: Beluga Whale	200
Table 8-5.12	Significance of Residual Effects to Beluga Whale	201
Table 8-5.13	Measurable Parameters and Threshold Values for Narwhal.....	215
Table 8-5.14	Effects Assessment Summary: Narwhal.....	218
Table 8-5.15	Significance of Residual Effects to Narwhal	219
Table 8-5.16	Measurable Parameters and Threshold Values for Bowhead Whales.....	229
Table 8-5.17	Effects Assessment Summary: Bowhead Whale.....	232
Table 8-5.18	Significance of Residual Effects to Bowhead Whale	233
Table 8-5.19	Surfacing, respiration and dive behavior of undisturbed bowhead whales engaged in various activities during the spring, summer, and fall (Thomas et al., 2002).....	242
Table 8-5.20	Measurable Parameters and Threshold Values for Polar Bears	248
Table 8-5.21	Effects Assessment Summary: Polar Bear	250
Table 8-5.22	Significance of Residual Effects to Polar Bear	252
Table 8-5.23	Measurable Parameters and Threshold Values for Bearded Seals	259
Table 8-5.24	Effects Assessment Summary: Bearded Seals	262
Table 8-5.25	Significance of Residual Effects to Bearded Seals.....	264

LIST OF FIGURES

Figure 8-1.1	Marine Study Area	2
Figure 8-1.2	Refined Shipping Route Approaching Steensby Inlet.....	3
Figure 8-2.1	Shipping Route to Steensby Inlet.....	11
Figure 8-2.2	Disturbance to Landfast Ice in Steensby Inlet	23
Figure 8-3.1	Milne Inlet Local Study Area Water and Sediment Quality	31
Figure 8-3.2	Steensby Inlet Local Study Area Water and Sediment Quality	32
Figure 8-3.3	Milne Inlet Water Quality Sites.....	34
Figure 8-3.4	Steensby Inlet Water Quality Sites	35
Figure 8-3.5	Boxplots of Selected Metals and Major Ions in Milne Inlet, Open-water 2008/10 and Ice-cover 2008	38
Figure 8-3.6	Boxplots of Selected Metals and Major Ions in Steensby Inlet, Open-water 2007/08 and Ice-cover 2008	42
Figure 8-3.7	Milne Inlet Sediment Quality Sites	45
Figure 8-3.8	Steensby Inlet Sediment Quality Sites.....	46
Figure 8-3.9	Pathways Showing Potential Effects of Project Activities on Water and Sediment Quality.....	53
Figure 8-3.10	Total Solid Particulate Deposition in Steensby Inlet	67
Figure 8-4.1	Milne Inlet Local Study Area – Marine Fish Habitat and Arctic Char	81
Figure 8-4.2	Steensby Inlet Local Study Area – Marine Fish Habitat and Arctic Char	82
Figure 8-4.3	Arctic Char Distribution in Milne Inlet	90
Figure 8-4.4	Arctic Char Distribution in Steensby Inlet	94

Figure 8-4.5	Pathways Showing Potential Effects of Project Activities on Anadromous Arctic Char	96
Figure 8-4.6	Steensby Inlet Infrastructure Located in Intertidal and Permanently Wetted Zones.....	107
Figure 8-5.1	Underwater (A) and In-Air (B) Audiograms for Marine Mammals.....	146
Figure 8-5.2	Likely Passing Locations of Project Ore Carriers Within the RSA during the open-water period (S=Summer) and ice-covered period (W=Winter)	154
Figure 8-5.3	Ringed Seal Distribution, Including Pupping and Basking Sites, in the RSA.....	156
Figure 8-5.4	Example of a 1/3-Octave Band Sensation Level Plot Used in the Ringed Seal Effects Analysis.....	159
Figure 8-5.5	Walrus Seasonal Occurrence Based on Scientific and IQ Information	176
Figure 8-5.6	Predicted Surface Wave Heights Generated by a Vessel Travelling at 14 Knots and Known Walrus Haulout Sites	183
Figure 8-5.7	Beluga Seasonal Occurrence Based on Scientific and IQ Information	195
Figure 8-5.8	Narwhal Seasonal Occurrence Based on Scientific and IQ Information	213
Figure 8-5.9	Bowhead Seasonal Occurrence Based on Scientific and IQ Information.....	227
Figure 8-5.10	Polar Bear Seasonal Occurrence and Denning Locations Based on IQ Information	246
Figure 8-5.11	Bearded Seal Distribution, Including Pupping and Basking Site, in the RSA.....	258

APPENDICES

Appendix 8A	Marine Baseline Description
Appendix 8A-1	Oceanography Baseline
Appendix 8A-2	Marine Mammal Baseline
Appendix 8A-3	Analysis of Polynya-like Features in Foxe Basin and Hudson Strait
Appendix 8B	Effluent Dispersion Modelling
Appendix 8B-1	Ballast Water Discharge at Steensby Inlet
Appendix 8B-2	Sewage Effluent Modelling at Steensby Inlet
Appendix 8C	Underwater Noise Modelling
Appendix 8C-1	Underwater Noise Modelling for Steensby Inlet, Foxe Basin and Hudson Strait
Appendix 8C-2	Underwater Noise Modelling for Milne Inlet and Eclipse Sound
Appendix 8C-3	Composite Marine mammal audiogram and noise
Appendix 8C-4	Assessment of Underwater Noise for the Mary River Iron Mine – Amendment
Appendix 8C-5	Composite Marine Mammal Audiogram and Noise Plots for Vibratory Pile Driving
Appendix 8D	Ship-generated wave and aircraft noise analyses
Appendix 8D-1	Aircraft airborne noise analysis relative to known walrus haulout sites
Appendix 8D-2	Ship Generated Wave Effects

VOLUME 9 – CUMULATIVE EFFECTS AND OTHER ASSESSMENTS

TABLE OF CONTENTS

	PAGE
DOCUMENT STRUCTURE	
PROJECT FACT SHEET	
TABLE OF CONTENTS	i
SECTION 1.0 - CUMULATIVE EFFECTS ASSESSMENT	1
1.1 INTRODUCTION	1
1.2 APPROACH.....	1
1.2.1 Methodology	1
1.2.2 Temporal Boundaries	3
1.2.3 Spatial Boundaries	4
1.2.4 Consideration of Alternative Development Scenarios	6
1.2.5 Ranking of Cumulative Effects	6
1.2.6 Cumulative Effects of Accidents and Malfunctions and other Projects	6
1.2.7 Adaptive Management.....	7
1.3 SCOPE	7
1.3.1 Project Components	7
1.3.2 Other Projects and Activities of Consideration	8
1.3.3 Summary of Other Projects and Activities.....	27
1.3.4 Screening of VEC and VSECs for Potential Cumulative Effects.....	29
1.4 ASSESSMENT	31
1.4.1 Atmospheric Environment	31
1.4.2 Terrestrial Environment	38
1.4.3 Freshwater Aquatic Environment	42
1.4.4 Marine Environment	46
1.4.5 Communities.....	51
1.4.6 Culture, Resources and Land Use	57
1.5 MONITORING CUMULATIVE EFFECTS	58
1.6 SUMMARY AND CONCLUSIONS	58
1.7 AUTHORS	59
SECTION 2.0 - EFFECTS OF THE ENVIRONMENT ON THE PROJECT	60
2.1 ENGINEERING HAZARD ASSESSMENT	60
2.2 POTENTIAL EFFECTS OF CLIMATE CHANGE ON THE PROJECT	72
2.3 AUTHORS	75
SECTION 3.0 - ACCIDENTS AND MALFUNCTIONS.....	76
3.1 IDENTIFICATION OF RISKS AND METHODOLOGY	76
3.2 MINE SITE.....	82
3.2.1 Open Pit Slope Failure or Waste Rock Stockpile Slope Failure.....	82
3.2.2 Open Pit Flooding.....	83

3.2.3	Explosives Accident.....	84
3.2.4	Accidental Discharge of Hazardous Materials.....	85
3.2.5	Traffic Accident.....	85
3.2.6	Fire at the Camp Facilities and Infrastructure	85
3.2.7	Failure of the Camp Power Supply.....	86
3.2.8	Failure of the Wastewater Treatment Plant.....	87
3.2.9	Contamination of the Water Supply.....	87
3.3	TOTE ROAD.....	88
3.3.1	Traffic Accidents and Release of Hazardous Materials	88
3.3.2	Collision with Wildlife	88
3.3.3	Road Embankment Failure and/or Collapse of a Water Crossing	88
3.3.4	Weather-related Strandings.....	89
3.4	RAILWAY OPERATION RELATED ACCIDENTS AND MALFUNCTION.....	89
3.4.1	Train Derailment with Ore Cars or General Non-Hazardous Freight	90
3.4.2	Train Derailment with Fuel or Other Hazardous Materials	91
3.4.3	Train Collisions	91
3.4.4	Injury to Passing Hunters at Steensby Inlet	91
3.4.5	Collapse of the Railway Tunnel.....	92
3.5	MILNE PORT AND STEENSBY PORT.....	92
3.5.1	Ship-to-shore Fuel Transfer.....	92
3.5.2	Fuel Spill from Over Wintering Fuel Barge/Vessel.....	93
3.5.3	Ice Accumulation at the Port.....	94
3.5.4	Congestion at the Port.....	94
3.5.5	Introduction of Invasive Marine Species.....	94
3.5.6	Introduction of Terrestrial Invasive Species	95
3.6	SHIPPING RELATED ACCIDENTS AND MALFUNCTIONS.....	95
3.6.1	Collision with Marine Mammals.....	95
3.6.2	Ship Engine Failure at Sea.....	96
3.6.3	Cargo Ship or Ore Carriers Grounding without Fuel Spill	96
3.6.4	Fuel Tanker Grounding or Collision Causing Fuel Spill	97
3.6.5	Ice / Ship Interaction.....	98
3.6.6	Collision with Other Vessels.....	98
3.7	AIR TRAFFIC.....	98
3.8	MAJOR DIESEL SPILL AT PORT OR ALONG THE SHIPPING LANE.....	99
3.8.1	Worst-Case Scenario	99
3.8.2	Spill Modelling	100
3.8.3	Fate of Diesel Fuel – Natural Weathering Processes	100
3.8.4	Mitigation Measures	102
3.8.5	Recovery Methods for Spills.....	103
3.8.6	Canadian Coast Guard (CCG) Response in the Arctic Region.....	104
3.8.7	Potential Effects of a “Worst-Case” Spill Scenario.....	107
3.8.8	Large Spill Modeling - Establishing the Size and Trajectory of the Spill	110
3.8.9	Spill Modelling at Milne Port (Appendix 9A)	111
3.8.10	Spill Modelling at Steensby Port (Appendix 9B).....	111
3.8.11	Generic Spill Scenario along the Shipping Lane (Appendix 9C).....	112

3.9	RESIDUAL EFFECTS SUMMARY	114
3.10	AUTHORS	118
SECTION 4.0 - TRANSBOUNDARY EFFECTS ASSESSMENT		119
4.1	INTRODUCTION	119
4.2	BOUNDARIES	119
4.3	RELEVANT INTERNATIONAL AGREEMENTS	119
4.3.1	Arctic Environment Protection Strategy - 1991	119
4.3.2	Polar Bear Conservation	120
4.3.3	Exchange of Information Related to Energy Project - Canada-Greenland Collaboration	120
4.3.4	Collaboration on Oil Spill Preparedness and Spill Response	120
4.3.5	Canada-Greenland Joint Commission on the Conservation and Management of Narwhal and Beluga	120
4.4	DEFINITION AND APPROACH	120
4.5	ASSESSMENT	121
4.5.1	Shipping.....	122
4.5.2	Climate Change/Air Quality	123
4.5.3	Demographic Change.....	123
4.6	CONCLUSION.....	123
4.7	AUTHORS	124
SECTION 5.0 - NAVIGATION OF WATERWAYS		128
5.1	INTRODUCTION	128
5.1.1	Purpose	128
5.1.2	Relevant Legislation	128
5.1.3	NWPA Related Consultation	129
5.2	MILNE PORT	129
5.2.1	Baseline Conditions.....	129
5.2.2	Proposed Works	130
5.2.3	Potential Effects and Mitigation	130
5.3	MILNE INLET TOTE ROAD	131
5.3.1	Baseline Conditions.....	131
5.3.2	Proposed Works	131
5.3.3	Potential Effects and Proposed Mitigation.....	131
5.4	RAILWAY.....	131
5.4.1	Baseline Conditions.....	131
5.4.2	Proposed Works	132
5.4.3	Potential Effects and Proposed Mitigation.....	132
5.5	STEENSBY PORT	132
5.5.1	Baseline Conditions	132
5.5.2	Proposed Works	132
5.5.3	Potential Effects and Proposed Mitigation.....	132
5.6	POTENTIAL RESIDUAL EFFECTS AND SIGNIFICANCE.....	133
5.7	AUTHORS	133

SECTION 6.0 - REFERENCES	134
SECTION 7.0 - DEFINITIONS AND ABBREVIATIONS	138
7.1 GLOSSARY	138
7.2 ABBREVIATIONS.....	142

LIST OF TABLES

Table 9-1.1	Current Levels of Shipping in the Eastern Arctic (2002-2010)	20
Table 9-1.2	Screening of VECs/VSECs and Key Indicators for Potential Cumulative Effects	30
Table 9-1.3	Screening of VSECs and Key Indicators for Potential Cumulative Effects.....	31
Table 9-1.4	Cumulative Effects Summary.....	32
Table 9-1.5	Approximate Width of Landfast Ice Disruption from Vessel Traffic with Various Transits Under Different Production Levels	47
Table 9-2.1	Engineering Hazard Assessment - Milne Port	61
Table 9-2.2	Engineering Hazard Assessment - Milne Inlet Tote Road	62
Table 9-2.3	Engineering Hazard Assessment - Mine Site	64
Table 9-2.4	Engineering Hazard Assessment - Railway.....	67
Table 9-2.5	Engineering Hazard Assessment - Steensby Port.....	71
Table 9-2.6	Sea-ice extent (10^6 km ²) in Winter (March) as projected by the five ACIA-designated models (International Arctic Science Committee, 2010)	73
Table 9-2.7	Sea-ice extent (10^6 km ²) in Summer (September) as projected by the five ACIA-designated models (International Arctic Science Committee, 2010)	73
Table 9-2.8	Changes in mean annual Northern Hemisphere sea-ice extent between 2000 and 2100 projected by the five ACIA-designated models (International Arctic Science Committee, 2010).....	74
Table 9-2.9	Design Measures for Project Structures used to Account for Climate Change	75
Table 9-3.1	Consequence Severity	77
Table 9-3.2	Likelihood of Accidents and Malfunctions	78
Table 9-3.3	Risk Matrix	78
Table 9-3.4	Major Accidents and Malfunctions Risk Summary.....	78
Table 9-3.5	Ratings for Evaluating Significance of Residual Effects of Accidents and Malfunctions	81
Table 9-3.6	Relative Risk Value of a "Worst-case Spill Scenario" per Vessel Type	100
Table 9-3.7	Canadian Coast Guard Arctic Community Pack Locations	105
Table 9-3.8	Residual Effects Assessment Summary – Major Accidents and Malfunctions.....	115
Table 9-3.9	Significance of Residual Effects from Accidents and Malfunctions	118
Table 9-4.1	Summary of Project Transboundary Effects Assessment - VSECs	125
Table 9-4.2	Summary of Project Transboundary Effects Assessment - VECs	126

LIST OF FIGURES

Figure 9-1.1	Cumulative Effect Assessment Framework	2
Figure 9-1.2	Existing and Future Industrial Projects and Activities in Nunavut.....	5
Figure 9-1.3	Special Management Areas.....	11

APPENDICES

- Appendix 9A Milne Port Fuel Spill Modelling
- Appendix 9B Steensby Port Fuel Spill Modelling
- Appendix 9C Coastal Environment Sensitivity Mapping

VOLUME 10 - ENVIRONMENTAL HEALTH AND SAFETY MANAGEMENT

TABLE OF CONTENTS

	<u>PAGE</u>
DOCUMENT STRUCTURE	
PROJECT FACT SHEET	
EIS Document Structure	i
Foreword	iii
SECTION 1.0 - ENVIRONMENTAL, HEALTH AND SAFETY MANAGEMENT FRAMEWORK	1
1.1 SUSTAINABLE DEVELOPMENT POLICY	3
1.2 PRECAUTIONARY APPROACH.....	5
1.3 INUIT PARTICIPATION.....	6
1.4 TRADITIONAL KNOWLEDGE.....	6
1.5 STAKEHOLDERS ENGAGEMENT	7
1.6 ENVIRONMENTAL RISK MANAGEMENT	7
1.6.1 Environmental and Social Impact Assessment (ESIA).....	7
1.6.2 Environmental Design Guidelines	8
1.6.3 Environmental Protection Plan (EPP).....	8
1.6.4 Environmental Monitoring and Mitigation Plan	8
1.6.5 Environmental Effects Monitoring Framework.....	8
1.6.6 Audits, Management Reviews and Assurance	9
1.6.7 Continuous Improvement and Adaptive Management	9
1.7 RESOURCES	9
1.8 RESPONSIBILITIES	9
SECTION 2.0 - IMPACTS AND MITIGATION MEASURES BY PROJECT PHASE	10
2.1 CONSTRUCTION PHASE.....	16
2.2 OPERATIONS PHASE	16
2.3 CLOSURE AND RECLAMATION PHASE	16
SECTION 3.0 - ENVIRONMENTAL DESIGN GUIDELINES	17
3.1 SITE SELECTION, ROADS AND RAILWAY ROUTING	17
3.2 AIR EMISSIONS	18
3.2.1 Fugitive Dust Emission from Material Handling Equipment	18
3.3 NOISE	18
3.4 WASTEWATER DISCHARGES AND RUNOFF WATER QUALITY	19
3.5 CREEK / STREAM / RIVER CROSSINGS – FISHERIES AND AQUATIC RESOURCES	20
3.6 FUEL STORAGE FACILITIES.....	21
3.7 WASTE MANAGEMENT FACILITIES.....	21

Baffinland Iron Mines Corporation

Suite 1016, 120 Adelaide Street West, Toronto, ON Canada M5H 1T1

Tel: +1 (416) 364-8820 • Fax: +1 (416) 364-0193

www.baffinland.com

3.8	EXPLOSIVES STORAGE FACILITIES	22
3.9	CLIMATE CHANGE	22
SECTION 4.0 - ENVIRONMENTAL PROTECTION PLAN (EPP)		23
4.1	PURPOSE OF THE EPP	23
4.2	ORGANIZATION OF THE EPP	24
4.2.1	Construction Phase	24
4.2.2	Operations and Closure Phases	25
4.3	CURRENT EPP STANDARDS AND PROCEDURES	25
4.3.1	Blasting	28
4.3.2	EPP 2.12 – Caribou Protection Measures	30
4.3.3	Explosives Handling Procedures in the mine pit	30
4.4	ENVIRONMENTAL APPROVALS	31
4.5	DOCUMENTATION	31
4.6	UPDATES AND REVISIONS	31
SECTION 5.0 - ROLES AND RESPONSIBILITIES		32
5.1	CONSTRUCTION PHASE	32
SECTION 6.0 - RISK MANAGEMENT AND EMERGENCY RESPONSE		33
6.1	RISK CONTROL AND ACTION	34
6.1.1	Project Risk Assessment Update	34
6.2	HAZARDOUS MATERIALS MANAGEMENT	34
6.3	EMERGENCY AND SPILL RESPONSE PLAN	35
6.3.1	Roles and Responsibilities	36
6.3.2	Shipping Companies	37
6.3.3	Coordination with Coast Guards and Government Agencies	37
6.3.4	Emergency Response Team	38
6.3.5	Emergency Response Training	39
6.3.6	Emergency Response Exercises	40
6.3.7	Communication	40
6.3.8	External Communications	40
6.3.9	Updates	41
6.4	MILNE PORT OIL POLLUTION EMERGENCY PLAN	41
6.5	STEENSBY PORT OIL POLLUTION EMERGENCY PLAN	42
6.6	EXPLOSIVES MANAGEMENT PLAN	42
SECTION 7.0 - ENVIRONMENTAL MONITORING AND MITIGATION PLANS		43
7.1	LIST OF EMMPS	45
7.2	SPECIFIC COMMITMENTS RELATED TO THE EMMPS	48
7.2.1	Air Quality and Noise	48
7.2.2	Waste Rock Management Plan	49
7.2.3	Quarry Management Plan	51
7.2.4	Fish Habitat Compensation	51
7.2.5	Railway Management Plan	51

7.2.6	Invasive Species	51
7.2.7	Introduction of Terrestrial Invasive Species.....	52
7.3	ENVIRONMENTAL EFFECTS MONITORING PLAN (MMER REQUIREMENT)	52
7.4	ENVIRONMENTAL MANAGEMENT PLAN	52
SECTION 8.0	- BIOPHYSICAL ENVIRONMENTAL EFFECTS MONITORING FRAMEWORK (BEEMF) ...	53
8.1	BIOPHYSICAL ENVIRONMENTAL EFFECTS MONITORING FRAMEWORK GOALS AND OBJECTIVES	55
8.2	BAFFINLAND APPROACH TO ENVIRONMENTAL EFFECTS MONITORING.....	55
8.3	PURPOSE OF BIOPHYSICAL ENVIRONMENTAL EFFECTS MONITORING FRAMEWORK.....	56
8.4	FRAMEWORK OF THE ENVIRONMENTAL EFFECTS MONITORING PROGRAM	57
8.5	RELATIONSHIP BETWEEN THE BIOPHYSICAL ENVIRONMENTAL EFFECTS MONITORING FRAMEWORK, EMMPS AND THE ENVIRONMENTAL MONITORING PLAN	58
8.6	UPDATE OF THE ENVIRONMENTAL EFFECTS MONITORING PLAN	58
SECTION 9.0	- SOCIO-ECONOMIC ENVIRONMENT MANAGEMENT PLANS	60
9.1	OCCUPATIONAL HEALTH & SAFETY MANAGEMENT PLAN	60
9.2	STAKEHOLDERS ENGAGEMENT PLAN	60
9.3	CULTURAL AND HERITAGE RESOURCES PROTECTION PLAN.....	61
9.3.1	Mitigation Measures.....	61
9.3.2	General Protection Measures	62
9.3.3	Roles and Responsibilities.....	62
9.3.4	Annual reporting	62
9.3.5	Incident Reporting.....	62
9.4	HUMAN RESOURCES PLAN	63
SECTION 10.0	- MINE CLOSURE AND RECLAMATION PLAN	64
SECTION 11.0	- FOLLOW-UP AND ADAPTIVE MANAGEMENT PLAN	65
11.1	PERFORMANCE MEASUREMENT AND MONITORING	65
11.2	ACCIDENTS, INCIDENTS, NON-CONFORMANCES AND CORRECTIVE AND PREVENTIVE ACTION	65
11.3	RECORDS AND RECORDS MANAGEMENT	66
11.4	AUDITING, REVIEW AND UPDATE	66
11.5	MANAGEMENT REVIEW.....	67
SECTION 12.0	- MANAGEMENT PLAN UPDATES AND DEVELOPMENT SCHEDULE.....	68
SECTION 13.0	- DEFINITIONS.....	69

LIST OF TABLES

Table 10-1.1	Core Principles of Continuous Improvement and the 18 Elements of an Effective EHS Management System.....	2
Table 10-2.1	Environmental Monitoring and Mitigation Plans to Reduce Impacts on VECs and VSECs.....	11
Table 10-4.1	Structure and Content of the Environmental Protection Plan	24
Table 10-7.1	Organization and Content of the Environmental Mitigation and Monitoring Plans	43
Table 10-7.2	Environment Monitoring and Mitigation Plans and Targeted VECs.....	45

LIST OF FIGURES

Figure 10-1.1	Relationships between the core principles and the 18 elements of an effective EHS Management System.....	3
Figure 10-2.1	Hierarchy for Project Adverse Impact Avoidance	10
Figure 10-8.1	EEM Program Activities	54
Figure 10-8.2	Relationship between BEEMF, EMMPs and EMP	59

Volume 10 - APPENDICES

Each appendix to Volume 10 is a stand-alone ESH Standard or Management Plan that is part of Baffinland's overall Environmental Management System. Some of these management plans are required for support of the Type A Water License Application (Appendix 3B of the FEIS). As the NWB requested that the Type A Water License Application be a “stand alone document”, for presentation purposes, the management plans required for support of the Type A Water License Application are included as Attachments to the Type A Water License Application, in Appendix 3B of the FEIS. As a result, these documents are not duplicated as Appendices to Volume 10. For each reference to the DEIS, the numbering of Volume 10 Appendices has been retained in the FEIS. The following Table presents a cross reference for where each Management Plan is located within the FEIS and Type A Water License Submissions (Appendix 3B of FEIS Volume 3).

Baffinland Iron Mines Corporation

Suite 1016, 120 Adelaide Street West, Toronto, ON Canada M5H 1T1

Tel: +1 (416) 364-8820 • Fax: +1 (416) 364-0193

www.baffinland.com

Table 1: EHS Management Plan Schedule Reviews and Updates				
Standard, Plan and Identification Number	FEIS Volume 10 Appendix	Type A Water License Application (FEIS Appendix 3B)	Next Review / Revision Date	Expected Implementation
EHS Framework Standard	10A-1		December 2012	In Effect
Hazard Identification and Risk Assessment Procedure	10A-2		December 2012	In Effect
Construction Risk Management Report	10A-3		During Detailed Design	
Environmental Protection Plan	10B	Attachment 5	As required	In Effect
Emergency Response and Spill Contingency Plan	10C-1	Attachment 5	April 2012	May 2012
Oil Pollution Emergencies Plan – Milne Port	10C-2	Attachment 5	April 2012	May 2011
Oil Pollution Emergencies Plan – Steensby Port	10C-3	Attachment 5	April 2012	May 2012
Explosives Management Plan	10C-4	Attachment 8	April 2012	May 2012
Hazardous Material and Hazardous Waste Management Plan	10C-5	Attachment 5	April 2012	May 2012
Air Quality and Noise Abatement Management Plan	10D-1		December 2011	September 2016
Surface Water, Aquatic Ecosystems, Fish and Fish Habitat Management Plan	10D-2	Attachment 5	April 2012	May 2011
Waste Water Management Plan	10D-3	Attachment 5	April 2012	In Effect
Waste Management Plan	10D-4	Attachment 5	April 2012	In Effect

Baffinland Iron Mines Corporation

Suite 1016, 120 Adelaide Street West, Toronto, ON Canada M5H 1T1

Tel: +1 (416) 364-8820 • Fax: +1 (416) 364-0193

www.baffinland.com

• Landfarm Manuals	10D-4	Attachment 5	April 2012	
• Landfill Manuals	10D-4	Attachment 5	April 2012	
• Incinerator Manuals	10D-4	Attachment 5	April 2012	
Waste Rock Management Plan	10D-5	Attachment 5	September 2015	2015
• ARD/ML Program	10D-5	Attachment 5	September 2015	2015
Borrow Pits and Quarry Management Plan	10D-6	Attachment 6	April 2012	EPP-2.17 In Effect
Fish Habitat Compensation	10D-7		January 2012	2012 to 2015
Roads Management Plan	10D-8		April 2012	
Railway Maintenance Management Plan	10D-9.1		December 2016	2017
Railway Emergency Response Plan	10D-9.2		December 2016	2017
Shipping and Marine Wildlife Management Plan	10D-10		May 2012	2012
Terrestrial Environmental Management and Monitoring Plan	10D-11		December 2011	Several EPP procedures in Effect
Environmental Monitoring Plan	10D-12	Attachment 5	December 2011	2017
Environmental Effects Monitoring Framework	10D-13		December 2011	2017
MMER Environmental Effects Monitoring Study Design Framework	10D-14		December 2011	2017
Health and Safety Management Plan	10E	Attachment 5	December 2011	In Effect

Baffinland Iron Mines Corporation

Suite 1016, 120 Adelaide Street West, Toronto, ON Canada M5H 1T1

Tel: +1 (416) 364-8820 • Fax: +1 (416) 364-0193

www.baffinland.com

Stakeholders Engagement Plan	10F-1		December 2011	In Effect
Cultural and Heritage Resource Protection Plan	10F-2		December 2011	In Effect
Human Resources Management Plan	10F-3		December 2011	April 2012
Preliminary Closure and Reclamation Plan	10G	Attachment 10	December 2011	2035

Baffinland Iron Mines Corporation

Suite 1016, 120 Adelaide Street West, Toronto, ON Canada M5H 1T1

Tel: +1 (416) 364-8820 • Fax: +1 (416) 364-0193

www.baffinland.com