Volume Contents

1.0 Introduction 1-1

1.1 Overview 1-1

1.1.1 Background 1-1
1.1.2 Fort McKay Specific Assessment Pilot Project Objective 1-2
1.1.3 Fort McKay Specific Assessment Scope and Constraints 1-2
1.1.4 Key Features of the Assessment 1-3
1.1.5 Future Use 1-4

1.2 Documents that Comprise this Assessment 1-4
1.3 Assessment Scenarios and Cases 1-4

1.3.1 Pre-Development Scenario 1-6
1.3.2 Current Scenario 1-7
1.3.3 Base, Application and Planned Development Cases 1-7
1.3.4 Assessment Approach - Baseline 1-7

1.4 Information Sources and Data Limitations 1-7

1.4.1 Fort McKay Specific Environmental Assessment 1-7
1.4.2 Fort McKay Specific Cultural Heritage Assessment 1-8

1.5 Study Areas 1-9

1.5.1 Overview of Fort McKay's Study Areas 1-9

1.5.1.1 Fort McKay Traditional Lands 1-9
1.5.1.2 Traditional Land Use – Culturally Sensitive Ecosystems 1-10
1.5.1.3 Forty Township Study Area 1-10
1.5.1.4 Traplines 1-13
1.5.1.5 Watersheds 1-13
1.5.1.6 Local Study Areas 1-14

1.5.2 Study Areas by Component 1-14

1.5.2.1 Air Quality, Odours and Air Emission effects on Vegetation 1-14
1.5.2.2 Aquatics – Groundwater, Surface Water, Water Quality and Fisheries Resources 1-14
1.5.2.3 Wildlife 1-14
1.5.2.4 Vegetation and Biodiversity 1-14
1.5.2.5 Disturbance and Access 1-15
1.5.2.6 Reclamation 1-15
1.5.2.7 Cultural Heritage Assessment 1-15

1.6 Indicators and Receptors 1-15
1.7 Assessment Criteria and Approach 1-18

1.7.1 Assessment Criteria 1-18

1.7.2 Green-Yellow-Red Rating System 1-18

1.8 Linkage between Environmental Specific Assessment and Cultural Heritage Assessment 1-25
1.9 Recommendations 1-29
1.10 References 1-29

2.0 Air Quality 2-1

2.1 Fort McKay Key Concerns Related to Air Quality 2-1

2.1.1 Introduction 2-1
2.1.2 Air Quality Deterioration and Health Concerns 2-1
2.1.3 Odour Concerns 2-4
2.1.4 Air-Related Impacts on Vegetation and Ecosystems 2-5

2.2 Fort McKay Specific Assessment Approach 2-7

2.2.1 Introduction 2-7

2.2.1.1 Focus 2-7
2.2.1.2 General Assessment Approach and Philosophy 2-7
2.2.1.3 Fort McKay's Assessment Criteria 2-8
2.2.1.4 Information Sources 2-9
2.2.1.5 Intent and Goal 2-9

2.2.2 Data Needs, Sources and Limitations 2-9

2.2.2.1 Data Sources 2-10
2.2.2.2 Assessment and Data Limitations 2-11

2.2.3 Fort McKay Air Quality Study Areas 2-18
2.2.4 Fort McKay Air Quality Receptors 2-21
2.2.5 Fort McKay Air Quality Assessment Criteria 2-21

2.2.5.1 Introduction 2-21
2.2.5.2 Health and Odour Based Air Quality Criteria for the Community 2-22
2.2.5.3 Keeping Clean Areas Clean (KCAC) Based Air Quality Targets 2-23
2.2.5.4 Vegetation and Ecosystems Protection Criteria 2-25
2.2.5.5 Significance Criteria 2-28
2.2.5.6 Emissions Management 2-29

2.3 Air Quality Parameters Assessment 2-30

2.3.1 Introduction 2-30
2.3.2 Sulphur Dioxide (SO_2) 2-31

2.3.2.1 Regional SO_2 Emissions 2-32
2.3.2.2 Proposed Project SO_2 Emissions 2-33
2.3.2.3 Health and Environmental Impacts of SO_2 2-33
2.3.2.4 Health and Environmental Criteria, Objectives and Guidelines for SO_2 2-34
2.3.2.5 SO_2 Impact Assessment 2-34

2.3.2.6 Overall SO_2 Assessment Conclusion 2-44
2.3.2.7 Shell's Proposed SO_2 Emissions Management 2-45
2.3.2.8 Fort McKay's SO_2 Recommendations 2-46
2.3.3 Nitrogen Oxides (NO_X, NO and NO_2) 2-47
2.3.3.1 Regional NO_X Emissions 2-47
2.3.3.2 Proposed Project NO_X Emissions 2-48
2.3.3.3 Health and Environmental Impacts of NO_X 2-49
2.3.3.4 Health and Environmental Criteria, Objectives and Guidelines for NO_2 2-49
2.3.3.5 NO_X Impact Assessment 2-51
2.3.3.6 Planned Development Case 2-58
2.3.3.7 Overall NO_2 Impact Assessment Conclusion 2-60
2.3.3.8 Shell's Proposed NO_X Emissions Management 2-61
2.3.3.9 Fort McKay's Nitrogen Oxides Recommendations 2-62
2.3.4 Fine Particulate Matter ($PM_{2.5}$) 2-63
2.3.4.1 Regional $PM_{2.5}$ Emissions 2-63
2.3.4.2 Proposed Project $PM_{2.5}$ Emissions 2-65
2.3.4.3 Health and Environmental Impacts of $PM_{2.5}$ 2-65
2.3.4.4 Health and Environmental Criteria, Objectives and Guidelines for $PM_{2.5}$ 2-66
2.3.4.5 $PM_{2.5}$ Impact Assessment 2-68
2.3.4.6 Overall $PM_{2.5}$ Impact Assessment Conclusion 2-75
2.3.4.7 Shell's Proposed $PM_{2.5}$ Emissions Management 2-76
2.3.4.8 Fort McKay's $PM_{2.5}$ Recommendations 2-77
2.4 Odour Assessment 2-78
2.4.1 Regional Emissions of Substances with the Potential to Produce Odours 2-79
2.4.2 Proposed Project Odourous Emissions 2-80
2.4.3 Health and Environmental Impacts of Odours 2-80
2.4.4 Health and Environmental Criteria, Objectives and Guidelines for Odourous Compounds 2-81
2.4.4.2 Current Scenario 2-84
2.4.4.3 Base Case 2-88
2.4.4.4 Application Case 2-93
2.4.4.5 Planned Development Case 2-93
2.4.4.6 Overall Odour Impact Assessment Conclusions 2-94
2.4.5 Shell's Proposed Odourous Emissions Management 2-94
2.4.6 Fort McKay's Recommendations 2-96
2.4.6.1 Odourous Emissions Management Recommendations 2-96
2.4.6.2 Odour Management in the Community of Fort McKay 2-97
2.5 Vegetation and Ecosystem Assessment 2-97
2.5.1 Regional Emissions Related to Vegetation Effects 2-98

2.5.2 Emissions from Shell's Proposed Projects Related to Vegetation Effects 2-100
2.5.3 Impacts of Emissions on Vegetation 2-100
2.5.4 Relevant Environmental Criteria, Objectives and Guidelines for Direct Effects on Vegetation 2-101
2.5.5 Assessment of Impacts of Emissions on Vegetation 2-103
2.5.6 Overall Conclusions of Impacts of Emissions on Vegetation Assessment 2-122
2.5.7 Shell's Proposed NO*X* and VOC Emissions Management 2-124
2.5.8 Fort McKay's Recommendations 2-127
2.5.8.1 NO*X* and VOC Emissions Management Recommendations 2-127
2.5.8.2 Ammonia Monitoring Studies 2-128
2.5.8.3 Vegetation Effects Measurement and Management in the Regional Municipality of Wood Buffalo 2-128
2.6 Summary and Conclusions 2-129
2.7 References 2-132

3.0 Groundwater 3-1

3.1 Fort McKay's Key Concerns Related to Groundwater 3-1
3.2 Fort McKay Specific Assessment Approach – Groundwater 3-1
3.2.1 Introduction 3-1
3.2.2 Potential Impacts on Groundwater 3-1
3.2.3 Data Sources and Limitations 3-4
3.2.4 Groundwater Study Areas 3-4
3.2.5 Groundwater Key Indicators 3-7
3.2.6 Fort McKay's Groundwater Assessment Criteria 3-7
3.2.6.1 Healing the Earth Groundwater Management Strategies ... 3-7
3.2.6.2 Assessment Criteria 3-7
3.3 Jackpine Mine Expansion Impact Assessment 3-9
3.3.1 Stressors on Groundwater 3-9
3.3.2 Pre-Development Scenario 3-10
3.3.3 Current Scenario 3-10
3.3.4 Base Case 3-11
3.3.5 Application Case 3-12
3.3.5.1 Direct Loss of Groundwater Resources 3-12
3.3.5.2 Groundwater Quality and Quantity at Cabin Sites 3-12
3.3.6 Planned Development Case 3-19
3.3.7 Conclusions and Significance Assessment Regarding Jackpine Expansion Mine 3-19
3.4 Pierre River Mine Impact Assessment 3-20
3.4.1 Stressors on Groundwater 3-20
3.4.2 Pre-Development Scenario 3-21

3.4.3 Current Scenario 3-21
3.4.4 Base Case 3-21
3.4.5 Application Case 3-22
3.4.6 Planned Development Case 3-25
3.4.7 Significance Assessment and Conclusions Regarding Pierre River Mine 3-26

3.5 Overall Conclusions and Recommendations Regarding Groundwater 3-27

3.5.1 Conclusions 3-27
3.5.2 Fort McKay's Recommendations 3-28

3.5.2.1 Project-Specific Recommendations 3-28
3.5.2.2 Cumulative-Effects Recommendations 3-29

3.6 References 3-29

4.0 Surface Water Hydrology 4-1

4.1 Fort McKay's Key Concerns Related to Surface Water 4-1
4.2 Fort McKay Specific Assessment Approach – Surface Water 4-1

4.2.1 Introduction 4-1
4.2.2 Potential Impacts on Surface Water 4-2
4.2.3 Data Sources and Limitations 4-2
4.2.4 Surface Water Study Areas 4-2
4.2.5 Surface Water Key Indicators 4-7
4.2.6 Fort McKay Surface Water Assessment Criteria 4-7
4.2.7 Fort McKay's Healing the Earth Strategy 4-7

4.3 Athabasca River Impact Assessment 4-8

4.3.1 Stressors on the Athabasca River 4-8
4.3.2 Pre-Development Scenario 4-8
4.3.3 Current Scenario 4-8
4.3.4 Base Case 4-11
4.3.5 Application Case 4-11

4.3.5.1 Application Case Assessment 4-11
4.3.5.2 Shell's Proposed Mitigation and Management Measures 4-11

4.3.6 Planned Development Case 4-12
4.3.7 Overall Conclusions Regarding Surface Water in the Lower Athabasca River Watershed 4-12

4.4 Jackpine Mine Expansion Impact Assessment 4-13

4.4.1 Stressors on the Muskeg River 4-13
4.4.2 Pre-Development Scenario 4-13
4.4.3 Current Scenario 4-19
4.4.4 Base Case 4-19
4.4.5 Application Case 4-19

4.4.5.1 Application Case Assessment 4-19
4.4.5.2 Shell's Proposed Mitigation and Management Measures 4-19

4.4.5.3 Fort McKay's Impact Ranking 4-20
4.4.6 Planned Development Case 4-20
4.4.6.1 Planned Development Case Assessment 4-20
4.4.6.2 Fort McKay's Impact Ranking 4-20
4.4.7 Overall Conclusions Regarding Surface Water in the Muskeg River Watershed 4-20
4.5 Pierre River Mine Impact Assessment 4-21
4.5.1 Stressors on the Pierre River Mine Area 4-21
4.5.2 Pre-development, Current Scenario, and Base Case Scenarios 4-21
4.5.3 Application Case 4-21
4.5.3.1 Application Case Assessment 4-21
4.5.3.2 Shell's Proposed Mitigation and Management Measures . 4-21
4.5.3.3 Shell's Proposed Mitigation and Management Measures . 4-22
4.5.4 Overall Conclusions Regarding Surface Water in the Pierre River Watershed 4-24
4.6 Overall Conclusions and Recommendations Regarding Surface Water 4-24
4.6.1 Lower Athabasca River Watershed 4-24
4.6.1.1 Project-Specific Recommendations 4-24
4.6.1.2 Cumulative Effects Recommendations 4-24
4.6.2 Muskeg River Watershed 4-25
4.6.3 Pierre River Watershed 4-25
4.7 References 4-25

5.0 Water Quality and Fisheries Resources 5-1

5.1 Fort McKay Key Concerns – Water Quality and Fisheries Resources 5-1
5.1.1 Lost, Diverted and Contaminated Aquatic Systems 5-1
5.1.2 Contamination from Seepage and Runoff 5-2
5.1.3 Catastrophic Failure of Tailings Impoundments 5-2
5.1.4 End Pit Lakes 5-2
5.2 Fort McKay Specific Assessment Approach 5-2
5.2.1 Introduction 5-2
5.2.2 Water and Fish Data Sources and Limitations 5-3
5.2.3 Water Quality and Fisheries Resources Study Areas 5-4
5.2.4 Water Quality and Fisheries Resources Key Indicators/Receptors 5-5
5.2.5 Water Quality Guidelines and Fisheries Resources Assessment Criteria 5-5
5.2.6 Fort McKay's Healing the Earth Strategy 5-8
5.3 Jackpine Mine Expansion Impact Assessment 5-8
5.3.1 Stressors on Water Quality and Fisheries Resources 5-8

5.3.2 Pre-Development Scenario (up to 1996) 5-9
5.3.3 Current Scenario (2006) 5-9
5.3.4 Base Case Assessment 5-10
5.3.5 Application Case Assessment 5-14
5.3.6 Planned Development Case 5-17
5.3.7 Shell's Proposed Mitigation and Monitoring 5-17
5.3.8 Significance Assessment and Conclusions 5-18
5.3.9 Fort McKay's Recommendations 5-20

5.4 Pierre River Mine Impact Assessment 5-21

5.4.1 Stressors on Water Quality and Fisheries Resources 5-21
5.4.2 Pre-Development Scenario (1965) 5-21
5.4.3 Current Scenario (2006) and Base Case 5-22
5.4.4 Application Case Assessment 5-22
5.4.5 Planned Development Case 5-24
5.4.6 Shell's Proposed Mitigation and Monitoring 5-24
5.4.7 Significance Assessment and Conclusions 5-24
5.4.8 Fort McKay's Recommendations 5-25

5.5 Healing the Earth Strategy 5-26
5.6 Fort McKay's Overall Conclusions and Recommendations 5-27
5.7 References 5-29

6.0 Wildlife 6-1

6.1 Fort McKay Key Concerns Related to Wildlife 6-1
6.2 Fort McKay Specific Assessment Approach for Wildlife 6-1

6.2.1 Introduction 6-1
6.2.2 Information Sources 6-4
6.2.3 Data and Information Limitations 6-4
6.2.4 Wildlife Study Areas 6-5
6.2.5 Stressors on Wildlife Habitat and Populations 6-6
6.2.6 Wildlife Indicators 6-7
6.2.7 Wildlife Assessment Criteria 6-7
6.2.8 Fort McKay's Healing the Earth Strategy 6-11

6.3 Moose 6-12

6.3.1 Pre-Development Large Game CSE 6-12
6.3.2 Forty Township Study Area (FTSA) 6-15
6.3.3 Moose Habitat Assessment 6-15
6.3.4 Moose Population Assessment 6-22
6.3.5 Moose Population 6-22

6.4 Beaver 6-24

6.4.1 Pre-Development Fur Bearers CSE Area 6-24
6.4.2 Forty Township Study Area (FTSA) 6-24
6.4.3 Beaver Habitat Impact Assessment 6-24

6.5 Canada Lynx 6-33

6.5.1 Pre-Development Fur Bearers CSE Area 6-33
6.5.2 Forty Township Study Area (FTSA) 6-34
6.5.3 Canada Lynx Habitat Impact Assessment 6-34

6.6 Fisher/Marten 6-43

6.6.1 Pre-Development Fur Bearers CSE 6-43
6.6.2 Pre-Development FTSA 6-44
6.6.3 Fisher/Marten Habitat Impact Assessment 6-44

6.7 Conclusions and Significance Assessment 6-53
6.8 Shell's Proposed Mitigation and Monitoring 6-55
6.9 Fort McKay's Recommendations 6-56
6.10 References 6-57

7.0 Vegetation 7-1

7.1 Fort McKay Concerns Related to Vegetation 7-1
7.2 Fort McKay Specific Assessment Approach to Vegetation 7-2

7.2.1 Introduction 7-2
7.2.2 Potential Impacts to Vegetation 7-4
7.2.3 Data Sources, Types and Limitations 7-4

7.2.3.1 Sources 7-4
7.2.3.2 Data Types 7-5
7.2.3.3 Data Limitations 7-5

7.2.4 Vegetation Study Areas 7-7
7.2.5 Vegetation Key Indicators and Receptors 7-8
7.2.6 Vegetation Assessment Criteria 7-9
7.2.7 Fort McKay's Healing the Earth Strategy 7-11

7.3 Upland (Forest) Impact Assessment 7-12

7.3.1 Stressors on Vegetation 7-12
7.3.2 Fort McKay Baseline Conditions 7-12

7.3.2.1 Pre-Development Scenario 7-12
7.3.2.2 Late 1990s Scenario 7-17
7.3.2.3 Base Case 7-31

7.3.3 Impacts to Uplands (Forest) 7-36

7.3.3.1 Application Case 7-36
7.3.3.2 Planned Development Case 7-41

7.3.4 Conclusions for Upland Forest 7-44

7.4 Wetland (Muskeg) Impact Assessment 7-46

7.4.1 Stressors on Wetlands 7-46
7.4.2 Fort McKay Baseline Conditions 7-47

7.4.2.1 Pre-Development Scenario 7-47
7.4.2.2 Late 1990s Scenario 7-48

7.4.2.3 Base Case 7-52
7.4.3 Impacts to Wetlands (Muskeg) 7-53
7.4.3.1 Application Case 7-53
7.4.3.2 Planned Development Case 7-58
7.4.4 Conclusions 7-63
7.5 Traditional Plants Impact Assessment 7-65
7.5.1 Stressors on Traditional Use Plants 7-65
7.5.2 Fort McKay Baseline Conditions 7-65
7.5.2.1 Pre-Development Scenario 7-65
7.5.2.2 Late 1990s Scenario 7-69
7.5.3 Impacts to Traditional Use Plants 7-76
7.5.3.1 Application Case 7-76
7.5.3.2 Planned Development Case 7-83
7.5.4 Conclusions 7-89
7.6 Shell's Proposed Mitigation 7-91
7.7 Fort McKay's Overall Conclusions and Recommendations 7-92
7.7.1 Conclusions 7-92
7.7.2 Recommendations 7-95
7.7.2.1 Project-Specific Recommendations 7-95
7.7.2.2 Cumulative Effects Recommendations 7-96
7.8 References 7-96

8.0 Biodiversity 8-1

8.1 Fort McKay Concerns Related to Biodiversity 8-1
8.2 Fort McKay Specific Assessment Approach to Biodiversity 8-2
8.2.1 Introduction 8-2
8.2.2 Potential Impacts to Biodiversity 8-4
8.2.3 Data Sources, Types and Limitations 8-4
8.2.3.1 Sources 8-4
8.2.3.2 Data Types 8-4
8.2.4 Biodiversity Study Area 8-7
8.2.5 Biodiversity Key Indicators and Receptors 8-7
8.2.6 Biodiversity Assessment Criteria 8-9
8.2.7 Fort McKay's Healing the Earth Strategy 8-11
8.3 Biodiversity Impact Assessment 8-11
8.3.1 Stressors on Biodiversity 8-11
8.3.2 Fort McKay Baseline Conditions 8-11
8.3.2.1 Pre-Development Scenario 8-11
8.3.2.2 Late 1990s Scenario 8-15

8.3.2.3 Base Case 8-16
8.3.3 Impacts to Biodiversity 8-20
8.3.3.1 Application Case 8-20
8.3.3.2 Planned Development Case 8-25
8.4 Conclusions 8-29
8.5 Shell's Proposed Mitigation and Monitoring 8-31
8.6 Fort McKay's Overall Conclusions and Recommendations 8-32
8.6.1 Conclusions 8-32
8.6.2 Recommendations 8-34
8.6.2.1 Project-Specific Recommendations 8-34
8.6.2.2 Cumulative Effects Recommendations 8-34
8.7 References 8-35

9.0 Land Disturbance and Access Implications for Traditional Use Opportunities 9-1

9.1 Fort McKay Key Concerns Related to Land Disturbance and Access 9-1
9.2 Fort McKay Specific Assessment Approach to Disturbance and Access 9-1
9.2.1 Information Sources and Data Limitations 9-1
9.2.1.1 Information Sources 9-1
9.2.1.2 Information and Data Limitations 9-2
9.2.2 Land Disturbance and Access Key Indicators 9-3
9.2.3 Land Disturbance and Access Study Areas 9-4
9.2.3.1 Introduction 9-4
9.2.3.2 Fort McKay Traditional Lands 9-4
9.2.3.3 Traditional Land Use - Culturally Sensitive Ecosystems 9-4
9.2.3.4 Forty Township Study Area (FTSA) 9-9
9.2.3.5 Traplines 9-9
9.2.3.6 Watersheds 9-10
9.2.3.7 Summary of Study Areas 9-10
9.2.4 Fort McKay Surface Land Disturbance and Access Assessment Criteria 9-10
9.2.5 Assessment Cases 9-11
9.2.6 Fort McKay's Healing the Earth Strategy 9-12
9.3 Direct Disturbance 9-12
9.3.1 Introduction 9-12
9.3.2 Traditional Lands and Forty Township Area (FTSA) 9-13
9.3.2.1 Pre-Development Scenario 9-13
9.3.2.2 Current Case 9-16
9.3.2.3 Base Case 9-16
9.3.2.4 Application Case 9-16
9.3.2.5 Planned Development Case 9-16

9.3.3 Traplines 9-17
9.3.3.1 Introduction 9-17
9.3.3.2 Pre-Development Scenario 9-18
9.3.3.3 Current Case 9-18
9.3.3.4 Base Case 9-18
9.3.3.5 Application Case 9-18
9.3.3.6 Planned Development Case 9-20
9.3.4 Traditional Land Use - Culturally Significant Ecosystems 9-20
9.3.4.1 Introduction 9-20
9.3.4.2 Pre-Development Scenario 9-23
9.3.4.3 Current Scenario and Base Case 9-23
9.3.4.4 Application Case 9-28
9.3.4.5 Planned Development Case 9-29
9.3.5 Athabasca River Sub-watersheds 9-30
9.3.5.1 Pre-Development Scenario 9-30
9.3.5.2 Current Scenario and Base Case 9-30
9.3.5.3 Application Case 9-32
9.3.5.4 PDC Case 9-33
9.4 Access 9-33
9.4.1 Traditional Trails 9-33
9.4.1.1 Introduction 9-33
9.4.1.2 Pre-Development Scenario 9-34
9.4.1.3 Base Case 9-34
9.4.1.4 Application Case 9-39
9.4.1.5 Planned Development Case 9-40
9.4.2 Linear Disturbance 9-43
9.4.2.1 Introduction 9-43
9.4.2.2 Pre-development Scenario 9-43
9.4.2.3 Current Scenario 9-43
9.4.2.4 Base Case 9-44
9.4.2.5 Application Case 9-45
9.4.2.6 Planned Development Case 9-45
9.4.3 Regional Population Levels 9-46
9.4.3.1 Introduction 9-46
9.4.3.2 Pre-Development Scenario 9-46
9.4.3.3 Current Scenario/Base Case 9-46
9.4.3.4 Application Case 9-48
9.4.3.5 Planned Development Case 9-48
9.4.4 Community Member's Experiences 9-48
9.5 Protected Areas 9-50
9.5.1 Introduction 9-50

9.5.1.1 Pre-Development Scenario 9-50
9.5.1.2 Current Scenario/ Base Case 9-51
9.5.1.3 Lower Athabasca Regional Plan Considerations 9-51
9.5.1.4 Constraints 9-52
9.6 Shell's Proposed Mitigation and Management Measures 9-59
9.7 Overall Conclusions and Recommendations Regarding Disturbance and Access 9-59
9.7.1 Summary and Conclusions 9-59
9.7.2 Recommendations 9-61
9.7.2.1 Project-Specific Recommendations 9-61
9.7.2.2 Cumulative Effects Recommendations 9-62
9.8 References 9-63

10.0 Reclamation 10-1
10.1 Introduction 10-1
10.2 Data Sources and Limitations 10-2
10.3 Fort McKay's Concerns Regarding Reclamation 10-2
10.3.1 Concern – Put the Land Back the Way It Was 10-2
10.3.2 Concern – Reclamation is Too Slow 10-3
10.3.3 Concern – You Can't Put the Spirit Back Into the Land 10-3
10.3.4 Concern – Reclaimed Land Will Not Be Safe for Animals or People 10-14
10.3.5 Concern – Muskeg is Important; Water is Important 10-14
10.3.6 Concern – Who Will Be Responsible for the Land When Mining is Complete? 10-15
10.4 Fort McKay's Overall Conclusions and Recommendations 10-16
10.4.1 Conclusions 10-16
10.4.2 Project-Specific Recommendations 10-16
10.4.3 Cumulative Effects Recommendations 10-17
10.5 References 10-18

11.0 Recommendations Summary 11-1
11.1 Introduction 11-1
11.2 Air Quality 11-1
11.2.1 Sulphur Dioxide (SO_2) Recommendations 11-1
11.2.1.1 Project-Specific Recommendations 11-1
11.2.1.2 Cumulative Effects Recommendations 11-2
11.2.2 Nitrogen Oxides (NO_X, NO and NO_2) Recommendations 11-2
11.2.3 Fine Particulate Matter ($PM_{2.5}$) Recommendations 11-4
11.2.4 Odour Recommendations 11-5
11.2.4.1 Odourous Emissions Management Recommendations 11-5
11.2.4.2 Odour Management in the Community of Fort McKay 11-6

11.2.5 Vegetation and Ecosystem Assessment 11-6
11.2.5.1 NO*X* and VOC Emissions Management Recommendations 11-6
11.2.5.2 Ammonia Monitoring Studies 11-7
11.2.5.3 Vegetation Effects Measurement and Management in the Regional Municipality of Wood Buffalo 11-8
11.3 Groundwater 11-8
11.3.1 Project-Specific Recommendations 11-8
11.3.2 Cumulative-Effects Recommendations 11-9
11.4 Surface Water Resources 11-9
11.4.1 Lower Athabasca River Watershed 11-9
11.4.2 Muskeg River Watershed 11-10
11.4.3 Pierre River Watershed 11-10
11.5 Water Quality and Fisheries Resources 11-10
11.5.1 Muskeg River Watershed 11-10
11.5.2 Pierre River Watershed 11-11
11.5.3 Overall Recommendations 11-12
11.6 Wildlife Impacts 11-12
11.6.1 Project-Specific and Cumulative Effects Recommendations 11-12
11.7 Vegetation Impacts 11-13
11.7.1 Project-Specific Recommendations 11-13
11.7.2 Cumulative Effects Recommendations 11-13
11.8 Biodiversity Impacts 11-14
11.8.1 Project-Specific Recommendations 11-14
11.8.2 Cumulative Effects Recommendations 11-15
11.9 Disturbance and Access 11-16
11.9.1 Project-Specific Recommendations 11-16
11.9.2 Cumulative Effects Recommendations 11-16
11.10 Reclamation 11-18
11.10.1 Project-Specific Recommendations 11-19
11.10.2 Cumulative Effects Recommendations 11-19
11.11 Cultural Heritage 11-20
11.11.1 Cultural Heritage Assessment Baseline 11-20
11.11.1.1 Cultural Resilience 11-20
11.11.1.2 Reclamation 11-20
11.11.1.3 Language Retention 11-21
11.11.1.4 Land-based Employment 11-21
11.11.1.5 Further Development and Documentation of the Cultural Heritage Baseline 11-21

11.11.1.6 Cumulative Effects and Regional Initiatives 11-22
11.11.1.7 Cultural Heritage Strategy 11-22
11.11.2 Project-Specific Recommendations 11-22
11.11.3 Cumulative Effects Recommendations 11-23
11.12 References 11-23

Figures

Figure 1-1: Fort McKay Specific Assessment Document Road Map 1-5
Figure 1-2: Fort McKay Specific Assessment Study Areas 1-11
Figure 2-1: Current vs. Pre-Development (PD) Annual Average Air Quality in Fort McKay (SO_2, NO_2 and $PM_{2.5}$) 2-2
Figure 2-2: Current vs. Pre-Development (PD) Air Quality in Fort McKay (Maximum Hourly Values - SO_2, NO2 and $PM_{2.5}$) 2-3
Figure 2-3: Ambient Air Monitoring Stations in the Regional Municipality of Wood Buffalo 2-12
Figure 2-4: Fort McKay's Traditional Lands and Specific Receptors Analyzed by Shell (Golder 2009) 2-19
Figure 2-5: Fort McKay SO_2 Concentration Trends for Period 1999-2007 2-37
Figure 2-6: Wind Direction Influence on Hourly SO_2 Level in Fort McKay (2005-2008) 2-38
Figure 2-7: Windrose for Fort McKay (2005 to 2008) 2-44
Figure 2-8: Fort McKay NO_2 Concentration Trends for Period 1999 2007 (Golder 2009) 2-53
Figure 2-9: Wind Direction Influence on Hourly NO_2 Level in Fort McKay (2005 2008) 2-54
Figure 2-10: Fort McKay $PM_{2.5}$ Concentration Trends (1999 2007; Golder 2009) 2-70
Figure 2-11: Wind Direction Influence on Hourly $PM_{2.5}$ Level in Fort McKay (2005 2008) 2-71
Figure 2-12: TRS and THC Levels in Fort McKay as a Function of Wind Direction (2000 to 2008 inclusive) 2-88
Figure 2-13: The Location of Key Receptors Modeled by Shell for Potential Odour Impacts Associated with the Proposed Jackpine Mine Expansion and Pierre River Mine Projects 2-91
Figure 2-14: Model Estimated Nitrogen Deposition Isopleths (5, 10 and 15 kgN/ha/yr) in Emission Levels and Area of Different Vegetation Covers Falling within Each Isopleth (NSMWG 2005) 2-109
Figure 2-15: Base Case Predictions and Application Case Predictions of Areas Exceeding an Annual Nitrogen Load of 8 kgN/ha/yr 2-113
Figure 2-16: Base Case Predicted PAI Exceedences 2-119
Figure 2-17: PDC Predicted PAI Exceedences 2-123

Figure 3-1: Typical Groundwater Flow Patterns in the Vicinity of Oil Sands In-situ and Surface Mining Projects (ARC in CCA 2009) 3-3

Figure 3-2: Regional and Local Hydrogeological Study Areas and Surrounding Developments and Location of Groundwater Observation Wells from Hackbarth and Natasha (1979) 3-5

Figure 3-3: Traplines and Cabins in relation to Application Case Groundwater Drawdown Predictions 3-13

Figure 3-4: Fens Potentially Affected by Groundwater Drawdown within Jackpine Expansion Mining Area LSA 3-17

Figure 3-5: Fens Potentially Affected by Groundwater Drawdown within Pierre River Mining Area LSA 3-23

Figure 4-1: Aquatic Resources Local Study Areas 4-3

Figure 4-2: Aquatic Resources Regional Study Areas..... 4-5

Figure 6-1: Moose Habitat Suitability in the Large Game Culturally Significant Ecosystem Area 6-13

Figure 6-2: Moose Density Estimates From Surveys Conducted in Fort McKay's Traditional Lands 6-22

Figure 6-3: Moose Population Estimates for WMU 531 with 30% Error Bars 6-23

Figure 6-4: Beaver Habitat Suitability in the Furbearer Culturally Significant Ecosystem Area 6-25

Figure 6-5: Canada Lynx Habitat Suitability in the Furbearer Culturally Sensitive Ecosystem Area. 6-35

Figure 6-6: Fisher/Marten Habitat Suitability in the Furbearer Culturally Sensitive Ecosystem Area 6-45

Figure 7-1: Land Cover Classes (Landsat) in the FTSA – Pre-Development Scenario..... 7-13

Figure 7-2: Natural and Human Disturbed Areas (Landsat) in the FTSA Pre Development Scenario..... 7-15

Figure 7-3: Productive and Unproductive Forest (Landsat) in the FTSA – Pre Development Scenario..... 7-19

Figure 7-4: Rare Plant Potential (Landsat) in the FTSA – Pre-Development Scenario 7-21

Figure 7-5: Ecosite Phases and Wetlands Types in the FTSA (AVI) – Late 1990s Scenario 7-23

Figure 7-6: Natural and Human Disturbance in the FTSA (AVI) – Late 1990s Scenario 7-25

Figure 7-7: Forest Productivity in the FTSA (AVI) – Late 1990s Scenario..... 7-27

Figure 7-8: Riparian Areas in the FTSA (AVI) – Late 1990s Scenario..... 7-29

Figure 7-9: Rare Plant Potential in the FTSA (AVI) – Late 1990s Scenario 7-33

Figure 7-10: Peatlands in the FTSA (AVI) – Late 1990s Scenario 7-49

Figure 7-11: Traditional Plant Potential in the FTSA (Landsat) – Pre Development Scenario 7-67

Figure 7-12: Traditional Plant Potential (AVI) in the FTSA – Late 1990s Scenario 7-71

Figure 7-13: Berry Sites in the FTSA (Ducks Unlimited Classification) – Late 1990s Scenario 7-73

Figure 7-14: Berry Sites Disturbed in the FTSA (Ducks Unlimited Classification) – Base Case 7-77

Figure 7-15: Berry Sites Disturbed in the FTSA (Ducks Unlimited Classification) – Application Case 7-81

Figure 7-16: Berry Sites Disturbed in the FTSA (Ducks Unlimited Classification) – Planned Development Case 7-87

Figure 8-1: Biodiversity Potential in the FTSA (Landsat) 8-13

Figure 8-2: Biodiversity Potential in the FTSA (AVI) 8-17

Figure 9-1: Fort McKay Culturally Sensitive Ecosystems (All Traditional Uses) 9-5

Figure 9-2: Fort McKay Traditional Lands, Treaty Land Entitlement Lands and Traplines 9-7

Figure 9-3: Existing and Potential Development Disturbances within Fort McKay's Traditional Lands and Traplines 9-21

Figure 9-4: Traditional Trail System of Fort McKay 9-35

Figure 9-5: Fort McKay Traditional Trails Disturbed (Ducks Unlimited Classification) Base Case 9-37

Figure 9-6: Fort McKay Traditional Trails Disturbed (Ducks Unlimited Classification) Application Case 9-41

Figure 9-7: Human Population Levels in the Regional Municipality of Wood Buffalo, Fort McMurray and Work Camps 9-47

Figure 9-8: Fort McKay Proposed Protected Areas 9-53

Figure 9-9: Fort McKay Proposed Protected Areas with Existing Development 9-55

Figure 9-10: Fort McKay Proposed Protected Areas with Tenured Leases and Existing Development 9-57

Figure 10-1: Pace of Development – Jackpine Mine Expansion 10-5

Figure 10-2: Pace of Development – Pierre River Mine 10-7

Figure 10-3: Pace of Development – Muskeg River Mine 10-9

Figure 10-4: Pace of Development – Jackpine Mine, Pierre River Mine & Muskeg River Mine 10-11

Tables

Table 1-1: Summary of Environmental Components and Indicators 1-16

Table 1-2: Summary of Assessment Criteria for Environmental Components 1-19

Table 1-3: Measures of Industry Stressors Proposed by the Community and Environmental Indicators 1-27

Table 2-1: Current vs. Pre-Development Air Quality in Fort McKay 2-2

Table 2-2: Comparison of Predicted Air Quality Levels in the various recent EIAs for the Planned Development Case 2-14

Table 2-3: Comparison of Estimated Emissions from Various Developments 2-16

Table 2-4: Air Quality Health Index Criteria for the Community of Fort McKay 2-23

Table 2-5: Fort McKay's Health and Odour based Ambient Air Quality Criteria for the Community and the Criteria Used in its Assessment 2-24

Table 2-6: Fort McKay's "Keeping Clean Areas Clean" (KCAC) Community based Air Quality Targets[1] 2-25

Table 2-7: Fort McKay's Vegetation and Ecosystem Protection Criteria used in its Assessment 2-27

Table 2-8: Estimated Planned Development Case SO_2 Emissions from Various Project EIAs 2-32

Table 2-9: Projected Total SO_2 Emissions from the Proposed Shell Jackpine Mine Expansion and Pierre River Mine Projects Relative to Other Recently Proposed Projects and Their Respective Contribution to Total Regional Emissions 2-33

Table 2-10: A Comparison of Air Quality Guidelines for SO_2 2-34

Table 2-11: Predicted Pre-development SO_2 Levels in Fort McKay 2-35

Table 2-12: Summary of Ambient SO_2 in Fort McKay for Years 1999-2006 and 2008 in Comparison to Pre-development Scenario SO_2 Levels 2-36

Table 2-13: Comparison of Current SO_2 Levels (2008) in Fort McKay Relative to the HTES (2009) Criteria 2-39

Table 2-14: Comparison of Predicted Base Case SO_2 Concentrations in Fort McKay from Various EIAs Relative to Fort McKay and Alberta Environment SO_2 Objectives 2-40

Table 2-15: Comparison of Predicted Application Case SO_2 Concentrations in Fort McKay Relative to Fort McKay and Alberta Environment SO_2 Objectives 2-41

Table 2-16: Comparison of Predicted Planned Development Case SO_2 Concentrations in Fort McKay from Various EIAs Relative to Fort McKay and Alberta Environment SO_2 Objectives 2-41

Table 2-17: Summary of SO_2 Predictions above the Alberta Ambient Air Quality (AAAQOs) and/or Fort McKay's HTES Criteria on Fort McKay Traditional Lands 2-43

Table 2-18: Samples Count above AAAQOs at Industrial Monitoring Sites (2000 2005) 2-43

Table 2-19: Summary of Fort McKay's Assessment of the Impact of Regional SO_2 Emissions on SO_2 Levels in Fort McKay for each Development Scenario 2-46

Table 2-20: Estimated Regional Emissions of Nitrogen Oxides 2-47

Table 2-21: Specific Sources and Estimated Emission Rates of NO_X from Shell's Proposed Jackpine Mine Expansion and Pierre River Mine Projects 2-48

Table 2-22: Comparison of Current AAAQO, Past and Current WHO Guidelines and Fort McKay's HTES Health-based Criteria for NO_2 2-50

Table 2-23: Fort McKay's "Keeping Clean Areas Clean" (KCAC) Community based Air Quality Targets for NO_2 2-50

Table 2-24: Predicted Pre-development NO_2 levels in Fort McKay 2-51

Table 2-25: Summary of Ambient NO_2 in Fort McKay for Years 1998-2006 and Year 2008 in Comparison to Pre-development Scenario NO_2 Levels 2-52

Table 2-26: Comparison of Current NO_2 Levels in Fort McKay Relative to the HTES (2009) Criteria 2-55

Table 2-27: Comparison of Predicted Base Case NO_2 Concentrations in Fort McKay from Various EIAs Relative to Fort McKay and Alberta Environment NO_2 Objectives 2-56

Table 2-28: Comparison of Predicted Application Case NO_2 Concentrations in Fort McKay relative to Fort McKay and Alberta Environment NO_2 Objectives 2-56

Table 2-29: Comparison of Predicted Planned Development Case NO_2 Concentrations in Fort McKay from Various EIAs Relative to Fort McKay and Alberta Environment NO_2 Objectives 2-57

Table 2-30: Summary of Fort McKay's Assessment of the Impact of Regional NO*X* Emissions on NO_2 Levels in Fort McKay for each Development Scenario 2-59

Table 2-31: Estimated Regional Emissions of Fine Particulate Matter ($PM_{2.5}$) 2-61

Table 2-32: Estimated Planned Development Case $PM_{2.5}$ Emissions from Various Project EIAs 2-62

Table 2-33: Specific Sources and Estimated Emission Rates of $PM_{2.5}$ from Shell's Proposed Jackpine Mine Expansion and Pierre River Mine Projects 2-63

Table 2-34: Comparison of Current AAAQO, Past and Current WHO Guidelines and Fort McKay's HTES Health-based Criteria for $PM_{2.5}$ 2-65

Table 2-35: Fort McKay's "Keeping Clean Areas Clean" (KCAC) Community based Air Quality Targets for $PM_{2.5}$ 2-65

Table 2-36: Predicted Pre-development $PM_{2.5}$ Levels in Fort McKay (circa 1965; Golder 2009) and 1999 Levels in Fort McKay 2-66

Table 2-37: Summary of Ambient $PM_{2.5}$ in Fort McKay for Years 1998-2006 and Year 2008 in Comparison to Pre-developmentScenario $PM_{2.5}$ Levels 2-67

Table 2-38: Comparison of Current $PM_{2.5}$ Levels in Fort McKay Relative to HTES (2009) Criteria ... 2-70

Table 2-39: Comparison of Predicted Base Case $PM_{2.5}$ Concentrations in Fort McKay from Various EIAs Relative to Fort McKay and Alberta Environment $PM_{2.5}$ Objectives 2-71

Table 2-40: Comparison of Predicted Application Case NO_2 Concentrations in Fort McKay Relative to Fort McKay and Alberta Environment $PM_{2.5}$ Objectives 2-72

Table 2-41: Comparison of Predicted Planned Development Case $PM_{2.5}$ Concentrations in Fort McKay from Various EIAs Relative to Fort McKay and Alberta Environment $PM_{2.5}$ Objectives 2-73

Table 2-42: Summary of Fort McKay's Assessment of the Impact of Regional $PM_{2.5}$ Emissions on $PM_{2.5}$ Levels in Fort McKay for each Development Scenario 2-74

Table 2-43: Estimated Regional Emissions – Potentially Odourous Compound Classes 2-78

Table 2-44: Specific Sources and Estimated Emission Rates of VOCs and TRS Compounds from Shell's Proposed Jackpine Mine Expansion and Pierre River Mine Projects 2-79

Table 2-45: Comparison of Odour-based Ambient Air Quality Criteria and Odour Thresholds for Odourous Compounds 2-80

Table 2-46: Summary of Ambient Total Reduced Sulphur (TRS) and Total Hydrocarbon (THC) Concentrations in Fort McKay for Period 1998-2006 Inclusive 2-83

Table 2-47: Summary of Total Reduced Sulphur (TRS) Levels in Fort McKay Before, During and After Syncrude's February 14 17, 2009 Diverter Stack Event 2-85

Table 2-48: Summary of Total Hydrocarbon (THC) Levels (ppm) in Fort McKay Before, during and After Syncrude's Diverter Stack Event on February 14-17, 2009..... 2-85

Table 2-49: Comparison of Shell's Base Case and Application Case 1-Hour, Peak[1] and 3 Minute Peak[2] Odour Threshold Exceedence Predictions at Key Fort McKay Traditional Land Receptors..... 2-87

Table 2-50: Predicted Reduced Sulphur Compound(s) Concentrations in Fort McKay under Base and Planned Development Cases..... 2-88

Table 2-51: Summary of Fort McKay's Assessment of the Impact of Regional Emissions on Odours for each Development Scenario and Case 2-93

Table 2-52: Estimated Regional Emissions of Substances with Direct Vegetation, Acid or Eutrophication Effects..... 2-97

Table 2-53: Specific Sources and Estimated Emission Rates of VOCs, SO_2 and NO*X* from Shell's Proposed Jackpine Mine Expansion and Pierre River Mine Projects..... 2-98

Table 2-54: Air Quality Critical Level, Nitrogen Critical Load and PAI Criteria Related to Vegetation Effects 2-100

Table 2-55: Air Quality and Nitrogen Critical Load Criteria Used by Shell and Fort McKay in the Assessment of Air Emissions Effects on Vegetation 2-102

Table 2-56: Summary of Ambient Ammonia (NH_3) Levels from WBEA's Passive Ammonia and Nitric/Nitrous Acid Monitoring Network 2-104

Table 2-57: Estimated Increase in Regional Emissions Associated with the Planned Development Case 2-116

Table 2-58: Summary of Fort McKay's Assessment of the Impact of Regional Emissions on Vegetation for each Development Scenario and the Actions Currently Required 2-123

Table 3-1: Fort McKay's Groundwater Quantity Assessment Criteria..... 3-9

Table 3-2: Fort McKay's Groundwater Quality Assessment Criteria 3-9

Table 3-3: Significance Assessment for Various Jackpine Mine Expansion Project Scenarios and Assessment Cases 3-19

Table 3-4: Significance Assessment for Various Pierre River Mine Project Scenarios and Assessment Cases 3-26

Table 4-1: Athabasca River Flows in Reach 4 for Development Cases Compared to Pre-Development..... 4-9

Table 4-2: 2008 Oil Sands Water Use from the Athabasca River..... 4-10

Table 4-3: Summary of the State of Surface Water in the Lower Athabasca River Watershed 4-13

Table 4-4: Disturbance Areas by Type and Development Case for the Muskeg River Watershed... 4-14

Table 4-5: Muskeg River Flows at Node M3 by Development Case Compared to Pre-Development 4-15

Table 4-6: Summary of the State of Surface Water in the Muskeg River Watershed at Node M3 .. 4-20

Table 4-7: Disturbance Areas by Type and Development Case for the Pierre River Watershed 4-22

Table 4-8: Pierre River Flows for Application Case compared to Pre-Development 4-23

Table 4-9: State of Surface Water Summary in the Pierre River Watershed 4-24

Table 5-1: Current Scenario (1997-2006) Selected Water Quality Concentrations at Mouth of the Muskeg River (M3) Compared to Pre Development Scenario 5-11

Table 5-2: Base Case Selected Water Quality Median Concentrations at Mouth of Muskeg River (M3) from Pre-Development, and Predicted for 2012 and 2065, Using Aquatic Change Index 5-13

Table 5-3: Application Case Selected Water Quality Median Concentrations at Mouth of Muskeg River (M3) from Pre-Development, and Predicted for 2012 and 2065, Using Aquatic Change Index 5-16

Table 5-4: Summary of Fort McKay's Assessment of Water Quality and Fisheries Resources for each Development Scenario for the Jackpine Mine Expansion 5-20

Table 5-5: Summary of Fort McKay's Assessment of Water Quality and Fisheries Resources for each Development Scenario for the Pierre River Mine Project 5-25

Table 6-1: Wildlife Impact Ranking Table 6-9

Table 6-2: Status Level, Environmental Consequence and Conditions with Expected Actions 6-11

Table 6-3: Habitat Suitability Classes for Moose within the Intense, Moderate and Low Use areas of the Culturally Significant Ecosystems 6-12

Table 6-4: Changes in Moose Habitat within the Intense Use CSE for Each Development Case Compared to Pre-Development Scenario 6-15

Table 6-5: Changes in Moose Habitat within the Moderate Use CSE Area for Each Development Case Compared to Pre-Development Scenario 6-17

Table 6-6: Changes in Moose Habitat within the Low Use CSE for Each Development Case compare to Pre-Development Scenario 6-18

Table 6-7: Changes in Moose Habitat within the FTSA for Each Development Case Compared to Pre-Development Scenario 6-20

Table 6-8: Wildlife Habitat Assessment Environmental Consequences for Moose by Study Areas and Development Scenario and Case 6-21

Table 6-9: Moose Populations Estimates of Wildlife Management Units (WMU) Located in the Oil Sands Region 6-23

Table 6-10: Habitat Suitability Classes for Beaver within the Intense, Moderate and Low Use Culturally Significant Ecosystems 6-24

Table 6-11: Changes in Beaver Habitat within the Intense Use CSE Area for Each Development Case Compared to Pre-Development Scenario 6-27

Table 6-12: Changes in Beaver Habitat within the Moderate Use CSE Area for Each Development Case compared to Pre-Development Scenario 6-28

Table 6-13: Changes in Beaver Habitat within the Low Use CSE for Each Development Case compared to Pre-Development Scenario 6-30

Table 6-14: Changes in Beaver Habitat within the FTSA for Each Development Case compared to Pre-Development Scenario 6-31

Table 6-15: Wildlife Habitat Assessment Environmental Consequences for Beaver by Study Areas and Development Scenario and Case 6-33

Table 6-16: Habitat Suitability Classes for Canada Lynx within the Intense, Moderate and Low Use areas of the Culturally Significant Ecosystems 6-33

Table 6-17: Changes in Canada Lynx Habitat within the Intense Use CSE Area for Each Development Case Compared to Pre-Development Scenario 6-34

Table 6-18: Changes in Canada Lynx Habitat within the Moderate Use CSE for Each Development Case compared to Pre-Development Scenario 6-38

Table 6-19: Changes in Canada Lynx Habitat within the Low Use CSE Area for Each Development Case compared to Pre-Development Scenario 6-40

Table 6-20: Changes in Canada Lynx Habitat within the FTSA for Each Development Case compared to Pre-Development Scenario 6-41

Table 6-21: Wildlife Habitat Assessment Environmental Consequences for Canada Lynx by Study Areas and Development Scenario and Case 6-43

Table 6-22: Habitat Suitability Classes for Fisher and Marten within the Intense, Moderate and Low Use areas of the Culturally Significant Ecosystems 6-43

Table 6-23: Changes in Fisher and Marten Habitat within the Intense Use CSE Area for Each Development Case Compared to Pre-Development Scenario 6-44

Table 6-24: Changes in Fisher and Marten Habitat within the Moderate Use CSE for Each Development Case Compared to Pre-Development Scenario 6-48

Table 6-25: Changes in Fisher and Marten Habitat within the Low Use CSE for Each Development Case Compared to Pre-Development Scenario 6-50

Table 6-26: Changes in Fisher and Marten Habitat within the FTSA for Each Development Case Compared to Pre-Development Scenario 6-51

Table 6-27: Wildlife Habitat Assessment Environmental Consequences for Fisher/Marten by Study Areas and Development Scenario and Case 6-53

Table 6-28: Wildlife Habitat Assessment Environmental Consequences by Study Areas and Development Scenario and Case 6-54

Table 7-1: Assessment Scenario/Cases and Data Availability 7-3

Table 7-2: LSA and Mine Development Footprints 7-8

Table 7-3: Criteria and Numerical Scores for Significance Assessment of Project Activities to Vegetation 7-10

Table 7-4: Summary of Effects to Upland Forest 7-45
Table 7-5: Summary of Effects to Wetlands (Muskeg) 7-64
Table 7-6: Number of Traditional Use Berry Sites Located within FTSA as Recorded by Fort McKay 7-66
Table 7-7: Summary of Effects to Traditional Use Plant Potential and Sites in the FTSA 7-90
Table 8-1: Assessment Case/Scenarios and Data Availability 8-3
Table 8-2: Criteria and Numerical Scores – Significance Assessment of Project Activities to Biodiversity 8-10
Table 8-3: Summary of Effects to Biodiversity 8-30
Table 9-1: Disturbances within Fort McKay's Traditional Lands 9-14
Table 9-2: Disturbances within the Forty Township Study Area (FTSA) 9-15
Table 9-3: Disturbances within Fort McKay Community Members' Registered Fur Management Areas 9-19
Table 9-4: Disturbances within Local Registered Fur Management Areas 9-19
Table 9-5: Disturbances within Fort McKay's Culturally Significant Ecosystems – All Traditional Uses 9-24
Table 9-6: Disturbances within Fort McKay First Nation Culturally Significant Ecosystems – Large Game Harvesting 9-24
Table 9-7: Disturbances within Fort McKay's Culturally Significant Ecosystems – Traditional Plant Harvesting (Berries) 9-26
Table 9-8: Disturbances within Fort McKay's Culturally Significant Ecosystems – Utilization Distribution of Fish 9-26
Table 9-9: Disturbances within Fort McKay's Culturally Significant Ecosystems – Utilization Distribution of Birds 9-27
Table 9-11: Significance Assessment of Athabasca River Tributary Watersheds Disturbance 9-31
Table 9-11: Traditional Trails (km) in the FTSA by Development Scenario/Case 9-34
Table 9-12: Traditional Trails (km) in the Jackpine Mine Expansion LSA by Development Scenario/Case 9-39
Table 9-13: Traditional Trails (km) in the Pierre River Mine LSA by Development Scenario/Case 9-39

Equations

Equation 2-1: Health Canada Air Quality Health Index (AQHI) 50
Equation 2-2: Determining AQHI 67

Appendices

Appendix 1-1: Fort McKay Community Assessment. Data report prepared by Golder Associates Ltd. for Shell Canada Limited. Electronic copy available on CD.

Appendix 2-1: Fort McKay's Healing the Earth Strategy - DRAFT Air Quality Section

Appendix 2-2: An Assessment of Air Quality in Fort McKay in 2008: Based on Health Canada's Air Quality Health Index (AQHI) and Fort McKay's related Community AQHI Criteria

Appendix 7-1: Vegetation Assessment Tables

Appendix 8-1: Biodiversity Assessment Tables

Appendix 9-1: Disturbance Scenario/Case Maps

Appendix 9-2: Culturally Significant Ecosystem Maps