TABLE OF CONTENTS  

8.0 ENVIRONMENTAL EFFECTS ASSESSMENT ................................................................. 8-1

8.1 PROJECT INTERACTIONS WITH THE ENVIRONMENT .............................................. 8-3

8.2 ATMOSPHERIC ENVIRONMENT ............................................................................. 8-5

8.2.1 Scope of Assessment .......................................................................................... 8-6

8.2.1.1 Rationale for Selection of Valued Environmental Component, Regulatory Context, and Issues Raised During Engagement .................................................. 8-6

8.2.1.2 Selection of Environmental Effects and Measurable Parameters .................... 8-7

8.2.1.3 Temporal Boundaries ................................................................................... 8-8

8.2.1.4 Spatial Boundaries ..................................................................................... 8-8

8.2.1.5 Administrative and Technical Boundaries .................................................... 8-9

8.2.1.6 Residual Environmental Effects Significance Criteria ................................... 8-14

8.2.2 Existing Conditions ........................................................................................... 8-15

8.2.2.1 Climate ....................................................................................................... 8-16

8.2.2.2 Ambient Air Quality .................................................................................... 8-19

8.2.2.2.1 Provincial Ambient Air Quality Monitoring ................................................ 8-19

8.2.2.2.2 Ambient Air Quality Monitoring Within the LAA ........................................ 8-20

8.2.2.3 Air Contaminant and GHG Emissions .......................................................... 8-23

8.2.3 Potential Project-VEC Interactions ..................................................................... 8-24

8.2.4 Assessment of Project-Related Environmental Effects ....................................... 8-26

8.2.4.1 Potential Project Environmental Effects Mechanisms ..................................... 8-29

8.2.4.2 Mitigation of Project Environmental Effects .................................................. 8-29

8.2.4.3 Characterization of Residual Project Environmental Effects ......................... 8-30

8.2.4.3.1 Air Quality ............................................................................................ 8-30

8.2.4.3.2 Greenhouse Gas Emissions ................................................................... 8-31

8.2.5 Assessment of Cumulative Environmental Effects ............................................. 8-32

8.2.6 Determination of Significance ........................................................................... 8-34

8.2.6.1 Residual Project Environmental Effects ....................................................... 8-34

8.2.6.2 Residual Cumulative Environmental Effects .................................................. 8-34

8.2.7 Follow-up or Monitoring .................................................................................. 8-35

8.3 ACOUSTIC ENVIRONMENT ................................................................................... 8-37

8.3.1 Scope of Assessment ......................................................................................... 8-38

8.3.1.1 Rationale for Selection of Valued Environmental Component, Regulatory Context, and Issues Raised During Engagement .................................................. 8-38

8.3.1.2 Selection of Environmental Effect and Measurable Parameters ..................... 8-39

8.3.1.3 Temporal Boundaries .................................................................................. 8-39

8.3.1.4 Spatial Boundaries ..................................................................................... 8-39

8.3.1.5 Administrative and Technical Boundaries .................................................... 8-40

8.3.1.6 Residual Environmental Effects Significance Criteria ................................... 8-44

8.3.2 Existing Conditions ........................................................................................... 8-44

8.3.3 Potential Project-VEC Interactions ..................................................................... 8-50
8.3.4 Assessment of Project-Related Environmental Effects .............................................. 8-52
  8.3.4.1 Potential Project Environmental Effects Mechanisms ............................... 8-55
  8.3.4.2 Mitigation of Project Environmental Effects ........................................ 8-55
  8.3.4.3 Characterization of Residual Project Environmental Effects ............. 8-56
8.3.5 Assessment of Cumulative Environmental Effects ................................................. 8-57
8.3.6 Determination of Significance ..................................................................................... 8-58
  8.3.6.1 Residual Project Environmental Effects .................................................. 8-58
  8.3.6.2 Residual Cumulative Environmental Effects ........................................... 8-59
8.3.7 Follow-up or Monitoring .......................................................................................... 8-59
8.4 WATER RESOURCES .................................................................................................. 8-61
  8.4.1 Scope of Assessment ................................................................................................ 8-63
    8.4.1.1 Rationale for Selection of Valued Environmental Component, Regulatory Context, and Issues Raised During Engagement ........................................ 8-63
    8.4.1.2 Selection of Environmental Effect and Measurable Parameters ......... 8-64
    8.4.1.3 Temporal Boundaries ........................................................................ 8-65
    8.4.1.4 Spatial Boundaries .............................................................................. 8-65
    8.4.1.5 Administrative and Technical Boundaries ............................................. 8-66
    8.4.1.6 Residual Environmental Effects Significance Criteria ....................... 8-66
  8.4.2 Existing Conditions .................................................................................................. 8-69
    8.4.2.1 Climate and Water Resources .................................................................... 8-69
      8.4.2.1.1 Precipitation Analysis ..................................................................... 8-70
      8.4.2.1.2 Extreme Precipitation ....................................................................... 8-71
    8.4.2.2 Hydrological Conditions ........................................................................... 8-72
      8.4.2.2.1 Watershed Delineation ...................................................................... 8-72
      8.4.2.2.2 Stream Flow ..................................................................................... 8-75
      8.4.2.2.3 Surface Water Quality ..................................................................... 8-80
      8.4.2.2.4 Surface Water Users ........................................................................ 8-87
    8.4.2.3 Groundwater ............................................................................................... 8-88
      8.4.2.3.1 Bedrock Geology .............................................................................. 8-88
      8.4.2.3.2 Surficial Geology ............................................................................ 8-88
      8.4.2.3.3 Hydrogeologic Setting ....................................................................... 8-90
      8.4.2.3.4 Groundwater Quality ....................................................................... 8-100
      8.4.2.3.5 Groundwater Users ........................................................................ 8-103
  8.4.3 Potential Project-VEC Interactions ....................................................................... 8-104
    8.4.3.1 Construction .......................................................................................... 8-105
    8.4.3.2 Operation ............................................................................................... 8-106
    8.4.3.3 Decommissioning, Reclamation and Closure ....................................... 8-107
  8.4.4 Assessment of Project-Related Environmental Effects ......................................... 8-108
    8.4.4.1 Potential Project Environmental Effects Mechanisms ........................... 8-113
      8.4.4.1.1 Construction: Physical Construction and Installation of Project Facilities .................................................. 8-113
      8.4.4.1.2 Operation: Mine Waste and Water Management .......................................... 8-114
      8.4.4.1.3 Decommissioning, Reclamation and Closure: Closure .................... 8-115
8.4.4.2 Mitigation of Project Environmental Effects .................................................. 8-115
8.4.4.3 Characterization of Residual Project Environmental Effects 8-117
  8.4.4.3.1 Construction ............................................................................................. 8-117
  8.4.4.3.2 Operation................................................................................................. 8-126
  8.4.4.3.3 Decommissioning, Reclamation and Closure ........................................... 8-131
8.4.5 Assessment of Cumulative Environmental Effects ........................................... 8-133
8.4.6 Determination of Significance ........................................................................... 8-134
  8.4.6.1 Residual Project Environmental Effects ...................................................... 8-134
  8.4.6.2 Residual Cumulative Environmental Effects ................................................... 8-135
8.4.7 Follow-up or Monitoring .................................................................................. 8-135
8.5 AQUATIC ENVIRONMENT ......................................................................................... 8-137
  8.5.1 Scope of Assessment ...................................................................................... 8-141
    8.5.1.1 Rationale for Selection of Valued Environmental Component, Regulatory Context, and Issues Raised During Engagement ...................................................................................... 8-141
    8.5.1.2 Selection of Environmental Effect and Measurable Parameters 8-142
    8.5.1.3 Temporal Boundaries .................................................................................. 8-144
    8.5.1.4 Spatial Boundaries ..................................................................................... 8-144
    8.5.1.5 Administrative and Technical Boundaries .................................................... 8-147
      8.5.1.5.1 Administrative Boundaries ..................................................................... 8-147
      8.5.1.5.2 Technical Boundaries .......................................................................... 8-154
    8.5.1.6 Residual Environmental Effects Significance Criteria ................................ 8-154
8.5.2 Existing Conditions .......................................................................................... 8-155
  8.5.2.1 General Setting ........................................................................................... 8-156
  8.5.2.2 Methods for the Characterization of Baseline Conditions 8-159
  8.5.2.3 Description of the Existing Aquatic Environment ........................................ 8-163
    8.5.2.3.1 Fish Habitat .......................................................................................... 8-164
    8.5.2.3.2 Fish ...................................................................................................... 8-187
8.5.3 Potential Project-VEC Interactions ................................................................... 8-192
  8.5.3.1 Construction: Activities With a Ranking of 0 or 1 ........................................ 8-193
  8.5.3.2 Operation: Activities With a Ranking of 0 or 1 ............................................. 8-195
  8.5.3.3 Decommissioning, Reclamation and Closure: Activities With a Ranking of 0 or 1 ............................................................................................ 8-196
  8.5.3.4 Summary of Activities with a Ranking of 0 or 1 .......................................... 8-196
8.5.4 Assessment of Project-Related Environmental Effects ....................................... 8-196
  8.5.4.1 Potential Project Environmental Effects Mechanisms ................................ 8-202
    8.5.4.1.1 Construction .......................................................................................... 8-202
    8.5.4.1.2 Operation............................................................................................... 8-203
    8.5.4.1.3 Decommissioning, Reclamation and Closure ............................................ 8-207
  8.5.4.2 Mitigation of Project Environmental Effects .............................................. 8-208
    8.5.4.2.1 TSF Site Selection and Design ................................................................. 8-209
    8.5.4.2.2 Fish Relocation .................................................................................... 8-209
    8.5.4.2.3 Mine Waste and Water Management .................................................... 8-209
    8.5.4.2.4 Fish Habitat Offsetting ......................................................................... 8-211
8.5.4.2.5 Management of Pit Lake Water at Closure ............................................... 8-211
8.5.4.3 Characterization of Residual Project Environmental Effects ............................. 8-211
8.5.4.3.1 Construction .................................................................................................. 8-211
8.5.4.3.2 Operation ..................................................................................................... 8-214
8.5.4.3.3 Decommissioning, Reclamation and Closure .............................................. 8-236
8.5.4.3.4 Summary of the Residual Environmental Effects of Decommissioning, Reclamation and Closure ................................................................. 8-238

8.5.5 Assessment of Cumulative Environmental Effects ................................................... 8-238
8.5.5.1 Cumulative Environmental Effects Mechanisms ............................................ 8-242
8.5.5.2 Mitigation of Cumulative Environmental Effects ............................................ 8-243
8.5.5.3 Characterization of Residual Cumulative Environmental Effects ..................... 8-243

8.5.6 Determination of Significance .................................................................................. 8-244
8.5.6.1 Residual Project Environmental Effects ........................................................ 8-244
8.5.6.2 Residual Cumulative Environmental Effects ................................................. 8-246

8.5.7 Follow-up or Monitoring ........................................................................................ 8-246

8.6 TERRESTRIAL ENVIRONMENT ................................................................................ 8-249
8.6.1 Scope of Assessment .............................................................................................. 8-250
8.6.1.1 Rationale for Selection of Valued Environmental Component, Regulatory Context, and Issues Raised During Engagement ........................................... 8-250
8.6.1.2 Selection of Environmental Effect and Measurable Parameters .................... 8-251
8.6.1.3 Temporal Boundaries ................................................................................... 8-252
8.6.1.4 Spatial Boundaries ....................................................................................... 8-252
8.6.1.5 Administrative and Technical Boundaries ..................................................... 8-259
8.6.1.6 Residual Environmental Effects Significance Criteria ................................... 8-261

8.6.2 Existing Conditions .................................................................................................. 8-262
8.6.2.1 Habitat Overview .......................................................................................... 8-262
8.6.2.2 Managed Wildlife Habitats ........................................................................... 8-263
8.6.2.2.1 Conservation Forest ................................................................................ 8-263
8.6.2.2.2 Deer Wintering Areas ............................................................................... 8-263
8.6.2.2.3 Protected Natural Areas (PNAs) .............................................................. 8-263
8.6.2.3 Interior Forest ............................................................................................... 8-264
8.6.2.4 Wildlife ......................................................................................................... 8-277
8.6.2.4.1 Birds ....................................................................................................... 8-277
8.6.2.4.2 Mammals and Herpetiles ....................................................................... 8-285
8.6.2.4.3 Winter Track Surveys ............................................................................. 8-286
8.6.2.4.4 Aerial Wildlife Survey ............................................................................ 8-287
8.6.2.5 Species at Risk (SAR) .................................................................................. 8-287
8.6.2.6 Species of Conservation Concern (SOCC) ................................................... 8-298

8.6.3 Potential Project-VEC Interactions ......................................................................... 8-299
8.6.4 Assessment of Project-Related Environmental Effects ............................................ 8-309
8.6.4.1 Potential Project Environmental Effects Mechanisms .................................... 8-314
8.6.4.2 Mitigation of Project Environmental Effects .................................................. 8-316
8.6.4.3 Characterization of Residual Project Environmental Effects ............................. 8-318
8.6.4.3.1 Habitat
8.6.4.3.2 Wildlife
8.6.5 Assessment of Cumulative Environmental Effects
8.6.6 Determination of Significance
8.6.6.1 Residual Project Environmental Effects
8.6.6.2 Residual Cumulative Environmental Effects
8.6.7 Follow-up or Monitoring

8.7 VEGETATED ENVIRONMENT

8.7.1 Scope of Assessment
8.7.1.1 Rationale for Selection of Valued Environmental Component, Regulatory Context, and Issues Raised During Engagement
8.7.1.2 Selection of Environmental Effect and Measurable Parameters
8.7.1.3 Temporal Boundaries
8.7.1.4 Spatial Boundaries
8.7.1.5 Administrative and Technical Boundaries
8.7.1.6 Residual Environmental Effects Significance Criteria

8.7.2 Existing Conditions
8.7.2.1 Overview
8.7.2.2 Methods Used to Establish Existing Conditions
8.7.2.2.1 Information Sources
8.7.2.2.2 Remote Sensing, Modelling, and Field Surveys
8.7.2.3 Vegetation Communities
8.7.2.4 Vascular Plant Populations (including SAR and SOCC)

8.7.3 Potential Project-VEC Interactions

8.7.4 Assessment of Project-Related Environmental Effects
8.7.4.1 Potential Project Environmental Effects Mechanisms
8.7.4.2 Mitigation of Project Environmental Effects
8.7.4.3 Characterization of Residual Project Environmental Effects

8.7.5 Assessment of Cumulative Environmental Effects
8.7.5.1 Cumulative Environmental Effects Mechanisms
8.7.5.2 Mitigation of Cumulative Environmental Effects
8.7.5.3 Characterization of Residual Cumulative Environmental Effects

8.7.6 Determination of Significance
8.7.6.1 Residual Project Environmental Effects
8.7.6.2 Residual Cumulative Environmental Effects

8.7.7 Follow-up or Monitoring

8.8 WETLAND ENVIRONMENT

8.8.1 Scope of Assessment
8.8.1.1 Rationale for Selection of Valued Environmental Component, Regulatory Context, and Issues Raised During Engagement
8.8.1.2 Selection of Environmental Effect and Measurable Parameters
8.8.1.3 Temporal Boundaries
8.8.1.4 Spatial Boundaries
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.8.1.5</td>
<td>Administrative and Technical Boundaries</td>
<td>8-392</td>
</tr>
<tr>
<td>8.8.1.6</td>
<td>Residual Environmental Effects Significance Criteria</td>
<td>8-397</td>
</tr>
<tr>
<td>8.8.2</td>
<td>Existing Conditions</td>
<td>8-398</td>
</tr>
<tr>
<td>8.8.2.1</td>
<td>Overview</td>
<td>8-398</td>
</tr>
<tr>
<td>8.8.2.2</td>
<td>Wetland Evaluation Methods</td>
<td>8-399</td>
</tr>
<tr>
<td>8.8.2.2.1</td>
<td>Information Sources</td>
<td>8-399</td>
</tr>
<tr>
<td>8.8.2.2.2</td>
<td>Remote Sensing, Modelling, and Field Surveys</td>
<td>8-399</td>
</tr>
<tr>
<td>8.8.2.3</td>
<td>Wetlands in the LAA</td>
<td>8-400</td>
</tr>
<tr>
<td>8.8.2.3.1</td>
<td>Wetland Function</td>
<td>8-416</td>
</tr>
<tr>
<td>8.8.3</td>
<td>Potential Project-VEC Interactions</td>
<td>8-421</td>
</tr>
<tr>
<td>8.8.4</td>
<td>Assessment of Project-Related Environmental Effects</td>
<td>8-424</td>
</tr>
<tr>
<td>8.8.4.1</td>
<td>Potential Project Environmental Effects Mechanisms</td>
<td>8-429</td>
</tr>
<tr>
<td>8.8.4.2</td>
<td>Mitigation of Project Environmental Effects</td>
<td>8-430</td>
</tr>
<tr>
<td>8.8.4.2.1</td>
<td>Wetland Mitigation in New Brunswick</td>
<td>8-431</td>
</tr>
<tr>
<td>8.8.4.3</td>
<td>Characterization of Residual Project Environmental Effects</td>
<td>8-432</td>
</tr>
<tr>
<td>8.8.4.3.1</td>
<td>Direct Loss of GeoNB-mapped Wetlands</td>
<td>8-433</td>
</tr>
<tr>
<td>8.8.4.3.2</td>
<td>Direct Loss of Unmapped Wetlands</td>
<td>8-434</td>
</tr>
<tr>
<td>8.8.4.3.3</td>
<td>Percent Loss within the RAA</td>
<td>8-437</td>
</tr>
<tr>
<td>8.8.4.3.4</td>
<td>Indirect Loss of Wetlands During Operation</td>
<td>8-438</td>
</tr>
<tr>
<td>8.8.4.3.5</td>
<td>Provincially Significant Wetlands</td>
<td>8-440</td>
</tr>
<tr>
<td>8.8.5</td>
<td>Assessment of Cumulative Environmental Effects</td>
<td>8-440</td>
</tr>
<tr>
<td>8.8.5.1</td>
<td>Cumulative Environmental Effects Mechanisms</td>
<td>8-447</td>
</tr>
<tr>
<td>8.8.5.2</td>
<td>Mitigation of Cumulative Environmental Effects</td>
<td>8-448</td>
</tr>
<tr>
<td>8.8.5.3</td>
<td>Characterization of Residual Cumulative Environmental Effects</td>
<td>8-448</td>
</tr>
<tr>
<td>8.8.6</td>
<td>Determination of Significance</td>
<td>8-448</td>
</tr>
<tr>
<td>8.8.6.1</td>
<td>Residual Project Environmental Effects</td>
<td>8-448</td>
</tr>
<tr>
<td>8.8.6.2</td>
<td>Residual Cumulative Environmental Effects</td>
<td>8-449</td>
</tr>
<tr>
<td>8.8.7</td>
<td>Follow-up or Monitoring</td>
<td>8-449</td>
</tr>
<tr>
<td>8.9</td>
<td>PUBLIC HEALTH AND SAFETY</td>
<td>8-451</td>
</tr>
<tr>
<td>8.9.1</td>
<td>Scope of Assessment</td>
<td>8-452</td>
</tr>
<tr>
<td>8.9.1.1</td>
<td>Rationale for Selection of Valued Environmental Component, Regulatory</td>
<td>8-452</td>
</tr>
<tr>
<td></td>
<td>Context, and Issues Raised During Engagement</td>
<td></td>
</tr>
<tr>
<td>8.9.1.2</td>
<td>Selection of Environmental Effects and Measurable Parameters</td>
<td>8-453</td>
</tr>
<tr>
<td>8.9.1.3</td>
<td>Temporal Boundaries</td>
<td>8-454</td>
</tr>
<tr>
<td>8.9.1.4</td>
<td>Spatial Boundaries</td>
<td>8-454</td>
</tr>
<tr>
<td>8.9.1.5</td>
<td>Administrative and Technical Boundaries</td>
<td>8-455</td>
</tr>
<tr>
<td>8.9.1.6</td>
<td>Residual Environmental Effects Significance Criteria</td>
<td>8-461</td>
</tr>
<tr>
<td>8.9.2</td>
<td>Existing Conditions</td>
<td>8-461</td>
</tr>
<tr>
<td>8.9.2.1</td>
<td>Current Health Status</td>
<td>8-461</td>
</tr>
<tr>
<td>8.9.2.1.1</td>
<td>Mortality</td>
<td>8-462</td>
</tr>
<tr>
<td>8.9.2.1.2</td>
<td>Cancer Incidence</td>
<td>8-462</td>
</tr>
<tr>
<td>8.9.2.1.3</td>
<td>Cardiovascular Disease</td>
<td>8-463</td>
</tr>
<tr>
<td>8.9.2.1.4</td>
<td>Neurodegenerative Diseases</td>
<td>8-463</td>
</tr>
</tbody>
</table>
8.9.2.1.5 Mental Health ................................................................. 8-464
8.9.2.1.6 Obesity ................................................................. 8-464
8.9.2.1.7 Teenage Pregnancy .................................................. 8-465
8.9.2.1.8 Injury ................................................................. 8-465
8.9.2.1.9 Injuries in Sport, Recreation and Exercise ................. 8-465
8.9.2.1.10 Workplace Health and Safety ................................ 8-466

8.9.2.2 Predicted Baseline Human Health Risks – Existing Environmental Contaminant Concentrations ................................................................. 8-466
8.9.2.2.1 Predicted Baseline Health Risks via Inhalation ................. 8-467
8.9.2.2.2 Predicted Baseline Health Risks via Ingestion of and Dermal Contact with Soil ................................................................. 8-468
8.9.2.2.3 Predicted Baseline Health Risks via Ingestion of Food ....... 8-468
8.9.2.2.4 Predicted Baseline Health Risks via Ingestion of Water ....... 8-469

8.9.3 Potential Project-VEC Interactions ........................................... 8-469
8.9.3.1 Potential Interactions With a Change in Public Health .......... 8-470
8.9.3.2 Potential Interactions With a Change in Public Safety .......... 8-471

8.9.4 Assessment of Project-Related Environmental Effects ......................... 8-472
8.9.4.1 Potential Project Environmental Effects Mechanisms .......... 8-475
8.9.4.2 Mitigation of Project Environmental Effects ...................... 8-476
8.9.4.3 Characterization of Residual Project Environmental Effects .... 8-476
8.9.4.3.1 Health Risks via Inhalation ........................................... 8-477
8.9.4.3.2 Health Risks via Ingestion of Soil and Dermal Contact with Soil ................................................................. 8-478
8.9.4.3.3 Health Risks via Ingestion of Food ................................... 8-479
8.9.4.3.4 Health Risks via Ingestion of Water .................................. 8-480
8.9.4.3.5 Summary ................................................................. 8-481

8.9.5 Assessment of Cumulative Environmental Effects ...................... 8-481
8.9.6 Determination of Significance ................................................... 8-483
8.9.6.1 Residual Project Environmental Effects ................................ 8-483
8.9.6.2 Residual Cumulative Environmental Effects ...................... 8-483
8.9.7 Follow-up or Monitoring .......................................................... 8-483

8.10 LABOUR AND ECONOMY .......................................................... 8-485
8.10.1 Scope of Assessment ............................................................... 8-486
8.10.1.1 Rationale for Selection of Valued Environmental Component, Regulatory Context, and Issues Raised During Engagement ............................... 8-486
8.10.1.2 Selection of Environmental Effects and Measurable Parameters ................................................................. 8-487
8.10.1.3 Temporal Boundaries ...................................................... 8-488
8.10.1.4 Spatial Boundaries ............................................................. 8-488
8.10.1.5 Administrative and Technical Boundaries ......................... 8-491
8.10.1.6 Residual Environmental Effects Significance Criteria .................. 8-491
8.10.2 Existing Conditions ............................................................... 8-492
8.10.2.1 Population Demographics ............................................... 8-492
8.10.2.2 Economy ........................................................................ 8-492
8.10.2.2.1 New Brunswick ............................................................. 8-493
8.10.2.2 York County ................................................................. 8-494
8.10.2.2.3 Carleton County .................................................... 8-494
8.10.2.3 Labour ................................................................. 8-495
8.10.2.3.1 New Brunswick .................................................. 8-495
8.10.2.3.2 York County ............................................................ 8-496
8.10.2.3.3 Carleton County .................................................. 8-497
8.10.2.4 Aboriginal Employment .............................................. 8-498
8.10.3 Potential Project-VEC Interactions .................................. 8-502
8.10.4 Assessment of Project-Related Environmental Effects .......... 8-504
  8.10.4.1 Potential Project Environmental Effects Mechanisms .......... 8-507
  8.10.4.2 Mitigation of Project Environmental Effects .......... 8-508
  8.10.4.3 Characterization of Residual Project Environmental Effects .... 8-508
8.10.5 Assessment of Cumulative Environmental Effects ................. 8-512
8.10.6 Determination of Significance ........................................ 8-514
  8.10.6.1 Residual Project Environmental Effects .......... 8-514
  8.10.6.2 Residual Cumulative Environmental Effects .......... 8-515
8.10.7 Follow-up or Monitoring .............................................. 8-515
8.11 COMMUNITY SERVICES AND INFRASTRUCTURE .................. 8-517
  8.11.1 Scope of Assessment .............................................. 8-518
    8.11.1.1 Rationale for Selection of Valued Environmental Component, Regulatory Context, and Issues Raised During Engagement .......... 8-518
    8.11.1.2 Selection of Environmental Effect and Measurable Parameters .......... 8-519
    8.11.1.3 Temporal Boundaries ........................................ 8-519
    8.11.1.4 Spatial Boundaries ........................................... 8-520
    8.11.1.5 Administrative and Technical Boundaries ............... 8-520
    8.11.1.6 Residual Environmental Effects Significance Criteria .......... 8-523
  8.11.2 Existing Conditions .............................................. 8-523
    8.11.2.1 Municipal Administration ................................ 8-523
    8.11.2.2 Education ...................................................... 8-524
    8.11.2.3 Permanent Housing ......................................... 8-524
    8.11.2.4 Temporary Accommodations ................................ 8-526
    8.11.2.5 Policing ......................................................... 8-527
    8.11.2.6 Fire Protection ................................................ 8-528
    8.11.2.7 Community Health ......................................... 8-529
    8.11.2.8 Recreation and Entertainment .............................. 8-532
  8.11.3 Potential Project-VEC Interactions .................................. 8-534
  8.11.4 Assessment of Project-Related Environmental Effects .......... 8-536
    8.11.4.1 Potential Project Environmental Effects Mechanisms .......... 8-539
    8.11.4.2 Mitigation of Project Environmental Effects .......... 8-539
    8.11.4.3 Characterization of Residual Project Environmental Effects .... 8-540
  8.11.5 Assessment of Cumulative Environmental Effects .......... 8-543
  8.11.6 Determination of Significance ...................................... 8-545
    8.11.6.1 Residual Project Environmental Effects .......... 8-545
8.11.6.2 Residual Cumulative Environmental Effects ................................................. 8-545

8.11.7 Follow-up or Monitoring .................................................................................... 8-546

8.12 LAND AND RESOURCE USE .............................................................................. 8-547

8.12.1 Scope of Assessment ......................................................................................... 8-548

8.12.1.1 Rationale for Selection of Valued Environmental Component, Regulatory
Context, and Issues Raised During Engagement ............................................... 8-548

8.12.1.2 Selection of Environmental Effect and Measurable Parameters ............... 8-549

8.12.1.3 Temporal Boundaries ................................................................................ 8-549

8.12.1.4 Spatial Boundaries .................................................................................... 8-550

8.12.1.5 Administrative and Technical Boundaries .................................................. 8-550

8.12.1.6 Residual Environmental Effects Significance Criteria ............................... 8-555

8.12.2 Existing Conditions ......................................................................................... 8-555

8.12.3 Potential Project-VEC Interactions ................................................................. 8-561

8.12.4 Assessment of Project-Related Environmental Effects ................................. 8-565

8.12.4.1 Potential Project Environmental Effects Mechanisms ............................. 8-568

8.12.4.2 Mitigation of Project Environmental Effects ............................................. 8-568

8.12.4.3 Characterization of Residual Project Environmental Effects ................. 8-569

8.12.5 Assessment of Cumulative Environmental Effects ........................................... 8-578

8.12.6 Determination of Significance .......................................................................... 8-580

8.12.6.1 Residual Project Environmental Effects ................................................ 8-580

8.12.6.2 Residual Cumulative Environmental Effects ........................................... 8-580

8.12.7 Follow-up or Monitoring ............................................................................... 8-583

8.13 CURRENT USE OF LAND AND RESOURCES FOR TRADITIONAL
PURPOSES BY ABORIGINAL PERSONS .................................................................. 8-585

8.13.1 Scope of Assessment ....................................................................................... 8-586

8.13.1.1 Rationale for Selection of Valued Environmental Component, Regulatory
Context, and Issues Raised During Engagement ............................................... 8-586

8.13.1.2 Selection of Environmental Effect and Measurable Parameters ............... 8-587

8.13.1.3 Temporal Boundaries ................................................................................ 8-588

8.13.1.4 Spatial Boundaries .................................................................................... 8-588

8.13.1.5 Administrative and Technical Boundaries .................................................. 8-591

8.13.1.6 Residual Environmental Effects Significance Criteria ............................... 8-592

8.13.2 Existing Conditions ......................................................................................... 8-595

8.13.2.1 First Nation Communities and Population in New Brunswick ............... 8-595

8.13.2.2 Traditional Territory ................................................................................ 8-597

8.13.2.3 Indigenous Knowledge Study (IKS) ......................................................... 8-598

8.13.2.4 Forest Resource Harvesting ................................................................. 8-602

8.13.3 Potential Project-VEC Interactions ................................................................. 8-603

8.13.4 Assessment of Project-Related Environmental Effects ................................. 8-607

8.13.4.1 Potential Project Environmental Effects Mechanisms ............................. 8-611

8.13.4.2 Mitigation of Project Environmental Effects ............................................. 8-611

8.13.4.3 Characterization of Residual Project Environmental Effects ................. 8-612

8.13.5 Assessment of Cumulative Environmental Effects ........................................... 8-630
8.13.6 Determination of Significance ................................................................. 8-636
  8.13.6.1 Residual Project Environmental Effects ........................................... 8-636
  8.13.6.2 Residual Cumulative Environmental Effects .................................... 8-636
8.13.7 Follow-up or Monitoring ........................................................................ 8-637

8.14 HERITAGE RESOURCES .............................................................................. 8-639
  8.14.1 Scope of Assessment .............................................................................. 8-640
    8.14.1.1 Rationale for Selection of Valued Environmental Component, Regulatory
             Context, and Issues Raised During Engagement ........................................ 8-640
    8.14.1.2 Selection of Environmental Effect and Measurable Parameter .......... 8-642
    8.14.1.3 Temporal Boundaries ........................................................................ 8-642
    8.14.1.4 Spatial Boundaries ........................................................................... 8-643
    8.14.1.5 Administrative and Technical Boundaries ........................................ 8-643
    8.14.1.6 Residual Environmental Effects Significance Criteria ...................... 8-649
  8.14.2 Existing Conditions .................................................................................. 8-650
    8.14.2.1 Background Research ....................................................................... 8-650
    8.14.2.2 Archaeological Survey ...................................................................... 8-658
    8.14.2.3 Shovel Testing Results To Date .......................................................... 8-663
  8.14.3 Potential Project-VEC Interactions .......................................................... 8-665
    8.14.3.1 Construction ..................................................................................... 8-667
    8.14.3.2 Operation ........................................................................................... 8-667
    8.14.3.3 Decommissioning, Reclamation and Closure .................................... 8-669
    8.14.3.4 Summary .......................................................................................... 8-669
  8.14.4 Assessment of Project-Related Environmental Effects .......................... 8-669
    8.14.4.1 Potential Project Environmental Effects Mechanisms ....................... 8-675
    8.14.4.2 Mitigation of Project Environmental Effects ....................................... 8-675
    8.14.4.3 Characterization of Residual Project Environmental Effects ............ 8-677
  8.14.5 Assessment of Cumulative Environmental Effects ................................. 8-679
    8.14.5.1 Past or Present Projects or Activities That Have Been Carried Out ...... 8-680
    8.14.5.2 Future Projects or Activities That Will Be Carried Out ...................... 8-681
  8.14.6 Determination of Significance ................................................................. 8-682
    8.14.6.1 Residual Project Environmental Effects ............................................ 8-682
    8.14.6.2 Residual Cumulative Environmental Effects ...................................... 8-682
8.14.7 Follow-up or Monitoring .......................................................................... 8-683

8.15 TRANSPORTATION ....................................................................................... 8-685
  8.15.1 Scope of Assessment .............................................................................. 8-685
    8.15.1.1 Rationale for Selection of Valued Environmental Component, Regulatory
             Context, and Issues Raised During Engagement ........................................ 8-686
    8.15.1.2 Selection of Environmental Effect and Measurable Parameters .......... 8-687
    8.15.1.3 Temporal Boundaries ........................................................................ 8-688
    8.15.1.4 Spatial Boundaries ........................................................................... 8-689
    8.15.1.5 Administrative and Technical Boundaries ........................................ 8-690
    8.15.1.6 Residual Environmental Effects Significance Criteria ...................... 8-694
  8.15.2 Existing Conditions .................................................................................. 8-695
8.15.2.1 Primary Site Access (PSA) Route and Secondary Site Access (SSA) Route .......................................................... 8-695
8.15.2.2 Existing Road Transportation Network ................................................. 8-696
8.15.2.3 Existing Level of Service ..................................................................... 8-699
8.15.2.4 Existing Traffic Safety ......................................................................... 8-701
8.15.2.5 Existing Road Network Infrastructure Condition ..................................... 8-702
8.15.3 Potential Project-VEC Interactions .......................................................... 8-708
8.15.4 Assessment of Project-Related Environmental Effects ................................ 8-711
  8.15.4.1 Potential Project Environmental Effects Mechanisms ............................. 8-715
  8.15.4.2 Mitigation of Project Environmental Effects ........................................ 8-715
  8.15.4.3 Characterization of Residual Project Environmental Effects .................. 8-716
    8.15.4.3.1 Road Infrastructure ........................................................................ 8-716
    8.15.4.3.2 Traffic Level of Service ................................................................. 8-721
    8.15.4.3.3 Summary ...................................................................................... 8-724
8.15.5 Assessment of Cumulative Environmental Effects ...................................... 8-725
8.15.6 Determination of Significance ................................................................... 8-727
  8.15.6.1 Residual Project Environmental Effects ................................................ 8-727
  8.15.6.2 Residual Cumulative Environmental Effects ........................................ 8-727
8.15.7 Follow-up or Monitoring ........................................................................... 8-728
8.16 EFFECTS OF THE ENVIRONMENT ON THE PROJECT ........................................ 8-729
  8.16.1 Environmental Attributes ...................................................................... 8-729
  8.16.2 Selection of Effects .................................................................................. 8-730
  8.16.3 Environmental Assessment Boundaries ................................................... 8-731
    8.16.3.1 Spatial Boundaries ........................................................................... 8-731
    8.16.3.2 Temporal Boundaries ...................................................................... 8-731
    8.16.3.3 Administrative and Technical Boundaries ......................................... 8-731
  8.16.4 Residual Effects Rating Criteria ................................................................. 8-733
  8.16.5 Existing Conditions .................................................................................. 8-733
    8.16.5.1 Climatological Background (1971 to 2000) ....................................... 8-733
    8.16.5.2 Seismic Activity .............................................................................. 8-736
    8.16.5.3 Forest Fires ....................................................................................... 8-737
  8.16.6 Effects Assessment ................................................................................... 8-738
    8.16.6.1 Effects of Climate on the Project ...................................................... 8-739
    8.16.6.2 Effects of Seismic Activity on the Project ......................................... 8-746
    8.16.6.3 Effects of a Forest Fire on the Project ............................................. 8-746
  8.16.7 Determination of Significance ................................................................... 8-747
  8.16.8 Follow-up or Monitoring ........................................................................... 8-747
8.17 ACCIDENTS, MALFUNCTIONS AND UNPLANNED EVENTS .................................. 8-749
  8.17.1 Methodology ......................................................................................... 8-750
  8.17.2 Selection of Accidents, Malfunctions and Unplanned Events ...................... 8-751
    8.17.2.1 Non-Credible Accidents, Malfunctions and Unplanned Events ............ 8-752
      8.17.2.1.1 Loss of Containment from Tailings Storage Facility (TSF) ............. 8-752
      8.17.2.1.2 Failure of a Water Management Pond ....................................... 8-754
8.17.2.1.3 Uncontrolled Explosion ............................................................... 8-754
8.17.2.2 Credible Accidents, Malfunctions and Unplanned Events .......... 8-755
8.17.3 Environmental Effects Assessment .................................................. 8-759
  8.17.3.1 Erosion and Sediment Control Failure .......................................... 8-759
    8.17.3.1.1 Description of Scenario ......................................................... 8-759
    8.17.3.1.2 Environmental Effects Assessment ......................................... 8-760
    8.17.3.1.3 Determination of Significance ................................................ 8-763
  8.17.3.2 Pipeline Leak ............................................................................... 8-763
    8.17.3.2.1 Description of Scenarios ......................................................... 8-764
    8.17.3.2.2 Environmental Effects Assessment ......................................... 8-764
    8.17.3.2.3 Determination of Significance ................................................ 8-766
  8.17.3.3 On-Site Hazardous Material Spill ................................................ 8-766
    8.17.3.3.1 Description of Scenarios ......................................................... 8-766
    8.17.3.3.2 Environmental Effects Assessment ......................................... 8-769
    8.17.3.3.3 Determination of Significance ................................................ 8-773
  8.17.3.4 Release of Off-Specification Effluent from Water Treatment Plant 8-773
    8.17.3.4.1 Description of Scenario .......................................................... 8-774
    8.17.3.4.2 Environmental Effects Assessment ......................................... 8-774
    8.17.3.4.3 Determination of Significance ................................................ 8-777
  8.17.3.5 Failure of Water Management Pond Pump ................................. 8-778
    8.17.3.5.1 Description of Scenario .......................................................... 8-778
    8.17.3.5.2 Environmental Effects Assessment ......................................... 8-779
    8.17.3.5.3 Determination of Significance ................................................ 8-782
  8.17.3.6 Off-Site Trucking Accident .......................................................... 8-783
    8.17.3.6.1 Description of Scenarios .......................................................... 8-783
    8.17.3.6.2 Environmental Effects Assessment ......................................... 8-785
    8.17.3.6.3 Determination of Significance ................................................ 8-791
  8.17.3.7 Vehicle Collision ......................................................................... 8-791
    8.17.3.7.1 Description of Scenarios .......................................................... 8-792
    8.17.3.7.2 Environmental Effects Assessment ......................................... 8-793
    8.17.3.7.3 Determination of Significance ................................................ 8-799
  8.17.3.8 Fire ............................................................................................... 8-800
    8.17.3.8.1 Description of Scenario .......................................................... 8-800
    8.17.3.8.2 Environmental Effects Assessment ......................................... 8-801
    8.17.3.8.3 Determination of Significance ................................................ 8-807
8.17.4 Overall Summary and Determination of Significance ........................ 8-807

9.0 FOLLOW-UP AND MONITORING PROGRAM ....................................... 9-1
9.1 OVERVIEW ........................................................................................... 9-1
9.2 ELEMENTS OF FOLLOW-UP AND MONITORING PROGRAM ............... 9-2
9.3 FOLLOW-UP AND MONITORING PROGRAM IMPLEMENTATION .......... 9-4
  9.3.1 Responsibilities ............................................................................... 9-4
9.3.2 Follow-Up and Monitoring Methods ................................................................. 9-4
  9.3.2.1 Collection of Baseline Data ....................................................................... 9-4
  9.3.2.2 Environmental Effects Assessment Predictions ......................................... 9-5
  9.3.2.3 Identification of Parameters for Follow-Up or Monitoring ......................... 9-5
  9.3.2.4 Determination of Frequency of Follow-Up or Monitoring ......................... 9-6
  9.3.2.5 Reproducibility of Follow-Up or Monitoring Results ............................... 9-6
  9.3.2.6 Quality Assurance/Quality Control Procedures ........................................ 9-6
9.3.3 Community/Stakeholder/Aboriginal Involvement ........................................... 9-7
9.3.4 Adaptive Management ..................................................................................... 9-7
9.3.5 Documentation and Reporting ........................................................................ 9-7
9.4 PROPOSED FOLLOW-UP AND/OR MONITORING MEASURES ......................... 9-8
  9.4.1 VECs with No Follow-up or Monitoring ...................................................... 9-8
  9.4.2 VECs with Follow-up or Monitoring ............................................................ 9-9
  9.4.3 Follow-Up .................................................................................................... 9-9
    9.4.3.1 Acoustic Environment ......................................................................... 9-11
    9.4.3.2 Aquatic Environment ........................................................................ 9-12
    9.4.3.3 Water Resources ............................................................................... 9-17
    9.4.3.4 Terrestrial Environment ................................................................. 9-19
    9.4.3.5 Vegetated Environment ................................................................. 9-23
    9.4.3.6 Wetland Environment ...................................................................... 9-23
    9.4.3.7 Public Health and Safety .................................................................. 9-24
    9.4.3.8 Current Use of Land and Resources for Traditional Purposes by 
          Aboriginal Persons ............................................................................... 9-24
    9.4.3.9 Heritage Resources .......................................................................... 9-24
  9.4.4 Monitoring .................................................................................................. 9-25
    9.4.4.1 Atmospheric Environment .................................................................. 9-27
    9.4.4.2 Acoustic Environment ....................................................................... 9-28
    9.4.4.3 Aquatic Environment ........................................................................ 9-28
    9.4.4.4 Water Resources ............................................................................... 9-33
    9.4.4.5 Terrestrial Environment ..................................................................... 9-33
    9.4.4.6 Wetland Environment ........................................................................ 9-33
    9.4.4.7 Current Use of Land and Resources for Traditional Purposes by 
          Aboriginal Persons ............................................................................... 9-33
    9.4.4.8 Heritage Resources .......................................................................... 9-34
    9.4.4.9 Accidents, Malfunctions or Unplanned Events .................................... 9-34
  9.4.5 Follow-up or Monitoring during Decommissioning, Reclamation and Closure .... 9-34

10.0 SUMMARY OF MITIGATION ........................................................................... 10-1

11.0 CONCLUSIONS ............................................................................................... 11-1
### REFERENCES

12.0 REFERENCES ................................................................................................................. 12-1

#### 12.1 LITERATURE CITED

12.1 LITERATURE CITED ........................................................................................................ 12-1

#### 12.2 PERSONAL COMMUNICATIONS

12.2 PERSONAL COMMUNICATIONS ................................................................................... 12-53

### LIST OF TABLES

**Table 8.1.1** Potential Interactions of the Project with the Environment .......................... 8-3

**Table 8.2.1** Measurable Parameters for Atmospheric Environment .............................. 8-7

**Table 8.2.2** Summary of Ambient Air Quality Objectives, Standards, and Criteria .......... 8-10

**Table 8.2.3** Selected Odour Thresholds ............................................................................ 8-13

**Table 8.2.4** Summary of Hourly Meteorological Data – Sisson Meteorological Tower Site ... 8-19

**Table 8.2.5** Highest Observed 24-hour Ground-Level Concentrations by Month – Total Suspended Particulate Matter (PM) – Napadogan .................................................. 8-21

**Table 8.2.6** Highest Observed 24-hour Ground-Level Concentrations by Month – Particulate Matter Less Than 2.5 Microns (PM_{2.5}) – Napadogan ........................................ 8-21

**Table 8.2.7** Highest Observed 24-hour Average Ground-Level Concentrations during Monitoring Period – Selected Trace Metals in PM – Napadogan ........................................ 8-22

**Table 8.2.8** Highest Observed Weekly Ground-Level Concentrations By Month – Sulphur Dioxide (SO_{2}) and Nitrogen Dioxide (NO_{2}) – Napadogan ......................................... 8-23

**Table 8.2.9** 2010 NPRI Air Contaminant Emissions Data – Provincial and National Totals .... 8-24

**Table 8.2.10** Potential Project Environmental Effects to the Atmospheric Environment .......... 8-25

**Table 8.2.11** Summary of Residual Project-Related Environmental Effects on the Atmospheric Environment ................................................................. 8-27

**Table 8.2.12** Potential Cumulative Environmental Effects to the Atmospheric Environment 8-32

**Table 8.3.1** Measurable Parameters for the Acoustic Environment ................................... 8-39

**Table 8.3.2** Baseline Sound Monitoring Locations and Dates ........................................... 8-47

**Table 8.3.3** Baseline Sound Pressure Level Monitoring Results – 1-h L_{eq} .......................... 8-47

**Table 8.3.4** Baseline Sound Pressure Level Monitoring Results – 24-h L_{eq} ....................... 8-47

**Table 8.3.5** Baseline Sound Pressure Level Monitoring Results - L_{DN} ................................. 8-48

**Table 8.3.6** Potential Project Environmental Effects to the Acoustic Environment .......... 8-50

**Table 8.3.7** Summary of Residual Project-Related Environmental Effects on the Acoustic Environment ........................................................................................................ 8-53

**Table 8.3.8** Potential Cumulative Environmental Effects to the Acoustic Environment .... 8-57

**Table 8.4.1** Measurable Parameters for Water Resources .................................................. 8-64

**Table 8.4.2** Long-term Average Monthly and Annual Climate Statistics within the LAA .... 8-69

**Table 8.4.3** Variability in Annual Precipitation for Wet and Dry Years within the LAA (mm) ... 8-70

**Table 8.4.4** Estimated 24-Hour Extreme Rainfall Return Period Values for PDA .......... 8-71

**Table 8.4.5** Water Balance Results under the Long-Term Average Climate Conditions .... 8-72

**Table 8.4.6** Hydrometric Monitoring Stations within Watersheds .................................... 8-75

**Table 8.4.7** Annual Seven-Day Low Flows by Return Period (m^{3}/s) ................................ 8-79

**Table 8.4.8** Flood Flows (m^{3}/s) by Return Period ......................................................... 8-80

**Table 8.4.9** Surface Water Quality Monitoring Stations .................................................... 8-80
<table>
<thead>
<tr>
<th>Table Number</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.4.10</td>
<td>Surface Water Quality in McBean Brook Sub-Watershed</td>
<td>8-81</td>
</tr>
<tr>
<td>8.4.11</td>
<td>Surface Water Quality in Napadogan Brook Sub-Watershed</td>
<td>8-84</td>
</tr>
<tr>
<td>8.4.12</td>
<td>Monitoring Well Construction Details and Hydraulic Conductivity Distribution</td>
<td>8-95</td>
</tr>
<tr>
<td>8.4.13</td>
<td>Groundwater Water Chemistry in Napadogan Brook Sub-Watershed</td>
<td>8-100</td>
</tr>
<tr>
<td>8.4.14</td>
<td>Potential Project Environmental Effects to Water Resources</td>
<td>8-104</td>
</tr>
<tr>
<td>8.4.15</td>
<td>Summary of Residual Project-Related Environmental Effects on Water Resources</td>
<td>8-109</td>
</tr>
<tr>
<td>8.4.16</td>
<td>Potential Cumulative Environmental Effects to Water Resources</td>
<td>8-133</td>
</tr>
<tr>
<td>8.5.1</td>
<td>Measurable Parameters for Aquatic Environment</td>
<td>8-143</td>
</tr>
<tr>
<td>8.5.2</td>
<td><strong>MMER</strong> Schedule 4 – Authorized Limits for Release of Deleterious Substances</td>
<td>8-149</td>
</tr>
<tr>
<td>8.5.3</td>
<td>CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life</td>
<td>8-150</td>
</tr>
<tr>
<td>8.5.4</td>
<td>CCME Canadian Sediment Quality Guidelines for the Protection of Aquatic Life</td>
<td>8-150</td>
</tr>
<tr>
<td>8.5.5</td>
<td>Fish Species Composition and Distribution Within the LAA</td>
<td>8-188</td>
</tr>
<tr>
<td>8.5.6</td>
<td>Baseline Concentrations for Selected Trace Metals in Whole Fish</td>
<td>8-191</td>
</tr>
<tr>
<td>8.5.7</td>
<td>Potential Project Environmental Effects to the Aquatic Environment</td>
<td>8-192</td>
</tr>
<tr>
<td>8.5.8</td>
<td>Summary of Residual Project-Related Environmental Effects on the Aquatic Environment</td>
<td>8-197</td>
</tr>
<tr>
<td>8.5.9</td>
<td>Comparison of Maximum Predicted Snowmelt Concentrations to CCME FAL Guidelines</td>
<td>8-221</td>
</tr>
<tr>
<td>8.5.10</td>
<td>Observed and Predicted Fish Habitat Connectivity Conditions at Identified Locations in West Branch Napadogan Brook and the Main Branch Napadogan Brook</td>
<td>8-230</td>
</tr>
<tr>
<td>8.5.11</td>
<td>Potential Cumulative Environmental Effects to the Aquatic Environment</td>
<td>8-238</td>
</tr>
<tr>
<td>8.5.12</td>
<td>Summary of Residual Cumulative Environmental Effects on the Aquatic Environment</td>
<td>8-241</td>
</tr>
<tr>
<td>8.6.1</td>
<td>Measurable Parameters for the Terrestrial Environment</td>
<td>8-251</td>
</tr>
<tr>
<td>8.6.2</td>
<td>Bird Species Observed During Breeding Bird Surveys in 2011 and/or 2012</td>
<td>8-278</td>
</tr>
<tr>
<td>8.6.3</td>
<td>Mammal and Herpetile Species Observed in the LAA During 2008, 2011, and 2012 Field Studies</td>
<td>8-286</td>
</tr>
<tr>
<td>8.6.4</td>
<td>Wildlife Species At Risk (SAR) with Records Within or Near the LAA</td>
<td>8-288</td>
</tr>
<tr>
<td>8.6.5</td>
<td>Potential Project Environmental Effects to the Terrestrial Environment</td>
<td>8-299</td>
</tr>
<tr>
<td>8.6.6</td>
<td>Summary of Residual Project-Related Environmental Effects on the Terrestrial Environment</td>
<td>8-310</td>
</tr>
<tr>
<td>8.6.7</td>
<td>Potential Cumulative Environmental Effects to the Terrestrial Environment</td>
<td>8-329</td>
</tr>
<tr>
<td>8.7.1</td>
<td>Measurable Parameters for Vegetated Environment</td>
<td>8-337</td>
</tr>
<tr>
<td>8.7.2</td>
<td>Distribution of Vegetation Communities Within the LAA</td>
<td>8-347</td>
</tr>
<tr>
<td>8.7.3</td>
<td>Vascular Plant Species Observed in the LAA and Surrounding Areas</td>
<td>8-354</td>
</tr>
<tr>
<td>8.7.4</td>
<td>Potential Project Environmental Effects to the Vegetated Environment</td>
<td>8-364</td>
</tr>
<tr>
<td>8.7.5</td>
<td>Summary of Residual Project-Related Environmental Effects on the Vegetated Environment</td>
<td>8-368</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
<td>------</td>
</tr>
<tr>
<td>8.7.6</td>
<td>Ecosites Within the LAA and RAA, and % of RAA That May Be Lost or Altered as a Result of the Project</td>
<td>8-376</td>
</tr>
<tr>
<td>8.7.7</td>
<td>NBDNR Old Forest Communities within PDA, LAA (but outside PDA), and Ecoregion</td>
<td>8-377</td>
</tr>
<tr>
<td>8.7.8</td>
<td>Potential Cumulative Environmental Effects to the Vegetated Environment</td>
<td>8-379</td>
</tr>
<tr>
<td>8.7.9</td>
<td>Summary of Residual Cumulative Environmental Effects on the Vegetated Environment</td>
<td>8-381</td>
</tr>
<tr>
<td>8.7.10</td>
<td>Measurable Parameters for Wetland Environment</td>
<td>8-390</td>
</tr>
<tr>
<td>8.7.11</td>
<td>Wetland Area, Vegetation and Hydrologic Characteristics for the PDA and LAA (Including the New 138 kV Transmission Line)</td>
<td>8-406</td>
</tr>
<tr>
<td>8.7.12</td>
<td>Summary of Wetland Functions for Each Wetland Type by Function Category</td>
<td>8-418</td>
</tr>
<tr>
<td>8.7.13</td>
<td>Potential Project Environmental Effects to the Wetland Environment</td>
<td>8-421</td>
</tr>
<tr>
<td>8.7.14</td>
<td>Summary of Residual Project-Related Environmental Effects on the Wetland Environment</td>
<td>8-425</td>
</tr>
<tr>
<td>8.7.15</td>
<td>Wetlands Within the PDA, LAA, and RAA (Crown Land Only and Estimated Total RAA), and Percent of RAA that May Be Directly or Indirectly Lost as a Result of the Project (Excluding 138 kV Transmission Line Corridor)</td>
<td>8-436</td>
</tr>
<tr>
<td>8.7.16</td>
<td>Potential Cumulative Environmental Effects to the Wetland Environment</td>
<td>8-440</td>
</tr>
<tr>
<td>8.7.17</td>
<td>Summary of Residual Cumulative Environmental Effects on the Wetland Environment</td>
<td>8-445</td>
</tr>
<tr>
<td>8.7.18</td>
<td>Measurable Parameters for Public Health and Safety</td>
<td>8-454</td>
</tr>
<tr>
<td>8.7.19</td>
<td>Potential Project Environmental Effects to Public Health and Safety</td>
<td>8-469</td>
</tr>
<tr>
<td>8.7.20</td>
<td>Summary of Residual Project-Related Environmental Effects on Public Health and Safety</td>
<td>8-473</td>
</tr>
<tr>
<td>8.7.21</td>
<td>Potential Cumulative Environmental Effects to Public Health and Safety</td>
<td>8-481</td>
</tr>
<tr>
<td>8.7.22</td>
<td>Measurable Parameters for Labour and Economy</td>
<td>8-488</td>
</tr>
<tr>
<td>8.7.23</td>
<td>Gross Domestic Product (GDP), New Brunswick, 2001 to 2010</td>
<td>8-493</td>
</tr>
<tr>
<td>8.7.26</td>
<td>Experienced Aboriginal Labour Force by Industry, Province of New Brunswick (2011)</td>
<td>8-499</td>
</tr>
<tr>
<td>8.7.27</td>
<td>Experienced Aboriginal Labour Force by Occupation, New Brunswick (2011)</td>
<td>8-499</td>
</tr>
<tr>
<td>8.7.28</td>
<td>Potential Project Environmental Effects to Labour and Economy</td>
<td>8-502</td>
</tr>
<tr>
<td>8.7.29</td>
<td>Summary of Residual Project-Related Environmental Effects on Labour and Economy</td>
<td>8-505</td>
</tr>
<tr>
<td>8.7.30</td>
<td>Employment Generated During Construction</td>
<td>8-509</td>
</tr>
<tr>
<td>8.7.31</td>
<td>Tax Revenues Generated During Construction ($ Millions)</td>
<td>8-510</td>
</tr>
<tr>
<td>8.7.32</td>
<td>Economic Activity Generated During Construction, as GDP ($ Millions)</td>
<td>8-510</td>
</tr>
<tr>
<td>8.7.33</td>
<td>Employment Generated During Operation</td>
<td>8-511</td>
</tr>
<tr>
<td>8.7.34</td>
<td>Tax Revenues Generated During Operation Expenditures ($ Millions)</td>
<td>8-511</td>
</tr>
<tr>
<td>8.7.35</td>
<td>Economic Activity Generated During Operation, as GDP ($ Millions)</td>
<td>8-512</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>8.10.15</td>
<td>Potential Cumulative Environmental Effects to Labour and Economy</td>
<td></td>
</tr>
<tr>
<td>8.11.1</td>
<td>Measurable Parameters for Community Services and Infrastructure</td>
<td></td>
</tr>
<tr>
<td>8.11.2</td>
<td>Number of Physicians at Healthcare Facilities in the LAA</td>
<td></td>
</tr>
<tr>
<td>8.11.3</td>
<td>Recreational Facilities, Fredericton</td>
<td></td>
</tr>
<tr>
<td>8.11.4</td>
<td>Potential Project Environmental Effects to Community Services and Infrastructure</td>
<td></td>
</tr>
<tr>
<td>8.11.5</td>
<td>Summary of Residual Project-Related Environmental Effects on Community Services and Infrastructure</td>
<td></td>
</tr>
<tr>
<td>8.11.6</td>
<td>Potential Cumulative Environmental Effects to Community Services and Infrastructure</td>
<td></td>
</tr>
<tr>
<td>8.12.1</td>
<td>Measurable Parameters for Land and Resource Use</td>
<td></td>
</tr>
<tr>
<td>8.12.2</td>
<td>Potential Project Environmental Effects to Land and Resource Use</td>
<td></td>
</tr>
<tr>
<td>8.12.3</td>
<td>Summary of Residual Project-Related Environmental Effects on Land and Resource Use</td>
<td></td>
</tr>
<tr>
<td>8.12.4</td>
<td>Potential Cumulative Environmental Effects to Land and Resource Use</td>
<td></td>
</tr>
<tr>
<td>8.13.1</td>
<td>Measurable Parameters for Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons</td>
<td></td>
</tr>
<tr>
<td>8.13.2</td>
<td>Population of New Brunswick Maliseet and Mi’kmaq First Nation Communities, 2006</td>
<td></td>
</tr>
<tr>
<td>8.13.3</td>
<td>Potential Project Environmental Effects to Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons</td>
<td></td>
</tr>
<tr>
<td>8.13.4</td>
<td>Summary of Residual Project-Related Environmental Effects on Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons</td>
<td></td>
</tr>
<tr>
<td>8.13.5</td>
<td>Summary of Concerns Raised by Aboriginal Groups (Revised November 10, 2014)</td>
<td></td>
</tr>
<tr>
<td>8.13.6</td>
<td>Potential Cumulative Environmental Effects to Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons</td>
<td></td>
</tr>
<tr>
<td>8.14.1</td>
<td>Measurable Parameter for Heritage Resources</td>
<td></td>
</tr>
<tr>
<td>8.14.2</td>
<td>Potential Project Environmental Effects to Heritage Resources</td>
<td></td>
</tr>
<tr>
<td>8.14.3</td>
<td>Summary of Residual Project-Related Environmental Effects on Heritage Resources</td>
<td></td>
</tr>
<tr>
<td>8.14.4</td>
<td>Potential Cumulative Environmental Effects to Heritage Resources</td>
<td></td>
</tr>
<tr>
<td>8.15.1</td>
<td>Measurable Parameters for Transportation</td>
<td></td>
</tr>
<tr>
<td>8.15.2</td>
<td>Highway Designations in New Brunswick</td>
<td></td>
</tr>
<tr>
<td>8.15.3</td>
<td>Level of Service (LOS) Criteria</td>
<td></td>
</tr>
<tr>
<td>8.15.4</td>
<td>Road Network Infrastructure Condition Geometric Criteria</td>
<td></td>
</tr>
<tr>
<td>8.15.5</td>
<td>Existing Level of Service (LOS) for Selected Routes within the LAA</td>
<td></td>
</tr>
<tr>
<td>8.15.6</td>
<td>Existing Levels of Service of Key Intersections</td>
<td></td>
</tr>
<tr>
<td>8.15.7</td>
<td>Existing Collision Rates Along Provincial Highway Routes (2006 – 2010)</td>
<td></td>
</tr>
<tr>
<td>8.15.8</td>
<td>Geometric Characteristics of Roads within the LAA</td>
<td></td>
</tr>
<tr>
<td>8.15.9</td>
<td>Potential Project Environmental Effects to Transportation</td>
<td></td>
</tr>
<tr>
<td>8.15.10</td>
<td>Summary of Residual Project-Related Environmental Effects on Transportation</td>
<td></td>
</tr>
</tbody>
</table>
Table 8.15.11  Distribution of Traffic Volumes to Highway Segments – Construction Phase........ 8-717
Table 8.15.12  Distribution of Traffic Volumes to Highway Segments – Operation Phase......... 8-719
Table 8.15.13  Level of Service – Existing Conditions and Construction Phase......................... 8-721
Table 8.15.14  Level of Service at Key Intersections – Existing Conditions and Construction Phase........................................................................................................................................... 8-722
Table 8.15.15  Level of Service – Existing Conditions and Operation Phase.......................... 8-723
Table 8.15.16  Level of Service at Key Intersections – Existing Conditions and Operation Phase........................................................................................................................................... 8-724
Table 8.15.17  Potential Cumulative Environmental Effects to Transportation........................ 8-725
Table 8.16.1   Projected Mean Annual Maximum and Minimum Temperature Change, and Precipitation Percent Change for both SDSM and CGCM1 Model Results.......................... 8-740
Table 8.17.1   Credible Accidents, Malfunctions and Unplanned Events and Scenarios ............ 8-756
Table 8.17.2   Potential Interactions between VECs and Erosion and Sediment Control Failure........................................................................................................................................... 8-760
Table 8.17.3   Potential Interactions between VECs and Pipeline Leak .................................. 8-764
Table 8.17.4   Potential Interactions between VECs and On-Site Hazardous Material Spill ..... 8-769
Table 8.17.5   Potential Interactions between VECs and Release of Off-Specification Effluent from Water Treatment Plant........................................................................................................................................... 8-774
Table 8.17.6   Potential Interactions between VECs and Failure of Water Management Pond Pump........................................................................................................................................... 8-779
Table 8.17.7   Potential Interactions between VECs and an Off-Site Trucking Accident.......... 8-785
Table 8.17.8   Potential Interactions between VECs and a Vehicle Collision........................... 8-793
Table 8.17.9   Existing Collision Rates along Provincial Highway Routes (2006 – 2010)........ 8-795
Table 8.17.10  Potential Interactions between VECs and a Fire ........................................... 8-802
Table 8.17.11  Summary of Residual Environmental Effects for Accidents, Malfunctions and Unplanned Events........................................................................................................................................... 8-809
Table 9.4.1   Proposed Follow-Up Program.............................................................................. 9-10
Table 9.4.2   Proposed Water Quality Stations for Long-Term Monitoring.............................. 9-18
Table 9.4.3   Proposed Monitoring Program ............................................................................ 9-25
Table 10.1.1  Summary of Mitigation: Sisson Project............................................................... 10-2

LIST OF FIGURES (VOLUME 2)

Figure 8.2.1  Project Development Area (PDA), and Local Assessment Area (LAA) for the Atmospheric Environment ................................................................................................................................. 8-11
Figure 8.2.2  Winds at the Fredericton Airport: 2006-2011.................................................. 8-17
Figure 8.2.3  Winds at the Sisson Meteorological Station: April 2011-May 2012................ 8-18
Figure 8.3.1  Local Assessment Area (LAA) and Regional Assessment Area (RAA) for Acoustic Environment ................................................................................................................................. 8-41
Figure 8.3.2  Baseline Sound Pressure Level Monitoring Locations.......................................... 8-45
Figure 8.3.3  Baseline Sound Pressure Levels at Meteorological Station (Monitoring Site 1) – 1-h $L_{eq}$ (October 20 to October 27, 2011) ........................................................................................................ 8-49
Figure 8.12.8  Photograph Taken Along Four Mile Brook Road, Looking South Toward the TSF (Photo 5 in Figure 8.12.3) ................................................................. 8-561
Figure 8.12.9  Viewshed Map ............................................................................................................ 8-573
Figure 8.12.10 Modelled View from Napadogan, Looking West Toward PDA (from Photo 1 in Figure 8.12.3, inset) .................................................................. 8-575
Figure 8.12.11 Modelled View from Within PDA, Looking Northwest Toward TSF (from Photo 2 in Figure 8.12.3, inset) .................................................................. 8-575
Figure 8.12.12 Modelled View Looking Northwest Toward Open Pit and TSF (from Photo 3 in Figure 8.12.3, inset) .................................................................. 8-576
Figure 8.12.13 Modelled View From Chainy Lakes Road, Looking North Toward TSF (from Photo 4 in Figure 8.12.3, inset) .................................................................. 8-576
Figure 8.12.14 Modelled View From Four Mile Brook, Looking South Toward TSF (from Photo 5 in Figure 8.12.3, inset) .................................................................. 8-577
Figure 8.12.15 Modelled View From Top of Crabbe Mountain, Looking North Toward Project ............................................................................................................ 8-577
Figure 8.12.16 Agricultural Land in the Vicinity of the New 138 kV Transmission Line ......................................................................................................................... 8-581
Figure 8.13.1  Project Development Area (PDA), and Local Assessment Area (LAA) for Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons .................................................................................................................. 8-589
Figure 8.13.2  Regional Assessment Area (RAA) for Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons ......................................................................................................................... 8-593
Figure 8.13.3  Location of New Brunswick First Nations Communities ................................................................................................................................. 8-596
Figure 8.13.4  Maliseet Traditional Territory .......................................................................................... 8-598
Figure 8.13.5  Proportion of the Regional Assessment Area (RAA) Occupied by the Local Assessment Area (LAA) for the Project ..................................................................................................................... 8-631
Figure 8.13.6  Proportion of Contiguous Crown Land Occupied by the Local Assessment Area (LAA) for the Project ................................................................................................................................. 8-633
Figure 8.14.1  Project Development Area (PDA), and Local Assessment Area (LAA) for Heritage Resources ................................................................................................................................. 8-645
Figure 8.14.2  Regional Assessment Area (RAA) for Heritage Resources ............................................................................................................................................................................. 8-647
Figure 8.14.3  Steps for the Evaluation of High, Medium and Low Archaeological Potential Areas ................................................................................................................................. 8-652
Figure 8.15.1  Local Assessment Area (LAA) and Regional Assessment Area (RAA) for Transportation ................................................................................................................................................ 8-691
Figure 8.15.2  Primary Site Access (PSA) Route and Secondary Site Access (SSA) Route ................................................................................................................................. 8-697
Figure 8.16.1  Predominant Monthly Wind Direction, Monthly Mean, Maximum Hourly and Maximum Gust Wind Speeds (1971 to 2000) at Fredericton, New Brunswick ......................................................................................................................... 8-734
Figure 8.16.2  Average Fire Weather Index for the Month of July (1981-2010) .................................................................................................................................................................................. 8-737
Figure 9.4.1  Baseline EEM Monitoring Locations ......................................................................................... 9-15
Figure 9.4.2  Location of Surface Water Quality Monitoring .............................................................................. 9-21
LIST OF APPENDICES

Appendix A  List of Acronyms and Units
Appendix B  Glossary of Selected Terms
Appendix C  Tables of Concordance (Cross-Referenced Index with Final Guidelines, and Terms of Reference)
Appendix D  Environmental and Social Management Systems (ESMS)
Appendix E  (Deleted from Final EIA Report – no longer relevant)
Appendix F  Availability of Resources for First Nations’ Traditional Use on Crown Land Near the Sisson Project
Appendix G  Loss of Containment in Tailings Storage Facility (TSF)
Appendix H  Reclamation Plan – Excerpt from Part 3 of the Mining and Reclamation Plan under the Mining Act