MEG Energy Corp.

Road Map of Christina Lake Regional Project - Phase 3

Application

Volume 1

- Overview
- Geology
- Project Facilities and Process Description
- Summary of the EIA
- Public Consultation

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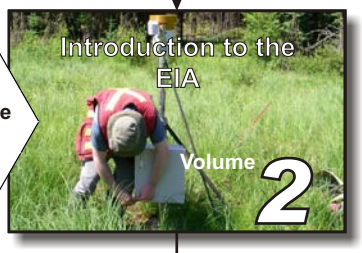

- Terms of Reference
- Assessment Approach
- EIA Methods
- Terms of Reference
- Quality Assurance and Quality Control
- Assessment Cases
- Climate Change Considerations
- Common and Scientific Names
- Monitoring Programs
- Regional Developments
- Concordance Tables

Air Quality, Noise, and Health

Volume 3

- Air Quality Assessment
- Noise Assessment
- Human Health Assessment
- Air Emissions Effects Assessment
- Wildlife Health

Aquatic Resources

Volume 4

- Hydrogeology Assessment and Baseline
- Hydrology Assessment and Baseline
- Water Quality Assessment and Baseline
- Fish and Fish Habitat Assessment and Baseline

Terrestrial Resources

Volume 5

- Soil and Terrain Assessment and Baseline
- Terrestrial Vegetation, Wetlands and Forestry Assessment and Baseline
- Wildlife Assessment and Baseline
- Biodiversity Assessment and Baseline
- Wildlife Habitat Modelling

Social Aspects

Volume 6

- Traditional Land Use Assessment and Baseline
- Resource Use Assessment and Baseline
- Visual Resources Assessment
- Historical Resources Assessment
- Socio-Economics Assessment

Acknowledgments

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TABLE OF CONTENTS

SECTION **PAGE**

1 INTRODUCTION 1-1

2 TERMS OF REFERENCE 2-1

3 ASSESSMENT APPROACH 3-1
3.1 IMPACT ASSESSMENT OVERVIEW 3-1
3.2 REPORT ORGANIZATION 3-3

4 ENVIRONMENTAL IMPACT ASSESSMENT METHODS 4-1
4.1 OVERVIEW 4-1
4.1.1 Information Used 4-1
4.1.2 Assessments Conducted 4-1
4.1.3 Content of Reports 4-2
4.1.4 MEG's Climate Action Plan 4-3
4.1.5 Assessment Scenarios 4-3
4.2 KEY ISSUES AND KEY QUESTIONS 4-5
4.2.1 Key Issues 4-5
4.2.2 Key Questions 4-9
4.3 SPATIAL CONSIDERATIONS 4-13
4.3.1 Air 4-13
4.3.2 Noise 4-17
4.3.3 Human Health 4-18
4.3.4 Air Emission Effects 4-18
4.3.5 Aquatic Resources 4-18
4.3.6 Terrestrial Resources 4-21
4.3.7 Socio-Economics 4-22
4.3.8 Traditional Land Use 4-23
4.3.9 Historical Resources 4-24
4.3.10 Resource Use 4-24
4.3.11 Visual Resources 4-25
4.4 TEMPORAL CONSIDERATIONS 4-25
4.5 LINKAGE DIAGRAMS 4-26
4.6 KEY INDICATOR RESOURCES 4-28
4.7 IMPACT ANALYSES 4-31
4.8 IMPACT DESCRIPTION CRITERIA 4-32
4.8.1 Certainty and Prediction Confidence 4-39
4.8.2 Environmental Consequence 4-40
4.8.3 Management and Monitoring 4-41

5 ASSESSMENT CASES 5-1

6 REFERENCES 6-1

LIST OF TABLES

Table 4.2-1 Summary of Key Questions for the Project: Project Case 4-9
Table 4.2-2 Summary of Key Questions for the Project: Planned Development Case 4-11
Table 4.3-1 Selected Receptors Included in the Air Quality Assessment 4-14
Table 4.3-2 Location of Receptors Included in the Noise Assessment 4-17
Table 4.3-3 Study Areas Used in the Resource Use Assessment 4-24
Table 4.6-1 Key Indicator Resources and Rationale for Selection 4-29
Table 4.8-1 Impact Description Criteria and Numerical Scores for the Project 4-35
Table 4.8-2 Screening System for Environmental Consequences 4-41
Table 5-1 Assessment Cases 5-2
Table 5-2 Developments Included and Components Considered in the Existing and Approved and Project Cases 5-5
Table 5-3 Developments Included and Components Considered in the Planned Development Cases 5-7

LIST OF FIGURES

Figure 1-1 Project Location 1-2
Figure 1-2 Project Footprint Components 1-4
Figure 4.3-1 Regional Study Areas 4-15
Figure 4.3-2 Local Study Areas 4-16
Figure 4.5-1 Key to Linkage Diagrams 4-27
Figure 5-1 Oil Sands Developments – Existing, Approved and Planned 5-4

LIST OF APPENDICES

Appendix 2-I Terms of Reference
Appendix 2-II QA/QC
Appendix 2-III Climate Change Considerations
Appendix 2-IV Common and Scientific Names
Appendix 2-V Monitoring Programs
Appendix 2-VI Regional Developments
Appendix 2-VII Concordance Tables
Appendix 2-VIII Phase 2 – Environmental Setting Reports

1 INTRODUCTION

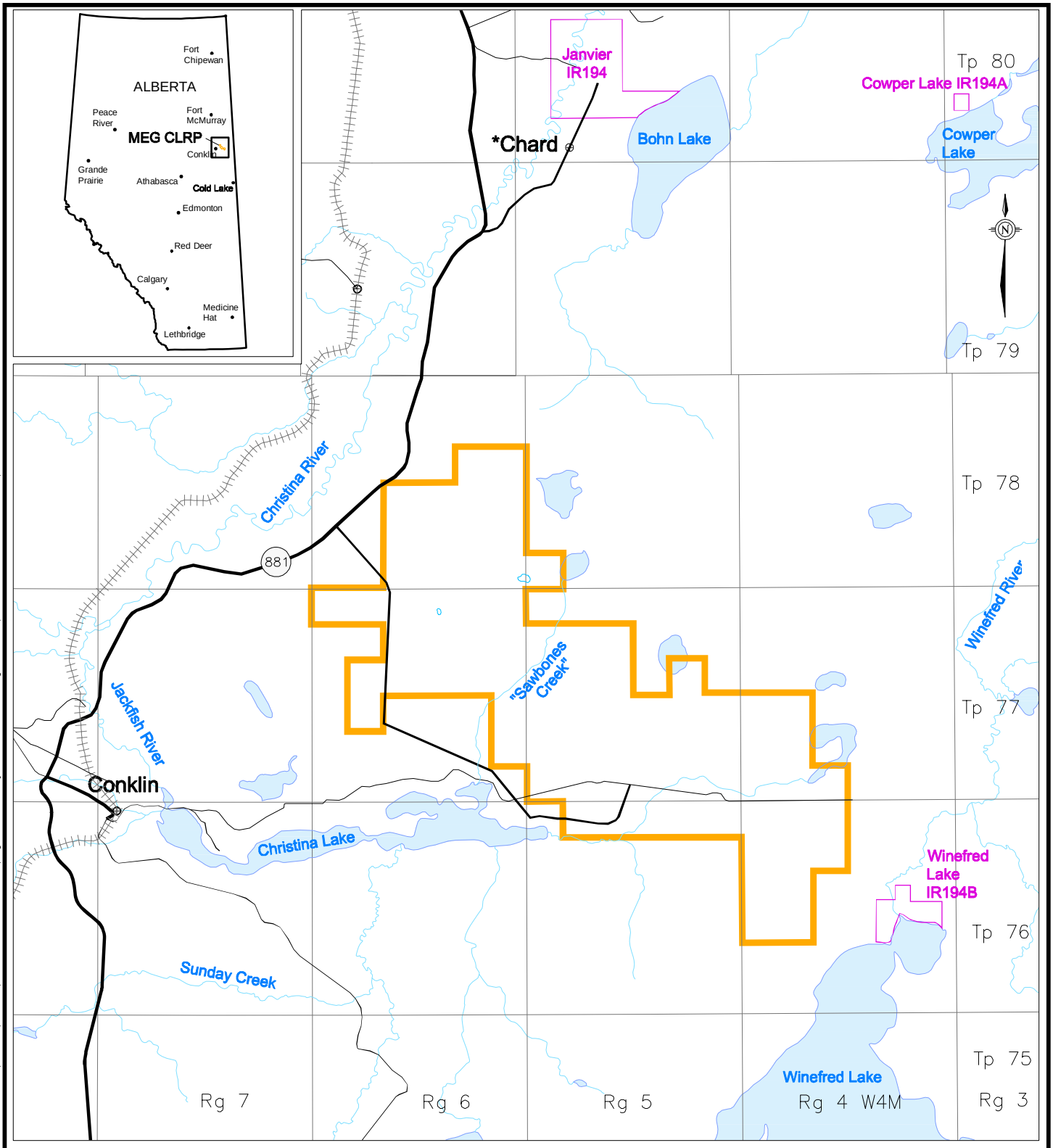
MEG Energy Corp. (MEG) is a Calgary-based, privately held energy company focused on the development and recovery of bitumen, shallow gas reserves and the generation of power in northeast Alberta. MEG's Christina Lake Regional Project (CLRP) consists of 80 sections of oil sands leases within the Regional Municipality of Wood Buffalo (RMWB), approximately 15 km southeast of Secondary Highway 881 and 20 km northeast of Conklin.

MEG currently has approval to construct and operate the first two phases of the CLRP over 23 sections of land. In addition, MEG is developing a facility expansion (Phase 2B) to increase the production capacity of the Central Plant to 60,000 barrels per day (bpd). The Phase 2B plant will be located immediately adjacent to the existing Phase 1 and 2 processing facilities.

MEG is now proposing a further expansion of the CLRP to fully develop its Christina Lake oil sands leases. The Christina Lake Regional Project – Phase 3 (the Project) is an expansion of the current CLRP development area and will use Steam Assisted Gravity Drainage (SAGD) bitumen recovery technology. The Project will consist of two additional processing facilities (Plants 3A and 3B), 138 SAGD multi-well pads and associated steam generating equipment. Plant 3A will be located in the southeast corner of the lease (Sections 20 and 29-76-4 W4M) and Plant 3B will be located in the northwest end of the lease (Sections 32 and 33-77-6 W4M).

Construction of the Project is proposed to occur in two phases. Phase 3A is anticipated to begin construction in 2010, with initial steam injection in 2012. Phase 3B is anticipated to begin construction in 2012, with initial steam injection in 2014. The operational life of each plant is expected to be 25 years. Total production from the two new plants will produce an incremental 150,000 bpd of bitumen (approximately 23,800 cubic metres per day). It is anticipated that reclamation of the Project will be complete by 2044.

Engineering, operations and environmental teams collaborated on the design of the Project to maximize energy efficiency and minimize environmental impacts. The footprint was superimposed on mapping systems, which incorporate information from environmental databases. An analysis was then undertaken and surface facilities re-located to mitigate potential environmental issues, maximize use of existing land disturbances, reduce aquatic and terrestrial fragmentation, and avoid potentially sensitive ecosystems. The Project design team also reviewed process issues such as integration with the previously approved phases of the CLRP, water usage, disposal and recycle, vapour recovery and flaring.



LEGEND

- ROAD
- RAILWAY
- RIVER
- OPEN WATER
- INDIAN RESERVE
- MEG LEASE BOUNDARY

5 0 5
SCALE 1:250,000 KILOMETRES

NOTE

* Also known as the Hamlet of Janvier
Unnamed watercourse locally known as "Sawbones Creek"

REFERENCE

ALBERTA NTDB DIGITAL DATA OBTAINED FROM GEOMATICS CANADA, AUGUST 2001.
DATUM: NAD 83 PROJECTION: UTM ZONE 12

PROJECT

CHRISTINA LAKE REGIONAL PROJECT - PHASE 3

TITLE

PROJECT LOCATION

MEG ENERGY CORP.

PROJ	07.1346.0009.5100		FILE No.	Project Location
DESIGN	VB	18/09/07	SCALE AS SHOWN	REV. 0
CADD	PSR	10/04/08		
CHECK	RC	17/04/08		
REVIEW	IGG	17/04/08		

FIGURE: 1-1

L:\2007\1346 Oil Sands\07-1346-0009-MEG EXPANSION\5100\5190\EIA INTRODUCTION\Fig 1-1_Project location.dwg Apr 17, 2008 - 2:39pm

The development footprint for the Project will be 2,028 ha. The footprint can be separated into three major components: the plants, field facilities and offsite services. Plants 3A and 3B will include processes and facilities that are generally the same as for the previously approved CLRP Phase 1, Phase 2 and Phase 2B. Major components will include steam generation, vapour recovery, bitumen treating, produced water recycling and sulphur recovery. Field facilities for the Project include wellpads, reservoir re-pressurization facilities, source and disposal wells, pumping stations, access roads, pipelines and utility corridors. Offsite services for the Project include camps and potential borrow pits. An overview of the Project footprint components is shown in Figure 1-2.

Under the Alberta *Environmental Protection and Enhancement Act* (EPEA), an Environmental Impact Assessment (EIA) report is required for the Project. The EIA will form part of the submission made to the Alberta Energy Resources Conservation Board (ERCB) pursuant to the *Oil Sands Conservation Act* (OSCA).

Rg 7
Rg 6
Rg 5
Rg 4
Rg 3 W4M
Tp 78
Tp 77
Tp 76
CHRISTINA RIVER
WINEFRED RIVER
881
PLANT 3B
PLANT 3A
"SAWBONES CREEK"
JACKFISH RIVER
CHRISTINA LAKE
CHRISTINA LAKE
WINEFRED LAKE IR 194B
WINEFRED LAKE

LEGEND

- ROAD
- RAILWAY
- RIVER
- TRANSMISSION PIPELINE
- UNDERGROUND PIPELINE
- OPEN WATER
- INDIAN RESERVE
- MEG LEASE BOUNDARY
- EXISTING AND APPROVED DEVELOPMENT
- UTILITY CORRIDOR
- PHASE 3 PROJECT FOOTPRINT
- PHASE 3 POTENTIAL BORROW AREA
- PHASE 3 CAMP
- PHASE 3 POTENTIAL WATER SOURCE WELL
- PHASE 3 WELLPAD
- PHASE 3 PUMP STATION
- PHASE 3 WELLPAD AND POTENTIAL WATER SOURCE WELL
- PHASE 3 WATER DISPOSAL WELL

NOTE

Unnamed watercourse locally known as "Sawbones Creek"

2.5 0 2.5
SCALE 1:125,000 KILOMETRES

PROJECT

CHRISTINA LAKE REGIONAL PROJECT - PHASE 3

TITLE

PROJECT FOOTPRINT COMPONENTS

MEG ENERGY CORP.

PROJ	07.1346.0009.5100		FILE No.	project footprint	
DESIGN	BL	08/04/08	SCALE	AS SHOWN	REV. 0
CADD	PSR	10/04/08			
CHECK	RC	17/04/08			
REVIEW	IGG	17/04/08			

FIGURE: 1-2

L:\2007\1346 Oil Sands\07-1346-0009-MEG EXPANSION\5100\5190\EIA INTRODUCTION\Fig 1-2_Project Footprint Components.dwg Apr 18, 2008 - 5:27pm

2 TERMS OF REFERENCE

The proposed Terms of Reference (TOR) for the EIA were submitted to Alberta Environment (AENV) in September 2007. Alberta Environment issued the final TOR for the Project in March 2008 (AENV 2008). A copy of the TOR is provided in Appendix 2-I.

This assessment was completed to meet the relevant TOR (AENV 2008) for the Project (Appendix 2-I). The TOR also include the requirements of the *Canadian Environmental Assessment Act* (CEAA) and other applicable federal legislation. Volume 1 provides additional detailed EPEA information requirements. Concordance tables have been provided in Appendix 2-VII.

3 ASSESSMENT APPROACH

To gain approval for this development, MEG has developed an integrated application to the ERCB and Alberta Environment (AENV) for the Project. This application will provide details on the Project and provide supporting information for additional approvals for the Project. The application and EIA have also been completed to conform to the requirements of applicable legislation. The integrated application fulfills the requirements of the following Acts:

- *Canadian Environmental Assessment Act* (CEAA);
- *Climate Change and Emission Management Act*;
- *Electric Utilities Act*;
- *Environmental Protection and Enhancement Act*;
- *Fisheries Act*;
- *Historical Resources Act*, for clearance to construct the facilities;
- *Migratory Birds Convention Act*;
- *Navigable Waters Protection Act*;
- *Oil and Gas Conservation Act*, for well and water disposal licenses;
- *Oil Sands Conservation Act*;
- *Pipelines Act* (and Alberta EPEA), for the construction and operation of new pipeline tie-ins for the Phase 3 plants;
- *Public Lands Act*, for surface rights;
- *Species at Risk Act*; and
- *Transportation of Dangerous Goods Act.*

3.1 IMPACT ASSESSMENT OVERVIEW

The assessment of environmental and social considerations for the Project is presented as an integration of two key components of the Project. As stated in the TOR for the Project (AENV 2008), the EIA report will identify Project development activities and describe the effects, mitigation options and residual effects of the Project.

Information on MEG operations as well as the development details for the Project are provided in Volume 1. Details on the EIA completed for the Project are provided in Volumes 2 to 6. This section details the purpose and approach for the EIA, including a description of the methods used to complete the EIA.

The EIA methods used to assess the effects of the Project are described in Section 4, while the developments included in the assessment are listed in Section 5.

This EIA builds on a variety of environmental information collected in the Oil Sands Region, other regional EIAs and specific Project information. All relevant provincial and federal regulatory requirements were considered in the development of the Project application and completion of the EIA.

Data sources for the EIA include:

- data collected during baseline studies for the Project as well as other developments in the Oil Sands Region;
- data collected for the CLRP 2004 and 2007 Pre-disturbance Assessments (PDA);
- digital elevation data for the study area (from National Topographic Database [NTDB]);
- government resource agencies, such as Alberta Sustainable Resource Development (ASRD) and Alberta Environment (AENV);
- government statistics;
- interviews with local trappers;
- Light Detection and Ranging (LIDAR);
- literature (published and unpublished) on environmental parameters relevant to the Project;
- oil sands development EIAs and associated, public supporting data;
- Project design details;
- published literature on environmental assessment methods;
- socio-economic information collected specifically for the Project;
- socio-economics interviews;
- Traditional Land Use information; and
- vegetation data (Alberta Vegetation Inventory [AVI] data supplied by Alberta Pacific Forest Industries Inc.).

Existing regional data was also used for the initial Project design work. MEG will continue to incorporate findings and recommendations from regional efforts as part of the adaptive management of the Project.

The Quality Assurance and Quality Control (QA/QC) program for the Project EIA is detailed in Appendix 2-II.

3.2 REPORT ORGANIZATION

The Project application and EIA have been organized into six volumes as follows:

- Volume 1 includes:
  - the application for the Project including ERCB and EPEA applications;
  - a corporate overview of MEG;
  - a summary of the current CLRP operations;
  - a geological description;
  - a description of the reservoir recovery process;
  - a description of the Project;
  - environmental management and controls;
  - a summary of the EIA;
  - a summary of public consultation activities;
  - the Conservation and Reclamation (C&R) Plan; and
  - waste management and contingency plans.
- Volume 2 includes:
  - an introduction to the EIA;
  - monitoring programs;
  - concordance tables; and
  - Phase 2 Environmental Setting Reports (on CD).
- Volumes 3 includes assessments of:
  - Air Quality;
  - Noise;
  - Health (including human and wildlife health risk assessments); and
  - Air Emissions Effects.

- Volume 4 is an integrated volume of the following assessments:
  - Hydrogeology;
  - Hydrology;
  - Water Quality; and
  - Fish and Fish habitat.
- Volume 5 is an integrated volume of the following assessments:
  - Soil and Terrain;
  - Terrestrial Vegetation, Wetlands and Forestry;
  - Wildlife and Wildlife Habitat; and
  - Biodiversity.
- Volume 6 includes assessments of:
  - Traditional Land Use;
  - Resource Use;
  - Visual Resources;
  - Historical Resources; and
  - Socio-Economics.
- Each volume also includes:
  - a glossary, list of abbreviations and acronyms, and references;
  - discipline-specific baseline reports, where applicable; and
  - appendices containing relevant supporting and/or additional information.

4 ENVIRONMENTAL IMPACT ASSESSMENT METHODS

4.1 OVERVIEW

The Project EIA was completed employing accepted techniques and in compliance with the regulatory requirements. The EIA addresses the requirements of the Project TOR (AENV 2008) as well as additional information to address federal regulations. The Cumulative Effects Assessment (CEA) completed as an integral component of the Project EIA meets the requirements of Section 16 of the Canadian Environmental Assessment Act.

4.1.1 Information Used

The Project EIA used the following information:

- quantitative and qualitative information on the environmental and ecological processes in the study areas, including Traditional Ecological Knowledge (TEK), where available and relevant information presented in previous environmental assessments;
- current, publicly available information about the past, existing and planned human activities in the study areas and the nature, size, location and duration of their potential interactions with the environment;
- information about ecological processes and natural forces that are expected to produce changes in environmental conditions;
- existing and proposed industrial projects, as well as activities associated with land use and infrastructure, to the extent information is known and available to the public at the time of this assessment; and
- information on regional monitoring, research and other strategies or plans to minimize, mitigate and manage potential adverse effects.

4.1.2 Assessments Conducted

The information was used to analyze and address potential environmental effects of the Project. The assessments include:

- quantitative and qualitative descriptions of effects, with consideration of trends and uncertainties for the available information used in the EIA;
- descriptions of any deficiencies or limitations in existing environmental databases;

  - how identified deficiencies and/or limitations were addressed, considering their potential impact on the analysis and discussion on any appropriate follow-up;

- the use of appropriate predictive tools and methods, to enable quantitative estimates of future conditions with the highest possible degree of certainty;
- an evaluation of the effects, employing a system that is in compliance with the provincial and federal guidelines;
  - the ranking the consequences of effects measured quantitatively against management objectives or baseline conditions and described qualitatively with respect to the views of the proponent and stakeholders;
- a description of management plans to prevent, or mitigate adverse effects and to monitor and respond to expected or unexpected conditions, a description of follow-up plans to verify the accuracy of predictions or determine the effectiveness of mitigation plans;
- a discussion of the assumptions and confidence in data to support conclusions regarding reclamation and mitigation success; and
- a description of residual effects and their environmental consequences.

4.1.3 Content of Reports

The Project EIA and baseline reports include the following information for each discipline:

- a description of the existing conditions;
- the identification of environmental disturbances from previous activities that are considered part of baseline conditions;
- a description of the nature and significance of environmental effects associated with Project development activities;
- comments on whether available data are sufficient to assess effects and mitigative measures;
- the presentation of plans to minimize, mitigate or eliminate adverse effects and impacts, together with a discussion of the key elements of such plans;
- the identification of residual effects and the significance of those impacts;
- the presentation of a plan to monitor environmental effects and manage environmental change to demonstrate that the Project will be operated in an environmentally sound manner;

- the presentation of a plan that addresses the adverse effects associated with the Project that may require joint resolution by government, industry and the community; and
- a summation of the mitigative measures that will be implemented for the Project.

4.1.4 MEG's Climate Action Plan

MEG's corporate GHG emission reduction strategy focuses on reducing GHG emissions on a per unit of production basis. MEG is examining ways to improve overall efficiency of operations to enhance energy efficiency and reduce emissions from production, facility and field operations. The economics of emission reductions will be evaluated, along with the benefits of reducing GHG emissions. Amongst the opportunities being considered are emissions capture and sequestration technologies.

MEG recognizes that a federal/provincial/territorial climate change and environmental assessment working group has developed a general guidance document "Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners" (FPTC 2003). MEG has utilized the guidance document to assist in the completion of the Project EIA.

4.1.5 Assessment Scenarios

The Project EIA does not assess the effects of the Project in isolation. Incremental effects of the Project on the Existing and Approved Case (EAC) (i.e., existing and approved developments) as well as two assessment cases are examined.

The EAC includes consideration of the existing environmental conditions and existing and approved projects or activities within the study areas.

The Project Case includes the EAC plus the Project. The Project Case includes both existing oil sands and other regional resource development activities and is a Cumulative Effects Assessment (CEA) for the Project.

The second assessment case, the Planned Development Case (PDC), includes the Project Case developments plus other regionally planned projects. The methodology for completing this case is the same as for the Project Case. The PDC for the Project includes consideration of the following, as required by the TOR (AENV 2008):

- MEG will conduct a cumulative environmental effects assessment of the Project based on the EUB/AENV/NRCB Information Letter *Cumulative Effects Assessment in Environmental Impact Assessment Reports under the Alberta Environmental Protection and Enhancement Act* June 2000 (AENV, EUB and NRCB 2000). MEG will include a summary of all proposed monitoring, research and other strategies or plans to minimize mitigate and manage potential adverse effects.
- The identification and assessment of the likely cumulative effects of the Project will:
  - define the spatial and temporal Study Area boundaries, and provide the rationale for assumptions used to define those boundaries for each environmental component examined;
  - describe the current (baseline) state of the environment in the Regional Study Area (used for the cumulative effects assessment) and the activities that have created the current conditions;
  - assess the incremental consequences that are likely to result from the Project in combination with other existing, approved and planned projects in the region;
  - discuss how relevant information or data used from previous oil sands and other development projects is appropriate for use in this EIA report;
  - consider and describe deficiencies or limitations in the existing database for relevant components of the environment; and
  - explain the approach and methods used to identify and assess cumulative impacts, including cooperative opportunities and initiatives undertaken to further the collective understanding.

A PDC assessment is only completed for a component when the Project Case assessment results in a rating for predicted residual effects greater than negligible. The PDC is considered a conservative assessment of social and environmental conditions, since the projects included in the assessment may or may not proceed. In addition, the scope and size of the planned developments may change once designs are finalized and approved.

For the purposes of the Project, the information used for "Planned Projects" is based on what was publicly available on October 31, 2007. Projects disclosed after that date, or projects where approvals were issued or plans were modified after October 2007 were considered in the Project EIA based on the relevant information available as of cut-off date.

The Project Case and PDC are both CEAs, as they consider the effects of existing and approved developments in combination with the Project and in combination with other planned projects. The CEA aspect of the Project has been completed to comply with the provincial land federal requirements, as detailed "*Cumulative Effects Assessment in Environmental Impact Assessment Reports under the Alberta Environmental Protection and Enhancement Act*" (AENV, EUB and NRCB 2000) and to meet the requirements of Section 16 of the *Canadian Environmental Assessment Act*. The process for completing the CEA as part of the Project EIA included consideration of guideline information as provided in the Athabasca Oil Sands Cumulative Effects Framework Report (Golder 1999a), and the *Cumulative Effects Practitioners Guide* (Hegmann et al. 1999).

4.2 KEY ISSUES AND KEY QUESTIONS

The Project EIA is explicit in identifying the key issues by addressing key questions. These key questions frame the relationships between the Project and the potential environmental impacts. This transparency allows reviewers to understand the rationale and assumptions used to make conclusions.

4.2.1 Key Issues

A key component of the impact assessment process is to identify and focus on the issues that are of greatest concern to stakeholders and regulators. This process was initiated through evaluation of the issues and responses in recent oil sands EIAs, recent oil sands application regulatory hearings, the Regional Sustainable Development Strategy (RSDS) for the Athabasca Oil Sands Region (AENV 1999a), other relevant documents and through information received during consultation with stakeholders on the Project.

Some of the key issues identified through regional initiatives such as RSDS and through consultation sessions include:

- sustainable ecosystems and end land use;
- air emissions and their effects on human health, wildlife and vegetation;
- water quality and quantity.
- fish and fish habitat;
- vegetation diversity;
- wildlife and wildlife habitat; and
- traditional land use.

Some of the issues considered in association with the Project include:

- facilities location;
- climate change considerations;
- air quality and noise;
- aquatic resources;
- terrestrial resources; and
- socio-economics.

Several of the key issues are presented below. Additional issues relevant to the Project are provided within the Project EIA.

4.2.1.1 Facilities Location

- location of facilities and infrastructure relative to Christina Lake and associated watercourses.

4.2.1.2 Climate Change Considerations

The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment (FPTCCCEA) issued a general guidance document in November 2003 for practitioners to use when incorporating climate change issues into environmental assessments (FPTC 2003). The guidance document sets out the following two approaches for incorporating climate change considerations:

- Greenhouse Gas (GHG) considerations where the proposed project may contribute to GHG emissions; and
- impact consideration where changing climates may have an impact on the proposed project.

The federal guidance document indicates that projects are typically more closely aligned with one type of consideration or the other, but provides for cases where both considerations could be addressed.

In this application, production and management of GHG emissions is addressed in the air quality section of the EIA (Volume 3, Section 1). Consideration and predictions of how changing climates may impact on the Project are addressed in Appendix 2-III.

The Project application and EIA provide the following information with respect to consideration of climate change in the assessment.

Quantification of Greenhouse Gas Emissions

The predicted GHG emissions associated with the construction and operation of the Project are presented in Volume 1 and assessed in Air Quality Key Question AQPC-6 in Volume 3.

Identification of Project Sensitivities to Climate Change

The design, operations and reclamation planning for oil sands operations in northeastern Alberta consider relatively extreme climate variables as an expectation for occurrence during the life of the Project. This includes design for operations under possible operating temperatures ranging from -40 to +35°C.

An evaluation of the historic changes in temperature and precipitation as well as the possible changes in the future was completed for the Project (Appendix 2-III). The results from that assessment indicate increases in temperature are expected, while changes in precipitation are less well defined but are within existing annual variation. The results of the evaluations showed that potential predicted changes in key climate variables are not predicted to adversely impact the planned construction, operation and reclamation of the Project.

4.2.1.3 Air Quality and Noise

- emissions of oxides of sulphur dioxide (SO_2), nitrogen (NO_x), Greenhouse Gases (GHGs) and Particulate Matter (PM), as well as other industrial emissions;
- effects of emissions on ecological receptors; and
- effects of sound levels on people, wildlife and local traditional land uses.

4.2.1.4 Aquatic Resources

- groundwater withdrawals and potential effects on groundwater quality and quantity, as well as surface water flows and water levels;
- watercourse crossings and associated effects of suspended sediment entrainment and deposition;
- natural drainage and flow patterns;
- wastewater management;

- runoff management;
- spill management;
- acid deposition from air emissions;
- effects on fish and fish habitat, including benthic invertebrate communities; and
- effects of fishing pressure.

4.2.1.5 Terrestrial Resources

- caribou habitat and movement (Christina Caribou Zone);
- old growth forest;
- rare plants;
- habitat fragmentation; and
- reclamation.

4.2.1.6 Traditional Land Use

- medicinal plants;
- traplines; and
- trail access.

4.2.1.7 Resource Use

- aggregate resources;
- berry picking;
- environmentally important areas;
- fishing;
- forestry;
- hunting and trapping; and
- recreation.

4.2.1.8 Socio-Economic

- traditional use;
- job creation; and
- community benefits.

4.2.2 Key Questions

Key questions have been identified for each EIA component to address the specific issues identified by the communities, stakeholders, regulators or technical experts. The key questions also address issues detailed in the EIA TOR as that document is designed to focus on the key issues associated with the Project. Although key questions are used to focus the impact assessment, issues over and above those captured in the key questions are also addressed.

Key questions are provided for both the Project Case and PDC. The PDC key questions are intended to focus the effects assessment on the primary cumulative effects issues associated with the Project in relation to other planned projects. Therefore, if the Project Case resulted in the determination that the Project had a negligible residual effect, the assessment under the PDC may not be completed as the effects of the Project are not expected to overlap with those of future planned projects.

A summary of key questions for the Project is provided in Table 4.2-1 and 4.2-2.

Table 4.2-1 Summary of Key Questions for the Project: Project Case

Number	Key Question
Air Emissions Effects	
AEEPC-1	What effects could air emissions from existing and approved developments and the Project have on waterbodies and the aquatic resources therein?
AEEPC-2	What effects could air emissions from existing and approved developments and the Project have on soils?
AEEPC-3	What effects could air emissions from existing and approved developments and the Project have on terrestrial vegetation and wetlands?
AEEPC-4	What effects could air emissions from existing and approved developments and the Project have on wildlife and wildlife habitat?
Air Quality	
AQPC-1	What effects could existing and approved developments and the Project have on ambient air quality in the region?
AQPC-2	What effects could existing and approved developments and the Project have on the deposition of acid-forming compounds in the region?
AQPC-3	What effects could existing and approved developments and the Project have on concentrations of ground-level ozone in the region?
AQPC-4	Will emissions from the Project be in compliance with relevant provincial and federal emission guidelines?
AQPC-5	What effects could existing and approved developments and the Project have on odours in regional communities?
AQPC-6	What effects could the Project have on the production and management of greenhouse gas emissions?

Table 4.2-1 Summary of Key Questions for the Project: Project Case (continued)

Number	Key Question
Noise	
NPC-1	What effects could activities associated with existing and approved developments and the Project have on local noise levels and nearby dwellings?
Hydrogeology	
HGPC-1	What effects could existing and approved developments and the Project have on groundwater quantities, levels and flow patterns?
HGPC-2	What effects could existing and approved developments and the Project have on groundwater quality?
Hydrology	
HPC-1	What effects could existing and approved developments and the Project have on open water areas, flows and water levels in receiving and nearby waterbodies, channel regime, geomorphic condition, sediment deposition and sediment concentration?
Water Quality	
WQPC-1	What effects could existing and approved developments and the Project have on surface water quality?
Fish and Fish Habitat	
FPC-1	What effects could existing and approved developments and the Project have on fish habitat?
FPC-2	What effects could existing and approved developments and the Project have on fish health?
FPC-3	What effects could existing and approved developments and the Project have on fish abundance?
FPC-4	What effects could existing and approved developments and the Project have on fish and fish habitat diversity?
Terrestrial	
TRPC-1	What effects could existing and approved developments and the Project have on the quantity of soil and terrain and soil quality/capability?
TRPC-2	What effects could existing and approved developments and the Project have on terrestrial vegetation, wetlands and forestry?
TRPC-3	What effects could existing and approved developments and the Project have on wildlife abundance and habitat?
TRPC-4	What effects could existing and approved developments and the Project have on biodiversity?
Historical Resources	
HRPC-1	What effects could existing and approved developments and the Project have on historical resources?
Resource Use	
RUPC-1	What effects could existing and approved developments and the Project have on environmentally important areas?
RUPC - 2	What effects could existing and approved developments and the Project have on natural resource use and users?

Table 4.2-1 Summary of Key Questions for the Project: Project Case (continued)

Number	Key Question
Socio-Economic	
SEPC-1	What effects could existing and approved developments and the Project have on the local and provincial economy?
SEPC-2	What effects could existing and approved developments and the Project have on population, services and infrastructure?
Traditional Land Use	
TLUPC-1	What effects could existing and approved developments and the Project have on traditional land uses?
Visual Resources	
VRPC-1	What effects could existing and approved developments and the Project have on visual resources?

Table 4.2-2 Summary of Key Questions for the Project: Planned Development Case

Number	Key Question
Air Emissions Effects	
AEEPDC-1	What effects could air emissions from existing and approved developments, the Project and planned developments have on waterbodies and the aquatic resources therein?
AEEPDC-2	What effects could air emissions from existing and approved developments, the Project and planned developments have on soils?
AEEPDC-3	What effects could air emissions from existing and approved developments, the Project and planned developments have on terrestrial vegetation and wetlands?
AEEPDC-4	What effects could air emissions from existing and approved developments, the Project and planned developments have on wildlife and wildlife habitat?
Air Quality	
AQPDC-1	What effects could the existing and approved developments, the Project and planned developments have on ambient air quality in the region?
AQPDC-2	What effects could existing and approved developments, the Project and planned developments have on the deposition of acid-forming compounds in the region?
Human Health	
HHPDC-1	What are the risks of adverse human health effects from short-term (acute) exposure to air emissions from existing and approved developments, the Project and planned developments?
HHPDC-2	What are the risks of adverse human health effects from long-term (chronic) exposure to air emissions and water releases from existing and approved developments, the Project and planned developments?
Hydrogeology	
HGPDC-1	What effects could existing and approved developments, the Project and planned developments have on groundwater quantities, levels and flow patterns?
HGPDC-2	What effects could existing and approved developments, the Project and planned developments have on groundwater quality?

Table 4.2-2 Summary of Key Questions for the Project: Planned Development Case (continued)

Number	Key Question
Hydrology	
HPDC-1	What effects could existing and approved developments, the Project and planned developments have on open water areas, flows and water levels in receiving and nearby waterbodies?
HPDC-2	What effects could existing and approved developments, the Project and planned developments have on the geomorphic conditions of watercourses and the concentration of suspended sediments in the watersheds and drainage systems?
Water Quality	
WQPDC-1	What effects could existing and approved developments, the Project and planned developments have on surface water quality?
Fish and Fish Habitat	
FPDC-1	What effects could existing and approved developments, the Project and planned developments have on fish habitat?
FPDC-2	What effects could existing and approved developments, the Project and planned developments have on fish health?
FPDC-3	What effects could existing and approved developments, the Project and planned developments have on fish abundance?
FPDC-4	What effects could existing and approved developments, the Project and planned developments have on fish and fish habitat diversity?
Terrestrial	
TRPDC-1	What effects could existing and approved developments, the Project and planned developments have on the quantity of soil and terrain and soil quality/capability?
TRPDC-2	What effects could existing and approved developments, the Project and planned developments have on terrestrial vegetation and wetlands?
TRPDC-3	What effects could existing and approved developments, the Project and planned developments have on wildlife abundance and habitat?
Historical Resources	
HRPDC-1	What effects could existing and approved developments, the Project and planned developments have on historical resources?
Resource Use	
RUPDC-1	What effects could existing and approved developments, the Project, and planned developments have on environmentally important areas?
RUPDC-2	What effects could existing and approved developments, the Project and planned developments have on natural resource use and users?
Socio-Economic	
SEPDC-1	What effects could existing and approved developments, the Project and planned developments have on socio-economics in the study area?
Traditional Land Use	
TLUPDC	What effects could existing and approved developments, the Project and planned developments have on traditional land uses?
Visual Resources	
VRPDC-1	What effects could existing and approved developments, the Project and planned developments have on visual resources?

4.3 SPATIAL CONSIDERATIONS

The disturbance footprint for the Project, including the existing and approved CLRP disturbances, is shown in Figure 1-2.

The main access route to MEG's lease is by the road that intersects Highway 881 about 15 km northwest of the CLRP site. MEG purchased this road from AltaGas, and the road has been renamed the MEG road. MEG has recently purchased an all-weather road from EnCana which services the eastern leases that are included in the Project.

The total area for all the components of the Project, including two plants, wellpads, camps, all potential borrow pits, access roads, utility corridors and pipelines is estimated to be 2,028 ha, which includes 310 ha of existing disturbance.

Study areas for the Project EIA were determined with consideration of the specific component of the EIA. The spatial approach defined for a component generally includes a Local Study Area (LSA) and a Regional Study Area (RSA). The LSA is used to focus on and evaluate areas that may be directly effected by the Project development. The RSA is generally used to evaluate the effects of the Project in the larger geographic and ecological contexts. The spatial extent of the EIA component study areas, as shown in Figures 4.3-1 and 4.3-2, are described below, with additional details in the relevant EIA component sections.

4.3.1 Air

As part of the dispersion modelling process, the spatial extent of the effects of the Project on ambient air quality determines the region over which modelling is conducted. Three regions defining this spatial extent were included in the assessment. These were defined as follows:

- The modelling domain defines the region within which emission sources were quantified and air quality predictions were performed. The modelling domain chosen for the air quality assessment extends north of the Athabasca Oil Sands Region, south of Cold Lake, east into Saskatchewan and west to Ranges 22 and 23. It is large enough to encompass the effects related to air emissions from the oil sands developments in the region. The modelling domain includes key communities in Alberta and Saskatchewan.
- The RSA defines the region over which modelling results are presented and is typically smaller than the modelling domain. The RSA was sized to meet the requirements of the Project TOR (AENV 2008). The air

quality RSA for the Project is defined by a 110 by 120 km area, shown in Figure 4.3-1. This area is sufficiently large to ensure that the 0.17 keq/ha/yr PAI isopleth was within it, as per the Project TOR. The RSA is also large enough to capture the air quality effects associated with the Project. The RSA extends into the province of Saskatchewan to ensure that any potential air quality effects near the Alberta/Saskatchewan border are clearly shown.

- The LSA defines the area in the immediate vicinity of the Project where the majority of air quality effects are expected to occur. The LSA represents a subset of the RSA and allows a more focused assessment of the effects associated with the Project. The LSA was sized to meet the AENV Air Quality Model Guideline requirements for study areas (AENV 2003). The LSA (shown in Figure 4.3-2) is defined by an area of approximately 30 by 30 km, encompassing the Project area.

One of the aims of the air quality evaluation is to put the potential effects into perspective for regional stakeholders. To facilitate this, maximum air quality concentrations were predicted for each of the receptors indicated in Table 4.3-1. This list includes one community and two locations in Alberta that are of importance to First Nations groups. These represent the primary population centres in or near the region that could potentially experience increased concentrations due to the Project. In addition, concentrations were predicted at two cabins, the Operator's Residence, the Christina Lake Lodge and along the Project maximum property boundary where persons could experience prolonged exposure to air emissions. For the purpose of this assessment, these eight receptors are referred to as the selected receptors. The relative locations of the selected receptors with respect to the Project are indicated in Table 4.3-1.

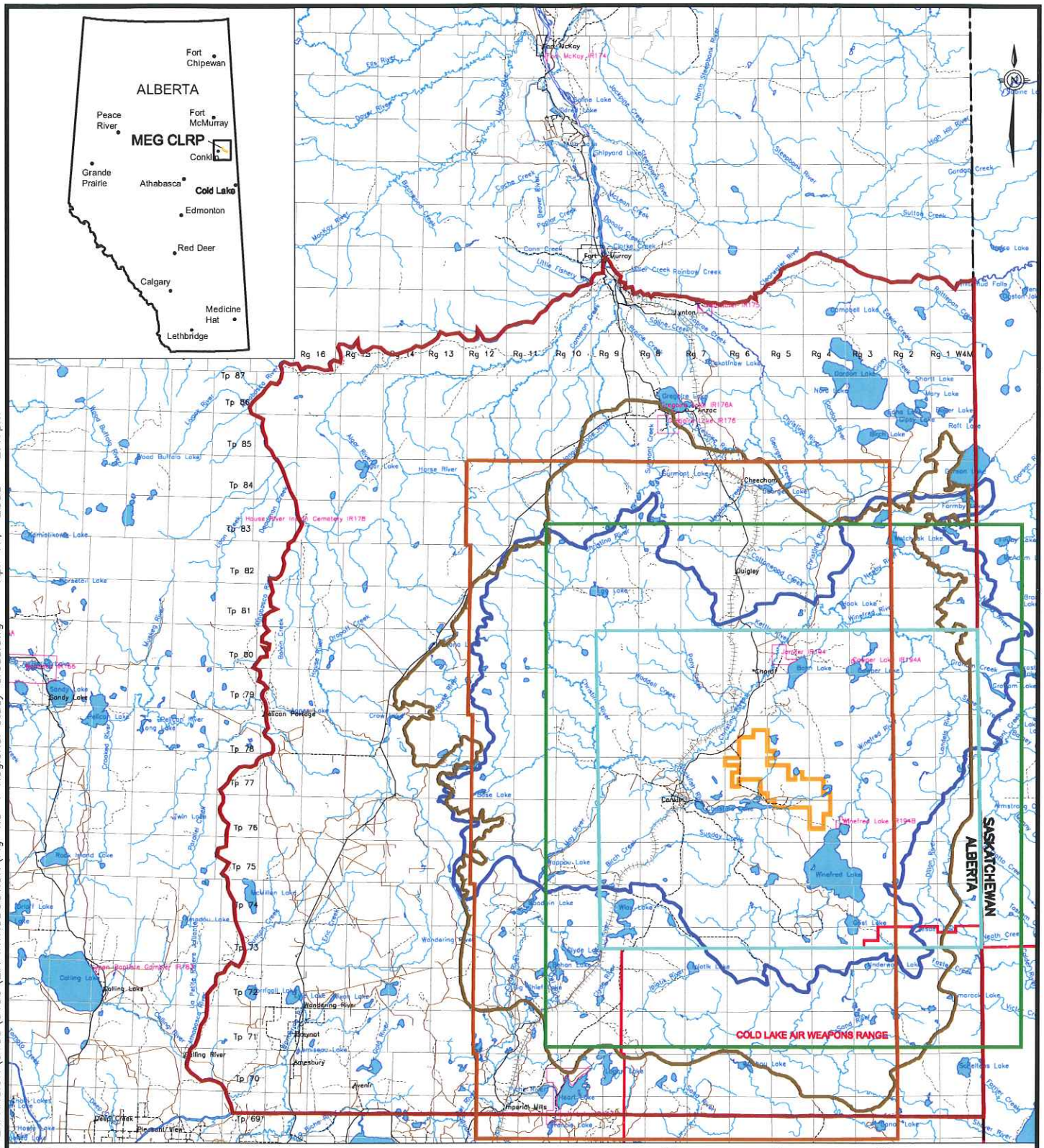
Table 4.3-1 Selected Receptors Included in the Air Quality Assessment

Receptors	Location[a]	
	Distance [km]	Direction
Conklin	24	W
Janvier/Chard (IR 194)	28	N
Winefred Lake (IR 194B)	15	SE
Hunter/Trapper A	6	SW
Hunter/Trapper B	12	NNW
Operator's Residence	4	SSW
Christina Lake Lodge	19	WSW
Maximum Property Boundary	n/a [b]	n/a [b]

[a] Distance and direction are relative to the Phase 2 Central Plant.

[b] Maximum Property Boundary Receptors are spaced 20 m apart around Plants 3A, 3B and the Central Plant.

n/a = Not applicable.



LEGEND

- ROAD
- RAILWAY
- RIVER
- OPEN WATER
- INDIAN RESERVE
- COLD LAKE AIR WEAPONS RANGE
- MEG LEASE BOUNDARY
- TERRESTRIAL RESOURCES REGIONAL STUDY AREA
- AQUATIC RESOURCES REGIONAL STUDY AREA
- HYDROGEOLOGY REGIONAL STUDY AREA
- AIR REGIONAL STUDY AREA
- RESOURCE USE REGIONAL STUDY AREA
- HISTORICAL RESOURCES REGIONAL STUDY AREA

25 0 25
SCALE KILOMETRES

NOTE

* Also known as the Hamlet of Janvier

REFERENCE

ALBERTA NTDB DIGITAL DATA OBTAINED FROM GEOMATICS CANADA, AUGUST 2001. DATUM: NAD 83 PROJECTION: UTM ZONE 12

PROJECT

CHRISTINA LAKE REGIONAL PROJECT - PHASE 3

TITLE

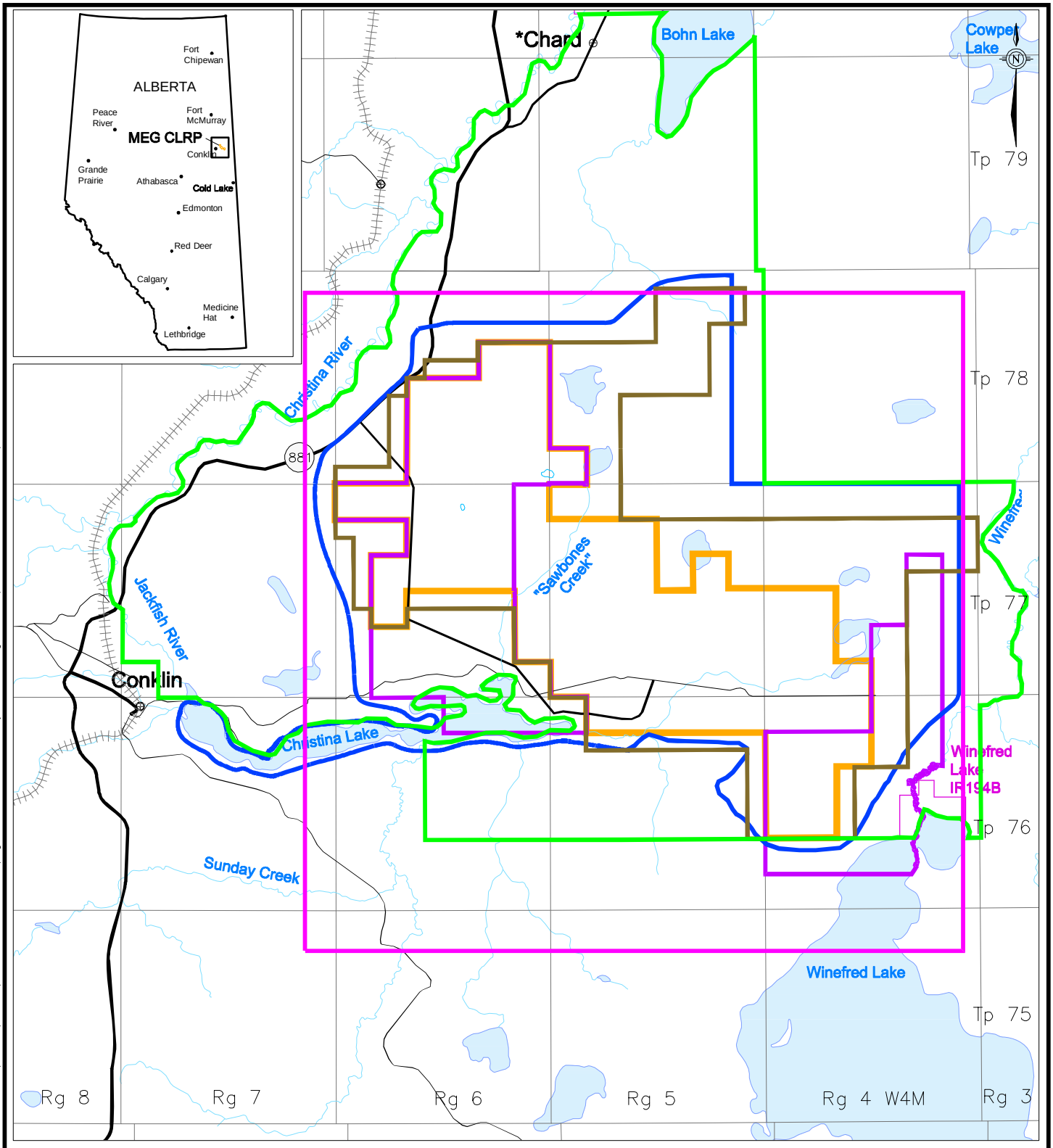
REGIONAL STUDY AREAS

MEG ENERGY CORP.

PROJ	07.1346.0009.5100		FILE No.	RSA areas
DESIGN	DD	07/01/08	SCALE AS SHOWN	REV. 0
CADD	TRE	17/04/08		
CHECK	RC	17/04/08		
REVIEW	IGG	17/04/08		

FIGURE: 4.3-1

L:\2007\1346 Oil Sands\07-1346-0009-MEG EXPANSION\5100\5190\EIA INTRODUCTION\Fig 4.3-1 Regional study areas.dwg Apr 17, 2008 - 2:47pm



LEGEND

- ROAD
- RAILWAY
- RIVER
- OPEN WATER
- INDIAN RESERVE
- MEG LEASE BOUNDARY
- HISTORICAL RESOURCES LOCAL STUDY AREA
- AQUATIC RESOURCES LOCAL STUDY AREA
- TRADITIONAL LOCAL STUDY AREA
- TERRESTRIAL RESOURCES LOCAL STUDY AREA
- AIR LOCAL STUDY AREA

5 0 5
SCALE 1:250,000 KILOMETRES

NOTE

* Also known as the Hamlet of Janvier
Unnamed watercourse locally known as "Sawbones Creek"

REFERENCE

ALBERTA NTDB DIGITAL DATA OBTAINED FROM GEOMATICS CANADA, AUGUST 2001.
DATUM: NAD 83 PROJECTION: UTM ZONE 12

PROJECT

CHRISTINA LAKE REGIONAL PROJECT - PHASE 3

TITLE

LOCAL STUDY AREAS

MEG ENERGY CORP.

PROJ	07.1346.0009.5100		FILE No.	LSA Areas
DESIGN	RC	07/01/08	SCALE AS SHOWN	REV. 0
CADD	TRE	17/04/08		
CHECK	RC	17/04/08		
REVIEW	IGG	17/04/08		

FIGURE: 4.3-2

L:\2007\1346 Oil Sands\07-1346-0009-MEG EXPANSION\5100\5190\EIA INTRODUCTION\Fig 4.3-2_Local Study Areas.dwg Apr 17, 2008 - 2:50pm

The effects of the Project were also evaluated in Saskatchewan due to its proximity. A receptor was placed at La Loche since it is one of the largest communities in Saskatchewan and is close to the Alberta-Saskatchewan border and to the Project. La Loche is located approximately 120 km NE of the Project.

4.3.2 Noise

The assessment and regulation of noise from energy projects in Alberta is the responsibility of the ERCB, which regulates noise from a receptor perspective. Noise-sensitive receptors are considered to be any permanent residences or seasonally occupied dwellings used at least six weeks out of the year outside the plant or project boundary that may be affected by the Project.

For the assessment of the noise resulting from the Project, six noise receptors were considered. Location details are provided in Table 4.3-2.

Table 4.3-2 Location of Receptors Included in the Noise Assessment

Location	Easting [m]	Northing [m]
Conklin	494494	6164871
Winefred Lake (IR 194B)	531603	6160262
Hunter/Trapper Cabin A (Gary York's cabin)	514296	6164497
Hunter/Trapper Cabin B (Fred Black's cabin)	514145	6180245
Operator's Residence	513258	6164571
Christina Lake Lodge	499711	6163283

In addition to the discrete noise receptors identified in the Table 4.3-2, noise levels were also determined over the LSA for each location assessed. Using the remote area 1.5 km criteria established in Directive 038, the LSA was defined to assess the propagation of noise from the Project. The noise LSA boundary for this Project is defined by a rectangle 39 by 28 km in size. The LSA was chosen to encompass all potential noise effects of the Project. It encompasses the noise-sensitive receptors, the Project area and the ERCB 1.5 km criteria boundary. The ERCB 1.5 km criteria boundary is measured 1.5 km from the Project area boundary. The noise-sensitive receptors, potential receptors, Project area, 1.5 km ERCB criteria boundary and LSA used for the Project are shown in Figure 4.3-2. A RSA is not defined for noise since noise attenuates with distance and it is expected to attenuate to background level within the defined LSA.

4.3.3 Human Health

The Human Health Risk Assessment (HHRA) for the Project focused on potential health risks to people in the:

- Regional Study Area: The area over which potential health risks were assessed (Figure 4.3-1). The RSA for the HHRA corresponds to the Air Quality RSA (Figure 4.3-1) which encompasses a 110 by 120 km area. The RSA extends into Saskatchewan to ensure that potential risks to Saskatchewan residents were considered and understood.
- Local Study Area: The area in the immediate vicinity of the Project where the majority of the potential health risks are expected to occur (Figure 4.3-2). The LSA for the HHRA corresponds to the Air Quality LSA (4.3-2) which is defined by an area of approximately 30 by 30 km, encompassing the Project area.

4.3.4 Air Emission Effects

The terrestrial resources portion of the Air Emission Effects assessment used the terrestrial resources RSA (Figure 4.3-1). Typically, the terrestrial air study area for oil sands EIAs has been based on the farthest measurable extent of emission species potentially affecting terrestrial ecological receptors for the PDC. However, in this assessment, these areas are so small that a study was not warranted. Volume 3, Sections 4.4, 4.5 and 4.6 describe the extent of deposition and ground-level concentrations of emission species relating to terrestrial resources.

The aquatic resources portion of the Air Emission Effects assessment focuses on the effects of air emissions from the Project and regional developments on lakes in the air quality modelling domain, as described in Volume 3, Section 1.2.8, and streams located within the Aquatics LSA as described in Volume 4, Section 2.2.2. The effects of acid deposition on surface waters over the entire modelling domain were considered to maximize the spatial coverage of the assessment and to consider all lakes included in similar assessments conducted recently. This area includes the entire Oil Sands Region and extends into western Saskatchewan.

4.3.5 Aquatic Resources

The geographic area selected for the aquatics component assessment consists of the RSA, which contains a smaller LSA and the Project area where immediate effects may occur.

The RSA for this study was defined on the basis of potential effects of construction and operation of the Project on groundwater quantity and quality, on flows and water levels in regional rivers and lakes (including surface water/groundwater interactions) and on waterbodies supporting fish populations.

The Aquatic Resources RSA, shown in Figure 4.3-1, includes the following major watersheds and lakes:

- Winefred River watershed (drainage area of 4,274 km^2): The Winefred River originates from Grist Lake, and drains north before discharging to the Christina River about 40 km north of the Project site.
- Christina River watershed upstream from the confluence of the Christina River and the Winefred River (drainage area of 5,671 km^2): The Christina River originates from the Stony Mountain Wildland and flows south before turning north near Chard and discharging into the Clearwater River about 120 km north of the Project site.
- Christina Lake (surface area of 21 km^2 and drainage area of 1,286 km^2): Christina Lake discharges to the Jackfish River, which discharges into the Christina River about 8 km northwest of the Christina Lake outlet.
- Winefred Lake (surface area of 127 km^2 and drainage area of 1,205 km^2): Winefred Lake originates from Grist Lake and other small tributaries originating from south and southwest. Winefred Lake discharges to the Winefred River, which flows northeast.

The total area of the RSA is about 9,950 km^2. Most of the RSA lies within Alberta, with about 3% extending into Saskatchewan within the Winefred River watershed. The Winefred River watershed within the RSA encompasses several regionally important lakes and groundwater resources.

Hydrogeology RSA

The RSA for the hydrogeology assessment was defined primarily on the basis of interpreted regional geology and groundwater flow patterns and was selected to be of adequate aerial extent to simulate cumulative effects of groundwater withdrawal and wastewater disposal (Figure 4.3-1). The extent of the RSA is defined by the following:

- *North* – the Clearwater River, extending from the Saskatchewan border to the confluence of the Athabasca River and the eastward flowing section of the Athabasca River to the confluence of the Clearwater River;

- *East* – the Saskatchewan border extending from the centre of Township 69 to the Clearwater River;
- *South* – the centre of Township 69 extending from the Saskatchewan border to the Athabasca River; and
- *West* – the northerly flowing portion of the Athabasca River, extending from the centre of Township 69 to Township 87.

The Aquatic Resources LSA was selected based on the Project lease area, local drainage basins and the requirements of aquatics components including water quality, hydrology, and fish and fish habitat. The LSA was delineated mostly by watershed boundaries of waterbodies and watercourses that may be directly or indirectly affected by the Project. In some cases, the LSA crosses watershed boundaries. In such cases, the LSA boundary was set sufficiently far away from the Project such that direct Project effects beyond the boundary were projected to be negligible.

The LSA has a total drainage area of 502 km^2 and consists of the six sub-basins shown in Figure 4.3-2. Two of the sub-basins drain into Christina Lake, one from the north and one from the east. The other three sub-basins drain either to the Christina River or Winefred River systems. The sixth sub-basin flows to the Jackfish River in the west. These sub-basins are illustrated with drainage arrows to show the general direction of surface flow in Volume 4, Appendix 4-III, Figure 2.

The LSA has undulating terrain with extensive low-lying wetlands areas. The maximum elevation difference in the LSA is about 71 m, ranging from 554 masl at Christina Lake to 625 masl in the north sub-basin. The average elevation of the LSA is approximately 580 masl.

Hydrogeology LSA

The Hydrogeology LSA was selected based on the Project lease area, the availability of detailed local geologic data, and the anticipated aereal extent of potential Project effects of groundwater withdrawal from the Quaternary Aquifers.

The LSA covers a 10.5 township (10,500 km^2) rectangular area and extends from Township 76, Range 4 W4M to Township 78, Range 7 W4M (Figure 4.3-2). Potential effects to groundwater quantity are most likely to occur within the LSA as this area contains the water supply, and disposal wells. In addition, Project effects related to groundwater quality may occur within the LSA as this area contains the Project facilities including Plant 3A, Plant 3B and the wellpads.

4.3.6 Terrestrial Resources

The RSA was established to assess the importance of the Project within the broader regional area (Figure 4.3-1). The Terrestrial Resources RSA covers an area of 1,538,591 ha and is situated primarily within the Central Mixedwood and Lower Boreal Highlands and natural subregions (Natural Regions Committee 2006). The RSA boundary was defined with consideration of the following parameters:

- ecodistrict and/or vegetation classification boundaries;
- geographic areas such as the northeastern shoulder of the Stony Mountain;
- defined woodland caribou habitat areas (e.g., Christina Caribou areas);
- one female woodland caribou home range diameter (30 km; Stuart-Smith et al. 1997); and
- the average size of two moose home range diameters (22 km; Hauge and Keith 1981).

The regional vegetation is represented by a mix of wetlands in poorly drained areas, surrounded by terrestrial vegetation. Typical terrestrial communities are dominated by pure or mixed stands of aspen and white spruce, with minor inclusions of balsam poplar and/or white birch. On drier sites with coarse-textured soils, jack pine forms the dominant tree species in the tree canopy. Poorly drained areas of the regional landscape are characterized by a diverse array of forested and non-forested wetlands types. These include peatlands such as black spruce and tamarack-dominated bogs and fens, as well as non-peatland marshes and swamps. Groundwater characteristics vary considerably among these wetlands types, resulting in considerable differences in plant species composition and structure. Fire has also been a prevalent form of natural disturbance throughout the area and as a result, many parts of the RSA are characterized by young forests that have regenerated following fire.

Landforms in the subregion are comprised predominantly of ground moraine and hummocky moraine, interspersed with some areas of aeolian dunes, sandy outwash plains and glaciolacustrine plains (Natural Regions Committee 2006). Post-glacial organic deposits overlay glacial and post-glacial mineral deposits in some areas. Overall, the terrain has low relief and a level to undulating surface. Dominant soil orders in this region include Organic, Gray Luvisolic, Brunisolic and Gleysolic.

The LSA was established to assess the effects of the Project at the local scale. It falls completely within the Central Mixedwood Natural Subregion (Natural Regions Committee 2006) and the following townships:

- Township 76, Ranges 4 to 5, W4M;
- Township 77, Ranges 4 to 6, W4M; and
- Township 78, Ranges 5 to 6, W4M.

The extent of the LSA was defined on the basis of the Project footprint plus a buffer zone of at least 500 m including all areas within the lease. In cases where the buffer boundary transected a waterbody, the boundary was adjusted to include the entire waterbody as part of the LSA. In total, the LSA encompasses 34,362 ha, with the majority of the area being comprised of wetlands vegetation (55%), followed by terrestrial vegetation (27%) and burns (6%). The remainder of the LSA is associated with non-vegetated classes such as waterbodies and disturbances.

The LSA is within the Hummocky Moraine ecodistrict, Eastern Alberta Plains Region, Mostoose Hills Upland Section and Mostoose Upland District. The LSA is characterized as having generally subdued relief and nearly level to slightly hummocky topography on glaciofluvial over moraine surficial material. Elevations within the Eastern Plains Region range from approximately 500 to 800 masl. The lowland areas are dominated by peatlands (fens and bogs). Microrelief is generally undulating throughout the LSA (1 to 3 m height). Overall, the slopes in the LSA range from 0.5% on the peatlands to less than 10% in the morainal areas, although some steeper slopes were encountered.

4.3.7 Socio-Economics

The Socio-Economics RSA is the geographic area within which the Project could potentially have socio-economic effects. The RSA for this Socio-Economics Assessment is made up of the following administrative units:

- Rural Municipality of Wood Buffalo (RMWB);
- Lac La Biche County (formerly Lakeland County and Lac La Biche);
- the Beaver Lake First Nation's Beaver Lake reserve;
- the Fort McMurray First Nation's (FMFN) reserves 176 and 176a (reported as Gregoire Lake IR 176 and Gregoire Lake IR 176a by Statistics Canada);
- the town of Bonnyville; and

- the city of Cold Lake.

The Socio-Economics LSA is made up of those communities nearest to the Project, which are likely to experience more and/or stronger effects than will be seen more broadly across the RSA. The communities nearest to the Project are:

- the hamlet of Conklin;
- the hamlet of Chard (also known as the Hamlet of Janvier);
- Chipewyan Prairie Dene First Nation (CPDFN) reserve (reported as Janvier IR 194, by statistics Canada);
- the town of Lac La Biche; and
- two of the three Heart Lake First Nation (HLFN) reserves (Heart Lake IR 167 and Heart Lake IR 167A).

4.3.8 Traditional Land Use

The TLU RSA is based on the Terrestrial Resources RSA and is shown in Figure 4.3-2. Traditional land use areas primarily include land that is used to collect traditional resources including hunted game and harvested berries or medicinal plants. It also includes areas of spiritual or historical significance based on oral tradition. The Terrestrial Resources RSA considers potential effects on wildlife and vegetation which are important components of traditional land use activities.

The LSA includes the six Registered Fur Management Areas (RFMAs) (also referred to as "traplines") that may be affected by the Project. The six RFMAs include:

- RFMA #1326, registered to Gary York;
- RFMA #1595, registered to Connie Down-Cicoria;
- RFMA #2313, registered to Don Thom;
- RFMA #1544, registered to Fred Black;
- RFMA #615, registered to Stuart Janvier; and
- RFMA #933, registered to Harry Janvier.

From the perspective of evaluation of TLU, RFMAs provide an appropriate basis for defining a LSA, since many traditional activities in this area are carried out within RFMAs.

4.3.9 Historical Resources

The Historical Resources RSA covers an area of 1,519,300 ha or 180 townships surrounding the Project. It extends from a western boundary of Range 12 to the eastern edge of Range 3, W4M. The southern boundary of Township 69 forms the southern boundary of the RSA, while the northern boundary of Township 84 forms the northern boundary. The RSA includes all or portions of 89 archaeological national registry (Borden) blocks identified in Alberta.

The Historical Resources LSA includes 35 sections of land over an area of 98,695 ha including: Sections 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 23, and 24-78-6 W4M; Section 6-78-5 W4M; Sections 17, 20, 21, 22, 23, 26, 27, 28, 31, 32, 33, 34 and 35-77-6 W4M; and Sections 17, 18, 19, 20, 28, 29 and 30-76-4 W4M. The initial configuration of the areas to be examined during the field component was established by MEG and Alberta Tourism, Parks Recreation and Culture (ATPRC) in their review of the application for the permit to conduct these studies.

4.3.10 Resource Use

Two areas have been delineated to facilitate Resource Use data collection and presentation; the RSA and the LSA. The RSA encompasses resources that are potentially affected by the Project both directly and indirectly. The LSA encompasses resources that are potentially directly affected by the Project. For this assessment, the Resource Use LSA has been determined to be the same boundary as the Terrestrial Resources LSA (Figure 4.3-2). In total, the LSA encompasses 34,362 ha.

Where applicable, study areas from other components were used to facilitate the transfer of data for environmental setting and analysis purposes. Table 4.3-3 summarizes the study areas used for the Resource Use assessment are summarized in Table 4.3-3 and depicted in Figures 4.3-1 and 4.3-2.

Table 4.3-3 Study Areas Used in the Resource Use Assessment

Resources	Local Study Area	Regional Study Area
aggregate resources	resource use	resource use
agriculture	resource use	resource use
berry picking	resource use	terrestrial resources
forestry	resource use	terrestrial resources
fishing	aquatic resources	aquatic resources
hunting and trapping	resource use	terrestrial resources
non-consumptive recreation	resource use	resource use
protected areas and ESAs	resource use	resource use

4.3.11 Visual Resources

One study area, the Visual Resources RSA, was identified for the assessment of potential effects on visual resources. The RSA includes all areas within 20 km of the Project and is 282,578 ha. Areas beyond 20 km from the Project are likely to have limited or obstructed views of the Project due to distance, topography, atmospheric conditions and vegetation.

4.4 TEMPORAL CONSIDERATIONS

The temporal considerations for the EIA are based on the Project Description (Volume 1, Sections 1 and 3) and include unique conditions that may affect environmental components differently. The schedule for the Project is detailed in Volume 1, Section 1.2.7.

Construction of the Project is proposed to occur in two phases. Phase 3A is anticipated to begin construction in 2010, with initial steam injection in 2012. Phase 3B is anticipated to begin construction in 2012, with initial steam injection in 2014. The operational life of each plant is expected to be 25 years. Total production from the two new plants will produce an incremental 150,000 bpd of bitumen (approximately 23,800 cubic metres per day). It is anticipated that reclamation of the Project will be complete by 2044.

The main Project phases include construction, operations and reclamation. For most components, impact analyses considered construction and operations together. Construction is discussed separately, where that activity adds a measurable, short-term change to the component under consideration (e.g., the influence of the initial construction vehicles on air emissions).

Some EIA components, particularly the terrestrial components, examine the Project under three temporal conditions: construction, operation and reclamation activities. Although there will be some sequencing of both the removal and reclamation of terrestrial systems, this sequential development and reclamation process is not considered in the assessments. Assessments consider either that everything is undeveloped, developed or reclaimed. This is a conservative approach so that effects are not underestimated.

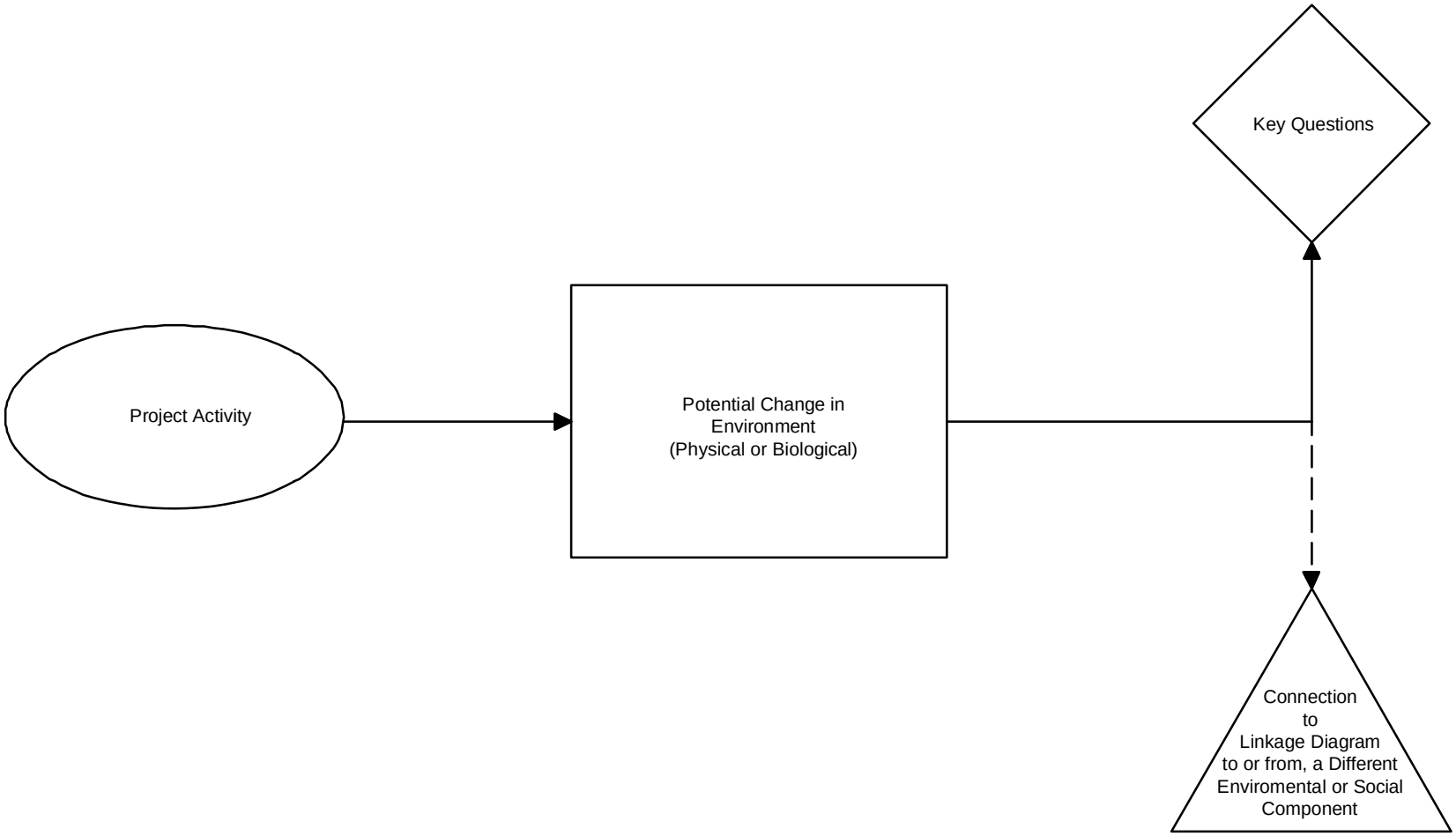
4.5 LINKAGE DIAGRAMS

The purpose of the EIA is to examine the relationships between the Project and its potential effects on human and natural environments. These relationships are defined in terms of linkage diagrams and revealed in the impact analyses. Linkage diagrams provide a means of defining the interaction between project activities, potential environmental change and the analysis of the key questions. The analysis of this interaction allows for assessment of effects in a broader ecological context.

Linkage diagrams are used to clearly describe how project activities could potentially lead to environmental changes, which in turn could affect specific components of the environment. Figure 5.5-1 illustrates the general format of the linkage diagrams. Symbols on the linkage diagrams include:

- ovals (project activities);
- rectangles (potential changes in the environment);
- diamonds (key questions); and
- triangles (connection to or from a different environmental or social component).

These diagrams are used as tools to guide the impact analysis, which addresses each link on the linkage diagram. They also show how the different environmental and social components are inter-related. The potential linkages between activities and impacts are evaluated to determine whether they apply to the Project.



PROJECT

CHRISTINA LAKE REGIONAL PROJECT - PHASE 3

TITLE

KEY TO LINKAGE DIAGRAMS

MEG ENERGY CORP.

PROJ	07.1346.0009.5100		FILE No.	Key
DESIGN	AG	22/01/08	SCALE AS SHOWN	REV. 0
CADD	TRE	17/04/08	**FIGURE: 4.5-1**	
CHECK	RC	17/04/08		
REVIEW	IGG	17/04/08		

The EIA considers each link on the component linkage diagram, with the analyses consisting of four main steps:

- identification of Project activities that could contribute to environmental change;
- analysis of potential linkages;
- analysis and classification of impacts; and
- identification and description of mitigation measures and monitoring for potential residual impacts.

When this evaluation indicates a potential impact, the linkage is ruled valid for assessment. When the evaluation does not indicate a potential impact, the linkage is ruled invalid for the Project and is not assessed for the EIA.

4.6 KEY INDICATOR RESOURCES

The linkage diagram analyses may also include consideration of Key Indicator Resources (KIRs) that provide definable assessment and measurement end points for some environmental components. These KIRs are representative species and/or communities that allow for a focused examination of the ways the Project may result in changes to the environment in terms of issues of importance to the species or communities.

Key Indicator Resources are the environmental attributes or components identified as having legal, scientific, cultural, economic or aesthetic value. The selection of KIRs is based on a process defined in detail by Golder (1999b) and a process used by the Cumulative Environmental Management Association (CEMA) (CEMA 2001). The Key Indicator Priority list of 2001 was revised in 2006 to focus more on ecosystem processes (CEMA 2006). In general, KIRs were selected based on:

- species presence/absence and abundance as determined during baseline surveys and/or historical studies;
- importance as a traditional resource;
- Cumulative Environmental Management Association indicator species or guild;
- Regional Aquatics Monitoring Program (RAMP) sentinel species (for aquatic resources);
- representation of sport, non-sport and forage species; and

- species status provincially or federally (e.g., ASRD 2006; COSEWIC 2007).

The identification of KIRs is not universal throughout the EIA. Some components assess all relevant attributes (e.g., air quality looks at the effects of all relevant emissions related to the Project; the socio-economics assessment looks at key indicators for those aspects of the human environment that are directly affected by the Project and oil sands projects in general).

Table 4.6-1 provides a summary of the KIRs selected for the Project.

Table 4.6-1 Key Indicator Resources and Rationale for Selection

Resource	KIRs		Rationale
Aquatic Resources	**Waterbodies**		
	Christina Lake, Unnamed Waterbodies WB2 and WB6, WB12	walleye northern pike Arctic grayling brook stickleback (forage fish) benthic invertebrates	traditional resource, historical documentation, listed species
		northern pike benthic invertebrates	fish species captured during spring and/or late summer surveys, traditional resource
		northern pike brook stickleback (forage fish) benthic invertebrates	fish species captured during spring and/or late summer surveys, traditional resource
	Unnamed Waterbodies, WB11 and WB13	brook stickleback (forage fish) benthic invertebrates	brook stickleback were the only fish species captured during spring and/or late summer surveys
	Unnamed Waterbodies WB5, WB7, WB8, WB9, WB15 and WB16	benthic invertebrates	
	Watercourses		
	Unnamed Tributary to the north bay of Christina Lake ("Sawbones Creek")	walleye northern pike brook stickleback (forage fish) benthic invertebrates	fish species captured or observed during spring and/or late summer surveys, historical documentation, traditional resource
	Unnamed Tributary to the east shore of Christina Lake	white sucker brook stickleback (forage fish) benthic invertebrates	fish species captured during spring and/or late summer surveys
	Unnamed Tributaries to the Christina River	benthic invertebrates	no fish captured during spring and/or late summer surveys, no historical documentation of captured fish species

Table 4.6-1 Key Indicator Resources and Rationale for Selection (continued)

Resource	KIRs	Rationale
Terrestrial Vegetation and Wetlands	lichen jack pine (a1) communities	caribou habitat communities with restricted spatial distributions
	riparian communities	highly productive areas with high rare plant potential; form important wildlife habitat and corridor areas
	old growth forests	mature forest within the boreal forest with restricted distribution because of the fire regime
	peatlands (bogs and fens)	important boreal forest ecosystems that cannot be reclaimed because of the complex interrelated hydrological, chemical and biotic conditions
	patterned fens	rare wetlands type with high rare plant potential; susceptible to physical disturbance; communities with restricted spatial distributions
	rare and special plant communities	plant communities with restricted spatial distributions
	productive forests	important to the forest industry
	rare plants	federally and/or provincially recognized plants with restricted spatial, ecological and temporal distributions
	traditional plants	plants traditionally used by Aboriginal peoples for food, medicine or spiritual purposes
Wildlife	woodland caribou	CEMA Sustainable Ecosystems Working Group (SEWG) environmental indicator, ecological importance(prey species), ease of monitoring, traditional importance, abundant information
	moose	CEMA SEWG environmental indicator, economic importance, recreational importance, ecological importance (primary prey species), ease of monitoring, traditional importance, abundant information
	Canada lynx	provincial status, ecological importance (carnivore, predator/prey relationship), traditional and economic importance
	black bear	traditional importance, ecological importance (carnivore), CEMA SEWG environmental indicator
	fisher	provincial status, ecological importance (carnivore), traditional and economic importance, CEMA SEWG environmental indicator
	beaver	traditional and economic importance, ecological importance (keystone species)
	barred owl	ecological importance (carnivore), provincial status, member of the CEMA SEWG environmental indicator bird community, old growth forest birds
	black-throated green warbler	provincial status, member of the CEMA SEWG environmental indicator bird community, old growth forest birds
	yellow rail	federal status, representative of the marsh bird community, riparian health indicator
	Canadian toad	provincial status, riparian health indicator

Table 4.6-1 Key Indicator Resources and Rationale for Selection (continued)

Resource	KIRs	Rationale
Socio-economics	employment	address different aspects of people's lives, including people as economic and social beings
	income	
	population change	
	services and infrastructure	
	provincial corporate tax and resource royalty income	traces the taxation consequences of the MEG Project
	federal corporate tax income	
Resource Use	aggregates	limited resource, high demand
	agriculture	commercial use, high importance
	berry picking	traditional subsistence and recreational importance
	environmentally important areas	designated as protected or environmentally important areas, recreational importance
	fishing	recreational importance
	forestry	economic importance
	hunting and trapping	economic and recreation importance, trapping is of importance to community subsistence
	land use policies	development requirements and guidelines
	recreation	recreational importance
	traditional use	subsistence and recreational importance
	visual resources	aesthetic importance

4.7 IMPACT ANALYSES

Impact analyses focus on assessment of potential changes to receptors within the environment due to the construction, operation and reclamation of the Project. Not all key questions used in the Project result in completion of an impact assessment, because the answer to the question may be information on environmental change that passes to another component where the effect on receptors is evaluated and an impact analyses completed.

The impact analysis includes validation of causal linkages between particular Project activities and potential environmental impacts, as described in Section 4.5. These potential linkages between Project activities and environmental change were considered for each EIA component. Where the changes in an environmental component are effected by changes in another environmental component, the linkages are represented as triangles (Figure 4.5-1). Sub-headings are provided for each link on the linkage diagram. Within each of the sub-headings, the potential for the Project to result in an environmental change is determined and the link is classified as valid or invalid.

The process of evaluating potential effects of the Project on receptors may result in the identification of opportunities for project re-design to eliminate or minimize a potential effect. This iterative process is an integral component of the

project design engineering team working with those completing environmental and social impact assessments. Through this process, many potential effects of the Project were eliminated during the process of designing the Project.

Validation of the link includes consideration of the mitigation measures. Mitigation, within the context of this EIA, is defined as follows: "the application of design, construction or scheduling principles to minimize or eliminate potential adverse impacts and, where possible, enhance environmental quality" (Sadar 1994). For certain activities, ongoing mitigation (e.g., changes in operating practices) can minimize or eliminate physical or chemical stresses, thereby rendering invalid the link between a Project activity and an environmental change.

If a link between a Project activity and an environmental change is considered valid, the key question under consideration is examined. Where the environmental component has defined KIRs, the impacts on each KIR are evaluated separately.

Quantitative methods of assessment are used where possible. Predictive modelling is used as a tool in the Air Quality, Hydrogeology, Hydrology, Water Quality, Fish and Fish Habitat, and Wildlife and Wildlife Habitat Assessments. Risk assessment techniques are used to assess impacts to human and wildlife health. Geographic Information Systems (GIS) were used to help develop qualitative measures to assess impacts on terrestrial resources and resource use. The detailed assessment techniques are described in the EIA component sections.

4.8 IMPACT DESCRIPTION CRITERIA

The environmental and socio-economic impacts are assessed in terms of quantitative impact criteria that are defined in this section of the EIA. These impact criteria are based on attributes such as direction, magnitude, geographic extent, duration, reversibility and frequency. An important component is the degree of confidence in the data and analysis. The outcome is a rating system of the environmental consequences of the Project on specific environmental or socio-economic resources.

Residual impacts are classified using quantification criteria to determine environmental consequence. Components where the potential change in a parameter results in an effect on another component do not provide an environmental consequence. For example, a change in water quality can result in an effect on fish and fish habitat. Therefore, water quality does not present an environmental consequence. Each impact is first described in terms of the

following criteria: direction, magnitude, geographic extent, duration, reversibility and frequency (including seasonal effects). These criteria are defined and considered as per guidelines in the *Canadian Environmental Assessment Act* Responsible Authorities Guide (FEARO 1994).

Direction of an impact may be positive, neutral or negative with respect to the key question (e.g., a habitat gain for a KIR would be classed as positive, whereas a loss in habitat would be considered negative).

Magnitude describes the intensity, or severity of an effect. It is often described as the amount of change in a measurable parameter or variable relative to the baseline condition, guideline value, or other defined standard. The specific definition used to determine the magnitude rating (negligible, low, moderate or high) is defined by each component. The ratings are relative to the characteristics being investigated, the methods available to measure the effect, and the accepted practice in each component. Definitions of magnitude are unique to the characteristics of the measured parameter or variable. The criteria are defined in detail in each component in specific sections describing the assessment methods.

Geographic extent is the spatial area that is affected by the Project in combination with other developments. It will generally be based on the local and regional study areas developed by each component, although some, such as terrestrial resources, may have a single study area. The choice of study area strongly influences the final classification of the residual effect; therefore, the size of the study area is an important consideration (i.e., is it too small or large). The general principle followed in determining study areas follows the guidelines outlined in the *Cumulative Effects Assessment Practitioners Guide* (Hegmann et al. 1999). That document suggests that consideration of a "zone-of-influence" beyond which the effects of the action have diminished to an acceptable or trivial state (i.e., a very low probability of occurrence or acceptably small magnitude) is an acceptable approach.

Duration refers to the length of time over which an environmental impact occurs. It considers the various phases of the Project, including construction, operation and reclamation during which the effects may occur as well as the length of time for the environmental component to recover from the disturbance.

Reversibility indicates the potential for recovery of the ecological endpoint. An effect is defined as irreversible if the resource element cannot be restored to pre-impact condition within the long-term as defined under duration. Because ecosystems are dynamic, a site is considered to be restored if natural succession

processes are re-established. Reversibility does not necessarily require the establishment of a mature stage, but can be achievement of a development stage that is capable of sustaining the pre-development successional pattern.

Frequency describes how often the effect occurs within a given time period and is classified as low, medium or high in occurrence. Discussions on seasonal considerations are made when they are important in the evaluation of the impact.

Table 4.8-1 details the impact description criteria for each of the Project EIA components. Criteria for direction, reversibility and frequency are the same for all environmental components. Magnitude, geographic extent and duration vary depending on the component. The impact description criteria table also provides numerical scores that are used to determine environmental consequence.

Table 4.8-1 Impact Description Criteria and Numerical Scores for the Project

Resource	Direction[a]	Magnitude[b]	Geographic Extent[c]	Duration[d]	Reversibility[e]	Frequency[f][g]
Air Quality	positive: a decrease in emissions and/or ambient concentrations negative: an increase in emissions and/or ambient concentrations	magnitude varies with the air contaminant being evaluated; specifics provided in Volume 3, Section 1	local: effect restricted to the Project lease area regional: effect restricted to the RSA beyond regional: effect extends beyond the RSA	short-term: <5 years medium-term: 5 to 30 years long-term: >30 years	reversible or irreversible	low: occurs once moderate: occurs intermittently high: occurs continuously
Noise	positive: a decrease in noise levels neutral: no change in noise levels negative: an increase in noise levels	negligible: no projected increase in ambient sound levels low: increased noise levels do not exceed the ERCB nighttime requirements moderate: increased noise levels exceed the ERCB nighttime requirements by <5 dB high: increased noise levels exceed the ERCB daytime requirements by more than 5 dB	local (0): occurring up to 1.5 km from the lease regional (+1): outside the limit of 1.5 km from the Project boundary	short-term (0): <3 years medium-term (+1): 3 to 30 years long-term (+2): >30 years	reversible (-3) or irreversible (+3)	low (0): occurs once medium (+1): occurs intermittently high (+2): occurs continuously
Hydrogeology/Groundwater	positive, negative or neutral for the measurement endpoints	negligible: no change from the Existing and Approved Case low: near (i.e., slightly above) Existing and Approved Case moderate: above Existing and Approved Case high: substantially above Existing and Approved Case	local: effect restricted to the LSA regional: effect extends beyond the LSA into the RSA beyond regional: effect extends beyond the RSA	short-term: <5 years medium-term: 5 to 30 years long-term: >30 years	reversible or irreversible	low: occurs once moderate: occurs intermittently high: occurs continuously
Hydrology	positive, negative or neutral for the measurement endpoints	negligible: <1% change low: 1 to 5% change moderate: 5 to 15% change high : >15% change	local: effect restricted to the LSA regional: effect extends beyond the LSA into the RSA beyond regional: effect extends beyond the RSA	short-term: <5 years medium-term: 5 to 30 years long-term: >30 years	reversible or irreversible	low: occurs once moderate: occurs intermittently (1 to 10 times per year) high: occurs frequently (>10 times per year)
Water Quality	positive, negative or neutral for the measurement endpoints	negligible: releases do not cause exceedance of guidelines low: releases contribute slightly to existing background exceedances moderate: releases cause exceedance of guidelines (where guidelines were not previously exceeded) high: releases cause substantial exceedance of guidelines	local: effect restricted to the LSA regional: effect extends beyond the LSA into the RSA beyond regional: effect extends beyond the RSA	short-term: <5 years medium-term: 5 to 30 years long-term: >30 years	reversible or irreversible	low: occurs once moderate: occurs intermittently high: occurs continuously

Table 4.8-1 Impact Description Criteria and Numerical Scores for the Project (continued)

Resource	Direction[a]	Magnitude[b]	Geographic Extent[c]	Duration[d]	Reversibility[e]	Frequency[f][g]
Fish and Fish Habitat	positive, negative or neutral for the measurement endpoints	negligible: no measurable change low: <10% change in measurement endpoint moderate: 10 to 20% change in measurement endpoint high: >20% change in measurement endpoint where guidelines or criteria[h] exist: negligible: releases do not cause exceedance of guidelines low: releases contribute slightly to existing background exceedances moderate: releases cause marginal exceedance of guidelines (where guidelines were not previously exceeded) high: releases cause substantial exceedance of guidelines	local: effect restricted to LSA regional: effect extends beyond the LSA into the RSA beyond regional: effect extends beyond the RSA	short-term: <5 years medium-term: 5 to 30 years long-term: >30 years	reversible or irreversible	low: occurs once moderate: occurs intermittently high: occurs continuously
Soil and Terrain	positive, negative or neutral for the measurement endpoints	negligible: no measurable effect (<1%) on the measurement endpoint low: <10% change in measurement endpoint moderate: 10 to 20% change in measurement endpoint high: >20% change in measurement endpoint	local: effect restricted to LSA regional: effect extends beyond the LSA into the RSA beyond regional: effect extends beyond the RSA	short-term: <5 years medium-term: 5 to 30 years long-term: >30 years	reversible or irreversible	low: occurs once moderate: occurs intermittently high: occurs continuously
Terrestrial Vegetation, Wetlands and Forestry	positive, negative or neutral for the measurement endpoints	negligible: no measurable effect to <1% low: 1 to <10% change in measurement endpoint moderate: 10 to 20% change in measurement endpoint high: >20% change in measurement endpoint	local : effect restricted to LSA regional: effect extends beyond the LSA into the RSA beyond regional: effect extends beyond the RSA	short-term: <5 years medium-term: 5 to 30 years long-term: >30 years	reversible or irreversible	low: occurs once moderate: occurs intermittently high: occurs continuously
Wildlife	positive, negative or neutral for the measurement endpoints	negligible: no measurable effect low: <10% change in measurement endpoint moderate: 10 to 20% change in measurement endpoint high: >20% change in measurement endpoint	local : effect restricted to LSA regional: effect extends beyond the LSA into the RSA beyond regional: effect extends beyond the RSA	short-term: <5 years medium-term: 5 to 30 years long-term: >30 years	reversible or irreversible	low: occurs once moderate: occurs intermittently high: occurs continuously

Table 4.8-1 Impact Description Criteria and Numerical Scores for the Project (continued)

Resource	Direction[a]	Magnitude[b]	Geographic Extent[c]	Duration[d]	Reversibility[e]	Frequency[f][g]
Air Emission Effects on Ecological Receptors – Water Quality and Aquatic Biota	positive: a decrease in acid deposition negative: an increase in acid deposition	negligible (0): no measurable effect (<1%) on the measurement end point low (+5): <10% change in measurement end point moderate (+10): 10 to 20% change in measurement end point high (+15): >20% change in measurement end point	local: effect restricted to the Project lease area regional: effect restricted to the Air Quality RSA beyond regional: effect extends beyond the Air Quality RSA	short-term: <5 years medium-term: 5 to 30 years long-term: >30 years	reversible or irreversible	low: occurs once medium: occurs intermittently high: occurs continuously
Air Emission Effects on Ecological Receptors – Soil	positive, negative or neutral for the measurement endpoints	negligible: <1% change in areas exceeding the critical loads low: <10% change in areas exceeding critical loads moderate: 10 to 20% change in areas exceeding critical loads high: >20% change in areas exceeding critical loads	local: effect restricted to around emission source regional: effect extends throughout the RSA beyond regional: effect extends beyond the RSA	short-term: <5 years medium-term: 5 to 30 years long-term: >30 years	reversible or irreversible	low: occurs once moderate: occurs intermittently high: occurs continuously
Biodiversity	positive, negative or neutral for the measurement endpoints	negligible: no measurable effect low: <10% change in measurement endpoint moderate : 10 to 20% change in measurement endpoint high : >20% change in measurement endpoint	local : effect restricted to LSA regional: effect extends beyond the LSA into the RSA beyond regional: effect extends beyond the RSA	short-term: <5 years medium-term: 5 to 30 years long-term: >30 years	reversible or irreversible	low: occurs once moderate: occurs intermittently high: occurs continuously
Resource Use	positive, negative or neutral for the measurement endpoints	negligible: <1% low: <10% change in measurement endpoint moderate : 10 to 20% change in measurement endpoint high: >20% change in measurement endpoint	local: effect restricted to LSA regional: effect extends beyond the LSA into the RSA beyond regional: effect extends beyond the RSA	short-term: <5 years medium-term: 5 to 30 years long-term: >30 years	reversible or irreversible	low: occurs once moderate: occurs more than once high: occurs continuously
Resource Use – Visual Quality	positive, negative or neutral for the measurement endpoints	negligible: plant site not visible low: plant site visible from a small number of locations moderate: plant site visible from many locations high: plant site visible from all locations	local: effect restricted to LSA regional: effect extends beyond the LSA into the RSA beyond regional: effect extends beyond the RSA	short-term: <5 years medium-term: 5 to 30 years long-term: >30 years	reversible or irreversible	low: occurs once moderate: occurs more than once high: occurs continuously

Table 4.8-1 Impact Description Criteria and Numerical Scores for the Project (continued)

Resource	Direction[a]	Magnitude[b]	Geographic Extent[c]	Duration[d]	Reversibility[e]	Frequency[f][g]
Historical Resources	positive: increase in information negative: loss of resources and/or contextual information	negligible (0): no physical impact occurs or no historical sites are expected to be present low (+5): minimal impact to valuable resources, or resources are few and of low value moderate (+10): moderate or partial impact to resources of high to moderate historical value high (+15): severe physical impact to resources of high historical value	local (0): effect restricted to areas of direct physical disturbance (LSA) regional (+1): effect extends to indirect effects of increased access/use in the region	short-term (0): <5 years medium-term (+1): 5-20 years long-term (+2): >20 years	reversible (-3) or irreversible (+3)	negligible: 0-5 low: 6-10 moderate: 11-15 high: >15
Human Health	positive, negative or neutral for the measurement endpoints	negligible: ER[i] <1 and no data gaps or 1<ER<10 due to naturally elevated background exposures and/or conservative exposure assumptions low: no ER due to lack of data, but anecdotal data suggests low hazard additional information necessary to characterize potential impact moderate: 10<ER<20 high: ER>20	local: effect restricted to LSA regional: effect extends beyond the LSA into the RSA beyond regional: effect extends beyond the RSA	short-term: <5 years medium-term: 5-30 years long-term: >30 years	reversible or irreversible	low: occurs once moderate: occurs intermittently high: occurs continuously

[a] Direction: positive or negative effect for measurement endpoints, as defined for the specific component.

[b] Magnitude: degree of change to analysis endpoint.

[c] Geographic Extent: area affected by the impact.

[d] Duration: length of time over which the environmental effect occurs.

[e] Reversibility: effect on the resource (or resource capability) can or cannot be reversed.

[f] Frequency: how often the environmental effect occurs.

[g] Season effects are assessed when relevant for a specific component as Spring, Summer, Fall or Year-Round.

[h] Criteria can include acute and chronic aquatic life as well as No Observed Effects Concentration (NOEC).

[i] ER: exposure ratio, the predicted exposure divided by the exposure limit.

4.8.1 Certainty and Prediction Confidence

The purpose of an EIA is to predict the future conditions of dynamic environmental and social components that are, by their very nature, continuously changing. As a result, within every EIA there is a degree of confidence (certainty or uncertainty) associated with the predictions therein.

The degree of confidence in predictions is assessed for each residual effect predicted in the EIA. Each component uses quantitative methods such as sensitivity analyses or semi-quantitative methods to assess prediction confidence to the extent reasonable. Other sources of information, such as the conservative nature of assumptions and experience gained from other projects, are also included when available.

Assumptions for statistical tests as well as details on models employed as part of the EIA are discussed within the applicable components. This information will generally be provided in the Baseline Reports or appendices to the EIA. The intent of the review is to show that the data meets statistical requirements and that models employed are justified for use in the EIA. Specific information provided for models includes:

- a pictorial representation for all model compartments and linkages including all subroutines and modules;
- a list of all parameters incorporated in the model (reference to pictorial representation above) with a brief description of their purpose, known range of values, whether set from literature, calibrated, or measured (derived from local data) and the value(s) used in the EIA predictions;
- a sensitivity analysis demonstrating which parameters have the largest influence on model output; and
- a discussion of error for the parameters to which the model is most sensitive and for the final model output.

Uncertainty in the Project EIA is also managed through use of assessment scenarios that evaluate what is often referred to as being a worse-case scenario. This conservatism is based on the fact that all developments considered in the completed impact assessments are assumed to be at the maximum extent in terms of surface disturbance and operational emissions. However, the vast majority of projects in the region will be operated in phases with progressive reclamation throughout the Project life. Therefore, the actual extent of these developments during operation and reclamation at any one time is overestimated. The application of conservative assumptions means that predicted effects will likely be greater than the observed effects in the study area.

Based on the results of these methods, confidence is ranked qualitatively based on the following criteria and ranking system:

- quality and quantity of baseline information;
- confidence in measurements or analytical techniques (e.g., modelling) used to assess resource effects; and
- confidence in the success of mitigation and predicted residual effects after mitigation.

Each criterion receives a confidence rating from low to high. The three assigned rankings are then discussed to provide a rationale for the overall confidence rating.

4.8.2 Environmental Consequence

The environmental consequence rating has been developed to provide a measurement that consolidates the results of five criteria: direction, magnitude, duration, frequency, geographic extent and reversibility. The purpose of assigning an environmental consequence is to provide a transparent process that consolidates the results of the criteria into one rating. The consolidation allows the effects from different components to be compared using a common rating so that areas of greatest potential concern can be identified.

Although a numerical system has been developed, the numbers are not an end in themselves. The intention is to use these numbers to provide a rating system that facilitates discussion and decision-making for the Project. Table 4.8-2 shows the screening system used to estimate an environmental consequence for residual impacts. The screening system details a numerical score for each of the parameters considered in evaluating an impact. The total is then used as a guide to assign environmental consequence of residual impacts as follows:

- negligible 0 to 5
- low 6 to 10
- moderate 11 to 15
- high greater than 15

Table 4.8-2 Screening System for Environmental Consequences

Magnitude (Severity)	Geographic Extent	Duration	Reversibility	Frequency
negligible (0)	local (0)	short-term (0)	yes (-3)	low (0)
low (+5)	regional (+1)	medium-term (+1)		moderate (+1)
moderate (+10)	beyond regional (+2)	long-term (+2)	no (+3)	high (+2)
high (+15)				

In some cases, the level of confidence on a prediction is low such that an estimate of environmental consequence cannot be made with a sufficient degree of certainty. Undetermined ratings are accompanied by recommendations for monitoring predictions and adaptive management success. Recommended follow-up activities are detailed within each of the EIA component sections.

4.8.3 Management and Monitoring

MEG uses the environmental consequence ratings to define the management approaches to be implemented for the predicted environmental effect. The management for the predicted effects could include:

- re-engineering of systems;
- redesign of operational plans;
- enhancement of mitigation plans or processes;
- improvements in monitoring systems to enhance information on effects; or
- collection of additional information to reduce levels of uncertainty in the assessment.

MEG views the definition of environmental consequences of project impacts as an important step to ensure sustainability of the environment, and uses this information to guide development of its Environmental Management System (EMS), detailed in Volume 1. MEG's current or planned monitoring activities are detailed in Appendix 2-V.

5 ASSESSMENT CASES

The assessment cases for the Project EIA include the EAC, the Project Case and the PDC. The Project Case includes the EAC and the Project. The PDC considers any project or activity that has been publicly disclosed TOR up to six months prior to the submission of the Project application and EIA report, whichever is sooner. Table 5-1 overviews the cases and the developments included in the three cases. Figure 5-1 shows the locations of developments included in the assessment cases.

The EIA considers the effects of the developments included in each of the assessment cases, and predicts changes as a result of the addition of projects. Information on the EAC is provided in Baseline Reports and the EAC of each of the EIA components. Details on these developments are provided in Appendix 2-VI. The data available for these developments are taken from project applications, EIAs, update reports and other project-specific information that is publicly available. In addition, the potential effects of EAC developments are monitored through the actions of project-specific and regional monitoring programs such as the Wood Buffalo Environmental Association (WBEA) and the Regional Aquatic Monitoring Program (RAMP).

The only development added to the EAC for consideration under the Project Case is the Project. The result of this focusing of the assessment is that any changes in environmental or social components identified from those reported for the EAC are thereby directly associated with the Project. The data for the potential effects of the Project are based on the project design and operational information, as provided in Volume 1 of the application.

The PDC adds the potential effects of a number of possible developments to the effects predicted for the Project in combination with the existing and approved developments. The determination of projects to be added in the PDC was made in compliance with the TOR conditions (AENV 2008) that stated that a planned project was one that had been publicly disclosed up to six months prior to the submission of the Project application and EIA (AENV 2008). Data used for the planned developments are based on:

- information provided by the developer in its public disclosure;
- data that has been shown to be typical of similar types of operations in the Oil Sands Region;
- information from Planned Development project applications and EIAs if such documents are available; and
- specific information provided by the developer on its proposed development, where available.

Table 5-1 Assessment Cases

Developments Included in Assessment Cases	
Existing and Approved Case	• **Albian Sands Energy Inc.:** Muskeg River Mine and Muskeg River Mine Expansion • **Canadian Natural Resources Limited:** Kirby Pilot Project, Horizon Oil Sands Project Burnt Lake Project, Primrose and Wolf Lake Project, Primrose East In-Situ Project • **ConocoPhillips Canada:** Surmont Commercial SAGD • **Connacher Oil and Gas Limited:** Great Divide Oil Sands Project • **Devon Canada Corporation:** Jackfish SAGD Project • **EnCana FCCL Oil Sands Ltd.:** Christina Lake Thermal Project, Foster Creek Pilot and Foster Creek Phases 1 and 2 • **Husky Energy Inc.:** Tucker Thermal Project and Sunrise Thermal Project • **Imperial Oil Resources Limited:** Cold Lake In-Situ Project, Nabiye Expansion and Mahihkan North Expansion • **Imperial Oil Resources Ventures Limited:** Kearl Oil Sands Project • **Japan Canada Oil Sands Limited:** Hangingstone – In-Situ Pilot • **OPTI Canada Inc./Nexen Canada Ltd.:** Long Lake Pilot and Commercial Project • **MEG Energy Corporation:** Christina Lake Regional Project – Pilot, Christina Lake Regional Project – Commercial (Phase 2 and 2B) • **Petrobank Energy and Resources:** Whitesands Pilot Project • **Petro-Canada:** Dover SAGD Pilot, VAPEX Pilot, MacKay River In-Situ and Meadow Creek(a) In-Situ • **Petro-Canada Oil Sands Inc**.: Fort Hills Oil Sands Project • **Shell Canada Limited:** Orion EOR Project, Jackpine Mine – Phase 1 • **Suncor Energy Inc.:** South Tailings Pond, Lease 86/17, Steepbank & Millennium Mines, Voyageur Upgrader, Upgrader Complex, North Steepbank Extension Mine, Millennium Coker Unit (MCU), Millennium Vacuum Unit (MVU), Firebag Enhanced Thermal Solvent (ETS) Pilot Project and Firebag SAGD Project • **Syncrude Canada Ltd.:** Mildred Lake Mining and Upgrading, Upgrader Expansion and Emissions Reduction Program (ERP), Aurora South Mine, Aurora North Mine • **Total E&P Canada Ltd.:** Joslyn Creek SAGD Project – Phase 1 and Commercial • **Aggregate Resources** • **Forestry** • **East Athabasca Aerodrome** • **Williams Liquids Extraction and Storage Facilities** • **Gas Plants And Compressors** • **Municipalities And Communities** • **Pipelines, Roadways, East Athabasca Highway, Others**

Table 5-1 Assessment Cases (continued)

Developments Included in Assessment Cases	
Planned Development Case	• **Canadian Natural Resources Limited :** Horizon In-Situ Project, Kirby In-Situ Oil Sands Project • **Connacher Oil and Gas Limited:** Algar Oil Sands Project • **Devon Canada Corporation:** Jackfish SAGD Project 2 • **EnCana FCCL Oil Sands Ltd.:** Foster Creek Expansion, Christina Lake Thermal Project Phases C and D • **EnCana Corporation:** Borealis SAGD Project • **Japan Canada Oil Sands Limited:** Hangingstone SAGD Project • **Statoil:** Kai Kos Dehseh SAGD Project • **OPTI Canada Inc./Nexen Canada Ltd**: Long Lake South SAGD Project • **Petro-Canada:** Lewis SAGD Project, Meadow Creek Expansion SAGD Project and MacKay River Expansion SAGD project • **Shell Canada Limited:** Jackpine Mine Expansion, Pierre River Mine • **Suncor Energy Inc.:** Voyageur South Project • **Synenco Energy Inc:** Northern Lights Oil Sands Project • **Total E&P Canada Ltd.,** Joslyn Creek SAGD Expansion, Joslyn North Mine Project • **Aggregate Resources** • **Forestry** • **Major Pipelines, Utility Corridors, Roadways And Others** • **Municipal Growth**

A summary of the developments considered in the Project EIA and the environmental or social components in which each development were specifically considered is provided in Table 5-2 for the Project Case and Table 5-3 for the PDC. Where a project is shown not to be considered by a component; that means there is no measurable overlap of potential effects of that project with the Project.

L:\2007\1346 Oil Sands\07-1346-0009-MEG EXPANSION\5100\5190\EIA INTRODUCTION\Fig 5-1 Oil Sands development.dwg Apr 17, 2008 - 3:12pm

Syncrude Aurora North Mine

Shell Jackpine Mine Expansion & Pierre River Mine Project

Canadian Natural Horizon Oil Sands Project

PCOSI Fort Hills Oil Sands Project

Synenco Northern Lights Project

TOTAL Joslyn Creek SAGD Phases 1 & 2 Commercial Project

Shell Lease AT34

Shell Jackpine Mine - Phase 1

TOTAL Joslyn Creek North Mine Project

Imperial Oil Kearl Oil Sands Project - Mine Development

Albian Sands Muskeg River Mine and Expansion

Suncor Firebag SAGD

Birch Mountain Resources Muskeg Valley Quarry

Birch Mountain Resources Hammerstone Quarry

Syncrude Mildred Lake Mining and Upgrading

Syncrude Aurora South Mine

Husky Sunrise Thermal Project

Petro-Canada Dover SAGD - In-Situ and Vapex Pilot

Suncor North Steepbank Extension

Suncor Millennium Mine

Petro-Canada MacKay River In-Situ

Suncor Lease 86/17

Petro-Canada Lewis SAGD Project

Petro-Canada MacKay River Expansion SAGD Project

Suncor South Tailings Pond Project (STP)

Suncor Voyageur South Project

Fort McMurray

Parsons Creek Resources Project

Northland Forest Products Ltd. Sawmill

Suncor Voyageur Upgrader

Petro-Canada Meadow Creek In-Situ

Petro-Canada Meadow Creek Expansion SAGD Project

OPTI/Nexen Long Lake Pilot and Commercial Project

JACOS Hangingstone-In-Situ Pilot

OPTI/Nexen Long Lake Commercial Project Phase 2

JACOS Hangingstone SAGD Project

ConocoPhillips Canada Surmont Commercial SAGD

Proposed Algar SAGD Project

Great Divide SAGD Project

North American Oil Sands Kai Kos Dehseh SAGD Project

MEG Christina Lake Regional Project - Phase 3

EnCana Christina Lake Thermal Project

Whitesands Pilot Project

Devon Jackfish SAGD Project 2

Devon Jackfish SAGD Project

Canadian Natural Kirby Commercial Expansion

Canadian Natural Kirby Pilot

EnCana Foster Creek Pilot and Phases 1 and 2

Canadian Natural Primrose East In-Situ Oil Sands Project

Canadian Natural Primrose In-Situ Project

Canadian Natural Burnt Lake Project

Imperial Oil Nabiye Expansion

Canadian Natural Wolf Lake In-Situ Project

Husky Tucker Thermal Project

Imperial Oil Mahihkan North Expansion

Imperial Oil Cold Lake In-Situ Project

Shell Orion EOR Project

ALBERTA

SASKATCHEWAN

COLD LAKE AIR WEAPONS RANGE

LEGEND

- EXISTING AND APPROVED DEVELOPMENTS
- PLANNED DEVELOPMENTS
- AIR WEAPONS RANGE
- ROAD
- RAILWAY
- RIVER
- OPEN WATER
- INDIAN RESERVE

NOTE

* Also known as the Hamlet of Janvier

REFERENCE

ALBERTA NTDB DIGITAL DATA OBTAINED FROM GEOMATICS CANADA, AUGUST 2001. SASKATCHEWAN NTDB DATA OBTAINED FROM ISC, AUGUST 2001. DATUM: NAD 83 PROJECTION: UTM ZONE 12

20 0 20

SCALE METRES

PROJECT

CHRISTINA LAKE REGIONAL PROJECT - PHASE 3

TITLE

OIL SANDS DEVELOPMENTS - EXISTING, APPROVED AND PLANNED

MEG ENERGY CORP.

PROJECT	07.1346.0009.5100		FILE No.	development	
DESIGN	CM	07/01/08	SCALE	AS SHOWN	REV. 0
CADD	TRE	04/04/08			
CHECK	RC	17/04/08			
REVIEW	IGG	17/04/08			

FIGURE: 5-1

Table 5-2 Developments Included and Components Considered in the Existing and Approved and Project Cases

Development	EIA Component											
	Air Quality	Noise	Health	Air Emission Effects	Hydrogeology	Aquatic Resources	Terrestrial Resources	Traditional Land Use	Resource Use	Historical Resources	Visual Resources	Socio-Economics
MEG Energy Corp.												
Christina Lake Regional Project – Pilot	●	●	●	●	●	●	●	●	●	●	●	●
Christina Lake Regional Project – Commercial (Phases 2 and 2B)	●	●	●	●	●	●	●	●	●	●	●	●
Christina Lake Regional Project – Phase 3	●	●	●	●	●	●	●	●	●	●	●	●
EnCana FCCL Oil Sands Ltd.												
Christina Lake Thermal Project	●	●	●	●	●	●	●	●		●	●	
Foster Creek Pilot	●	n/a	●	●	●	n/a	●	n/a	●	●	n/a	n/a
Foster Creek Phases 1 and 2	●	n/a	●	●	●	n/a	●	n/a	n/a		n/a	n/a
Devon Canada Corp.												
Jackfish SAGD Project	●	n/a	●	●	●	●	●	●	●	●	●	n/a
Petrobank Energy and Resources												
Whitesands Pilot Project	●	n/a	●	●	●	●	●	n/a	●	●	n/a	n/a
ConocoPhillips Canada Resource Ltd.												
Surmont Commercial SAGD Project	●	n/a	●	●	●	●	●	●	●	●	n/a	n/a
Petro-Canada Oil and Gas												
Meadow Creek In-Situ Project	●	n/a	●	●	●	n/a	●	●	n/a	●	n/a	n/a
MacKay River In-Situ Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Dover SAGD Pilot and VAPEX Pilot	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
OPTI Canada Inc./Nexen Canada Ltd.												
Long Lake Pilot Project	●	n/a	●	●	●	n/a	●	●	n/a	●	n/a	n/a
Long Lake Commercial Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	●	n/a	n/a
Connacher Oil and Gas Limited												
Great Divide Oil Sands Project	●	n/a	●	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a
Canadian Natural Resources Limited												
Kirby Pilot Project	n/a	n/a	n/a	●	●	●	n/a	●	n/a	●	n/a	n/a
Primrose North	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Burnt Lake Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Primrose South	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Primrose East In-Situ Oil Sands Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Wolf Lake	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Horizon Oil Sands Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Japan Canada Oil Sands Limited												
Hangingstone In-Situ Pilot Project	●	n/a	n/a	●	●	n/a	●	n/a	n/a	●	n/a	n/a
Imperial Oil Resources Limited												
Cold Lake In-Situ Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Imperial Oil Resources Ventures Limited												
Kearl Oil Sands Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Husky Energy Inc.												
Tucker Thermal Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sunrise Thermal Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 5-2 Developments Included and Components Considered in the Existing and Approved and Project Cases (continued)

Development	EIA Component											
	Air Quality	Noise	Health	Air Emission Effects	Hydrogeology	Aquatic Resources	Terrestrial Resources	Traditional Land Use	Resource Use	Historical Resources	Visual Resources	Socio-Economics
Shell Canada Limited												
Orion EOR Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Jackpine Mine – Phase 1	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Suncor Energy Inc.												
South Tailings Pond	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lease 86/17, Steepbank & Millennium Mines	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Voyageur Upgrader	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Upgrader Complex	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
North Steepbank Extension Mine	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Millennium Coker Unit (MCU)	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Millennium Vacuum Unit (MVU)	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Firebag Enhanced Thermal Solvent (ETS) Pilot Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Firebag SAGD Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Syncrude Canada Ltd.												
Mildred Lake Mining and Upgrader Expansion and Emissions Reduction Program (ERP)	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Aurora South Mine	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Aurora North Mine	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Birch Mountain Resources Ltd.												
Muskeg Valley Quarry	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Albian Sands Energy Inc.												
Muskeg River Mine and Muskeg River Mine Expansion	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total E&P Joslyn Ltd.												
Joslyn Creek SAGD Project – Phase 1 and Commercial	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Petro-Canada Oil Sands Inc.												
Fort Hills Oil Sands Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Northland Forest Products	n/a	n/a	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Northland Sawmill	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	●	n/a	n/a
Gas Plants	n/a	n/a	n/a	n/a	n/a	n/a	●	n/a	n/a	●	n/a	n/a
Aggregate	n/a	n/a	n/a	n/a	n/a	n/a	●	n/a	●	●	n/a	n/a

n/a = Not applicable.
● = Included in assessment.
● = Included in Project Case only.

Table 5-3 Developments Included and Components Considered in the Planned Development Cases

Development	EIA Component											
	Air Quality	Noise	Health	Air Emission Effects	Hydrogeology	Aquatic Resources	Terrestrial Resources	Traditional Land Use	Resource Use	Historical Resources	Visual Resources	Socio-Economics
MEG Energy Corp.												
Christina Lake Regional Project Pilot	●	●	●	●	●	●	●	●	●	●	●	●
Christina Lake Regional Project – Commercial (Phase 2 and 2B)	●	●	●	●	●	●	●	●	●	●	●	●
Christina Lake Regional Project – Phase 3	●	●	●	●	●	●	●	●	●	●	●	●
EnCana FCCL Oil Sands Ltd.												
Christina Lake Thermal Project	●	●	●	●	●	●	●	●	●	●	●	●
Christina Lake Phase 1C/1D	●	n/a	●	●	●	●	●	●	n/a	●	●	n/a
Foster Creek Pilot	●	n/a	●	●	●	n/a	●	n/a	n/a	●	n/a	n/a
Foster Creek Phase 1 Project	●	n/a	●	●	●	n/a	●	n/a	n/a	●	n/a	n/a
Borealis SAGD Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Devon Canada Corporation												
Jackfish SAGD Project	●	n/a	●	●	●	●	●	●	n/a	●	●	●
Jackfish Phase 2	●	n/a	●	●	●	●	●	●	n/a	●	●	●
Hangingstone	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Surmont	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Surmont West	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pony Creek	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Kirby North	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Kirby South	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Chard	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Leismer East	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Canadian Natural Resources Limited												
Primrose North	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Burnt Lake	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Primrose South	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Primrose East	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Wolf Lake	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Horizon	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Kirby In-Situ Oil Sands Project	●	n/a	●	●	●	●	●	●	●	●	n/a	●
Statoil ASA												
Kai Kos Dehseh	●	n/a	●	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a
ConocoPhillips Canada Resource Ltd.												
Surmont Commercial SAGD Project	●	n/a	●	●	●	●	●	●	●	●	n/a	●
OPTI Canada Inc./Nexen Canada Ltd.												
Long Lake Commercial Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	●	n/a	●
Long Lake South SAGD Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	●	n/a	●
Great Divide Oil Corporation												
Great Divide SAGD Project	●	n/a	●	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a
Algar SAGD Project	●	n/a	●	●	●	●	●	n/a	n/a	n/a	n/a	n/a

Table 5-3 Developments Included and Environmental Components Considered in the Planned Development Cases (continued)

Development	EIA Component											
	Air Quality	Noise	Health	Air Emission Effects	Hydrogeology	Aquatic Resources	Terrestrial Resources	Traditional Land Use	Resource Use	Historical Resources	Visual Resources	Socio-Economics
Petro-Canada Oil and Gas												
Meadow Creek Phase 1	●	n/a	●	●	●	n/a	●	●	n/a	●	n/a	n/a
Meadow Creek Expansion	●	n/a	●	●	●	n/a	●	●	n/a	●	n/a	n/a
MacKay River Expansion	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lewis SAGD Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Japan Canada Oil Sands Limited												
Hangingstone Pilot In-Situ Project	●	n/a	●	●	●	●	●	n/a	n/a	●	n/a	n/a
Hangingstone Commercial Project	●	n/a	●	●	●	●	●	n/a	n/a	●	n/a	n/a
Imperial Oil Resources Limited												
Cold Lake In-Situ Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Nabiye Expansion	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mahihkan North Expansion	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Imperial Oil Resources Ventures Limited												
Kearl Oil Sands Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Husky Energy Inc.												
Tucker Thermal Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sunrise Thermal Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Shell Canada Limited												
Orion EOR Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Jackpine Mine – Phase 1	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Jackpine Expansion	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pierre River Mine	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Suncor Energy Ltd.												
Voyageur Upgrader	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Upgrader Complex	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Millennium Vacuum Unit	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Firebag ETS Pilot	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Firebag SAGD	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Voyageur South	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Syncrude Canada Ltd.												
Mildred Lake Upgrader	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Aurora South Mine	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Aurora North Mine	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Birch Mountain Resources Ltd.												
Hammerstone	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Albian Sands Energy Inc.												
Muskeg River Mine	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Muskeg River Mine Expansion	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total E&P Canada Ltd.												
Joslyn Creek SAGD Project Phase 2	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 5-3 Developments Included and Environmental Components Considered in the Planned Development Cases (continued)

Development	EIA Component											
	Air Quality	Noise	Health	Air Emission Effects	Hydrogeology	Aquatic Resources	Terrestrial Resources	Traditional Land Use	Resource Use	Historical Resources	Visual Resources	Socio-Economics
Joslyn Creek SAGD Project Phase 3A	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Joslyn Creek SAGD Project North Mine	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Petro-Canada Oil Sands Inc.												
Fort Hills Oil Sands Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Synenco Energy Inc.												
Northern Lights Project	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pengrowth Corporation												
Lindbergh	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Williams Energy												
Chemical Plant	●	n/a	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gas Plants	●	n/a	n/a	n/a	n/a	n/a	●	n/a	n/a	●	n/a	n/a
Aggregate	●	n/a	n/a	n/a	n/a	n/a	●	n/a	●	●	n/a	n/a

n/a = Not applicable.

● = Included in assessment.

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GLOSSARY

3D Seismic	A remote sensing tool that uses sound waves to image the subsurface.
Abiotic	Non-living factors that influence an ecosystem, such as climate, geology and soil characteristics.
Aboriginal People	The descendents of the original inhabitants of Canada. Pursuant to the Canadian Constitution Act, 1982, and Schedule B of the Canada Act, 1982, (Chapter 11, Section 35) Aboriginal peoples includes the Indian, Inuit and Métis peoples of Canada. The Constitution does not define membership in individual groups.
Abscission	The separation of part of a plant from the main plant body - most commonly, the falling of leaves or the dropping of fruit.
Acid Cation	Hydrogen ion or metal ion that can hydrolyse water to produce hydrogen ions (e.g., ionic forms of aluminum, manganese and iron).
Acid Neutralizing Capacity (ANC)	The equivalent capacity of a solution to neutralize strong acids. Acid Neutralizing Capacity can be calculated as the difference between non-marine base cations and strong anions.
Acid Pulse	Acid pulse (or episodic acidification) refers to a rapid drop in pH in surface waters over a short period.
Acidification	The decrease of acid neutralizing capacity in water, or base saturation in soil, caused by natural or anthropogenic processes. Acidification is exhibited as the lowering of pH.
Acidophillic	Acid loving, as in a plant which prefers acidic soils
Admixing	The dilution of topsoil with subsoil, spoil or waste material, with the result that topsoil quality is reduced. Admixing can result in adverse changes in topsoil texture, poor soil aggregation and structure, loss of organic matter and decrease in friability.
Aeolian	Sedimentary deposits arranged by wind, such as sand, silt and other loose substrates in dunes.
Air Shed	The geographic area requiring unified management to achieve air pollution control.

Albedo	The ratio of reflected solar radiation to the total incoming solar radiation received at the surface.
Alberta Ambient Air Quality Guidelines	A document established under Section 14 of the Environmental Protection and Enhancement Act (EPEA). The guidelines are part of the Alberta air quality management system.
Alberta Ambient Air Quality Objective (AAAQO)	Alberta Ambient Air Quality Objectives are guidelines established for release of air compounds. The AAAQOs form an integral part of the management of air quality in the province and are used for reporting the state of the environment, establishing approval conditions, evaluating proposed facilities with air emissions, assessing compliance near major air emission sources and guiding monitoring programs.
Alberta Energy and Utilities Board (EUB)	An independent, quasi-judicial agency of the Government of Alberta, the EUB was created in February 1995 by the amalgamation of the Energy Resources Conservation Board and the Public Utilities Board. The purpose of the EUB is to ensure that the discovery, development, and delivery of Alberta's resources take place in a manner that is fair, responsible and in the public interest. Effective January 1, 2008, the Alberta Energy and Utilities Board (EUB) has been realigned into two separate regulatory bodies: • the Energy Resources Conservation Board (ERCB), which regulates the oil and gas industry, and • the Alberta Utilities Commission (AUC), which regulates the utilities industry.
Alberta Environment (AENV)	Provincial ministry that looks after the following: establishes policies, legislation, plans, guidelines and standards for environmental management and protection; allocates resources through approvals, dispositions and licenses and enforces those decisions; ensure water infrastructure and equipment are maintained and operated effectively; and prevents, reduces and mitigates floods, droughts, emergency spills and other pollution-related incidents.
Alberta Surface Water Quality Objectives (ASWQO)	Numerical concentrations or narrative statements established to support and protect the designated uses of water. These are minimum levels of quality, developed for Alberta watersheds, below which no waterbody is permitted to deteriorate.

Alberta Sustainable Resource Development (ASRD)	Alberta Ministry responsible for administering the development of Alberta's forests, public lands, and fish and wildlife resources.
Alberta Vegetation Inventory (AVI) (AEO 1991)	A GIS mapping system and digital forest inventory. It includes tree species, height, canopy closure, stand age, site conditions. and non-commercial vegetated and nonvegetated cover types.
Alberta Wetlands Inventory (AWI)	A digital wetlands inventory and GIS mapping system that includes wetlands class, amount of vegetation cover, presence or absence of permafrost, presence or absence of internal lawns, and internal lawn and vegetation cover type.
Alkalinity	A measure of water's capacity to neutralize an acid, expressed as an equivalent of calcium carbonate It indicates the presence of carbonates, bicarbonates and hydroxides and less significantly, borates, silicates, phosphates and organic substances.
Alleles/Allelic Diversity	One member of a pair or series of genes that occupy a specific position on a specific chromosome/the variety, distribution and abundance of different alleles within a population.
Alluvial	Soil or earth material which has been deposited by running water, as in a riverbed, floodplain, or delta.
Ambient Noise	The pre-existing sound environment of a location, before the introduction of, or in absence of, noise from a specific source which also affects the sound environment of that location.
Ambient Sound Level	Background sound level: the sound level that is present in the acoustic environment of a defined area. Ambient sound can include sources from transportation equipment, animals and nature.
Anchor Ice	A sheet of ice that adheres on the bottom of streams or channels when water flows on top of it.
Anion	A negatively charged ion.
Anthropogenic	Pertaining to the influence of human activities.
Aquiclude	An impermeable stratum or material that acts as a barrier to the flow of groundwater.

Aquifer	A body of rock or soil that contains sufficient amounts of saturated permeable material to yield economic quantities of water to wells or springs.
Aquitard	A material of very low permeability between aquifers.
ArcGIS	An integrated collection of Geographic Information System (GIS) software products for building a complete GIS. ArcGIS enables users to deploy GIS functionality wherever it is needed in desktops, servers, or custom applications; over the Web; or in the field.
Argillaceous	Applied to rocks or substances composed of clay minerals, or having a notable proportion of clay in their composition.
Artesian	A condition in a confined aquifer when the water level of a well that penetrates the unit is above the ground surface. A well drilled into such a unit would flow without requiring a pump.
Aspect	Aspect is the orientation of a slope by compass points and indicates if a slope is exposed to the north, south, east or west or any point between.
At Risk	Any species known to be 'At Risk' after formal detailed status assessment and designation as 'Endangered' or 'Threatened' in Alberta.
Attenuation (Noise)	The process by which a compound is reduced in concentration over time, through adsorption, degradation, dilution and/or transformation. A reduction or diminishing of noise level.
B Horizon	A subsoil horizon characterized by one of: (1) an enrichment of clay, iron and aluminum, or humus (Bt or Bf); (2) a prismatic or columnar structure that exhibits pronounced coatings or stainings associated with significant amounts exchangeable sodium (Bn or Bnt); (3) an alteration by hydrolysis, reduction or oxidation to give a change of colour or structure from the horizons above or below, or both (Bm).
Background	An area not influenced by chemicals released from the site under evaluation.
Bankfull Depth	The maximum depth of a channel within a riffle segment when flowing at a bank-full discharge.

Bankfull Width The width of the stream, measured at the water surface elevation corresponding to the bankfull discharge. For undisturbed streams with a wide floodplain, this is equivalent to channel width.

Basal Water Sands A water-saturated sand unit occurring at the lowest portion of a stratigraphic unit.

Base Cation An alkali or alkaline earth metal cation (Ca2+, Mg2+, K+, Na+).

Baseline A surveyed or predicted condition that serves as a reference point to which later surveys are coordinated or correlated.

Basic Sound Level The allowable sound level at a residential location, as defined by the current Alberta Energy and Utilities Board (EUB) Directive 038 with the inclusion of industrial presence based upon dwelling unit density and proximity to transportation noise sources.

Basin A geographic area drained by a single major stream; consists of a drainage system comprised of streams and often natural or man-made lakes.

Bed Slope The inclination of the river channel bottom.

Bedrock The body of rock that underlies gravel, soil or other surficial material.

Benthic Invertebrates Invertebrate organisms living at, in or in association with the bottom (benthic) substrate of lakes, ponds and streams.

Berm Containment wall or barrier, usually constructed from clay, but can also be cement or other man-made, impermeable material (also called dikes).

Bins Sub-divisions of wildlife Resource Selection Function (RSF) model output values.

Bioconcentration A process where there is a net accumulation of a chemical directly from an exposure medium into an organism.

Biodiversity The variety of plant and animal life in a particular habitat (e.g., plant community or a country). It includes all levels of organization, from genes to landscapes, and the ecological processes through which these levels are connected.

Biodiversity Ranking The relative contribution of an ecosite phase/wetlands type to the overall biological diversity of an area.

Biotic The living organisms in an ecosystem.

Bioturbation The disruption and mixing of sand and mud by animals such as worms, that live at or near the sediment water interface. Bioturbation is sometimes an indicator of the salinity of the water body that the sediment was deposited in.

Bitumen A highly viscous, tarry, black hydrocarbon material having an API gravity of about 9 (specific gravity about 1.0). It is a complex mixture of organic compounds. Carbon accounts for 80 to 85% of the elemental composition of bitumen, hydrogen 10%, sulphur 5% and nitrogen, oxygen and trace elements form the remainder.

Bog Sphagnum or forest peat materials formed in an ombrotrophic environment due to the slightly elevated nature of the bog, which tends to disassociate it from the nutrient-rich groundwater or surrounding mineral soils. Characterized by a level, raised or sloping peat surface with hollows and hummocks.

Mineral-poor, acidic and peat-forming wetlands that receives water only from precipitation.

Borden Block Map units of 10' latitude by 10' longitude used to facilitate site designation.

Boreal Forest The northern hemisphere, circumpolar, tundra forest type consisting primarily of black spruce and white spruce with balsam fir, birch and aspen.

Boreholes A hole advanced into the ground by means of a drilling rig.

Borrow Pit A bank or pit from which sand or clay is taken for use in filling or embanking. Often used in the construction of roads.

Bowen Ratio The ratio of sensible heat flux to latent heat flux.

Brackish Water See Saline Water.

Brine Water that contains high concentrations of soluble salts with a mineralization greater than 100,000 mg/L total dissolved solids.

Brown-Water System	Freshwaters with elevated colour and dissolved organic carbon concentrations.
Brunisolic Soil	An order of soils whose horizons are developed sufficiently to exclude the soils from the Regosolic order, but that lack the degrees or kinds of horizon development specified for soils of the other orders. These soils, which occur under a wide variety of climatic and vegetative conditions, all have Bm or Btj horizons.
Bryophyte	A member of the plant order Bryophyta, including the mosses, liverworts, and hornworts.
Buffer	A transition zone between areas managed for different objectives.
Buffer Zone	The area of land between the project footprint and Local Study Area boundaries.
Buffering Capacity	The ability of a system to accept acids without the pH changing appreciably.
Calendar-day	Stream-day multiplied by a service factor for planned and unplanned downtime. Production rate based on operating 365 day per year.
CALPUFF	A non-steady Lagrangian Gaussian Puff Model containing modules for complex terrain effects, overwater transport interaction effects, building downwash, wet and dry removal, and simple chemical transformation.
Canopy	An overhanging cover, shelter or shade. The tallest layer of vegetation in an area.
Canopy Disturbance	An opening in the forest canopy, from natural or unnatural causes.
Capability (land)	An evaluation of land performance that focuses on the degree and nature of limitation imposed by the physical characteristics of the land unit on a certain use, assuming a management system.
Carbonaceous Biochcemical Oxygen Demand (CBOD)	Carbonaceous biochemical oxygen demand is a measure of the quantity of oxygen consumed by microorganisms during the breakdown of organic molecules such a cellulose and sugars into carbon dioxide and water.
Carcinogen	An agent that is reactive or toxic enough to act directly to cause cancer.

Carnivore	Any order of mammals that feed chiefly on flesh or other animal matter rather than plants.
Catchment Area	The area of land from which water finds its way into a particular watercourse, lake or reservoir (Also termed "catch basin" or "watershed."
Cation	A positively charged ion.
Channel	The bed of a stream or river.
Channel Regime	The morphological characteristics, including cross-section, longitudal slope and sinuosity, of a watercourse that is in long-term equilibrium.
Chi-Square Analysis	A statistical test to determine if the patterns exhibited by data could have been produced by chance.
Chlorophyll a	A green photo-sensitive pigment that is essential for the conversion of inorganic carbon (e.g., carbon dioxide) and water into organic carbon (e.g., sugar).
Chlorosis	A yellowing of leaf tissue due to a lack of chlorophyll, generally caused by poor drainage, damaged roots, compacted roots, high alkalinity or nutrient deficiencies in the plant.
Class Area	The area of a particular habitat quality class within the study area.
Closed Canopy	Assemblages of trees with tops sufficiently close to each other that there is very little visible sky from the position of the forest floor.
Closure	The point after shutdown of operations when regulatory certification is received and the area is returned to the Crown.
Coefficient of Variation	Standardized index of the variability of a value relative to the mean value.
Colluvial	A heterogeneous mixture of material that as a result of gravitational action has moved down a slope and settled at its base.
Community	Plant or animal species living in close association or interacting as a unit.
Complex Structure	A stand of trees with a high variation in heights but with no distinct tree layers.

Concentration	Quantifiable amount of a substance in environmental media.
Concordance Table	A table that serves as a cross-reference between regulated requirements and location of documented compliance.
Conductivity	A measure of the capacity of water to conduct an electrical current.
Configuration	The location and arrangement of landscape elements.
Coniferous	These are cone-bearing trees with no true flower (e.g., white spruce, black spruce, balsam fir, jack pine and tamarack).
Connectivity	A measure of how connected or spatially continuous a corridor or matrix is.
Consolidated Frequency Analysis (CFA)	A computer program for deriving flood flow frequencies.
Contaminants	A general term referring to any chemical compound added to a receiving environment in excess of natural concentrations. The term includes chemicals or effects not generally regarded as "toxic", such as nutrients, colour and salts.
Contouring	Process of shaping the land surface to fit the form of the surrounding land.
Corridor	A travel route allowing animals to migrate from one faunal region to another.
Criteria (water quality)	The standards against which water quality is measured.
Critical Load	A quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur.
Cross Stratification	Inclined sedimentary beds that form in sand dunes.
Crown Closure	The ground cover area covered by a vertical projection of the tree crowns onto the ground for each identified storey.
Crust Lichen	Lichen with a hard upper surface and attached closely to the substrate.

Cumulative Effects	The effects of one project with consideration of current conditions, other existing projects, other approved projects and typically, other planned projects.
Cumulative Environmental Management Association (CEMA)	An association of oil sands industry, other industry, regional community representatives, regulatory agencies and other stakeholders designed to develop systems to manage cumulative effects associated with developments in the Oil Sands Region.
Cutblock	Previously forested area that has been harvested for timber and is presently regenerating at various stages of regrowth.
Cutline	A cleared right-of-way, often used in forestry or seismic work.
dBA	A decibel value which has been A-weighted, or filtered to match the response of the human ear.
dBC	A decibel value which has been C-weighted, or filtered to highlight low frequency content.
Decibel (dB)	A decibel value which has been A-weighted, or filtered to match the response of the human ear.
Deciduous	Tree species that lose their leaves at the end of the growing season.
Decommissioning	The act of taking a processing plant or facility out of service and isolating equipment to prepare for routine maintenance work, suspending or abandoning.
Department of Fisheries and Oceans (DFO) (now Fisheries and Oceans Canada)	Federal department responsible for policies and programs in support of Canada's economic, ecological and scientific interests in oceans and inland waters; for the conservation and sustainable utilization of Canada's fisheries resources in marine and inland waters.
Deposit	Material left in a new position by a natural transporting agent such as water, wind, ice or gravity, or by the activity of man.
Depressurization	The process of reducing the pressure in geological formation.
Detection Limit	The lowest concentration that can be reported by an analytical laboratory with a specified confidence level.
Detrended Correspondence Analysis (DCA)	An ordination technique used to visually determine species and site relationships.

Development Area	Any area altered to an unnatural state. This represents all land and water areas included within activities associated with the development of oil sands leases.
Diameter at Breast Height (DBH)	The diameter of a tree 1.37 m above the ground surface.
Dilbit	Diluted bitumen created by adding lighter fraction hydrocarbons to bitumen.
Diluent	A light liquid hydrocarbon added to bitumen to lower viscosity and density. The thinning agent is used by the oil sands to make heavy oil more fluid so it can be transported.
Discharge	In a stream or river, the volume of water that flows past a given point in a unit of time (i.e., m^3/s).
Dispersion Model	A set of mathematical relationships used to describe the rise and subsequent dispersion of a plume as it is transported by the wind. These relationships are given coded names (e.g., SCREEN3 and CALPUFF) and are computer modeled.
Dissolved Organic Carbon (DOC)	The dissolved portion of organic carbon water; made up of humic substances and partly degraded plant and animal materials.
Dissolved Oxygen (DO)	Measurement of the concentration of dissolved (gaseous) oxygen in the water, usually expressed in milligrams per litre (mg/L).
Disturbance	An event that causes a sudden change from the existing pattern, structure and/or composition in an ecological system or habitat.
Diversity	The variety, distribution and abundance of different plant and animal communities and species within an area.
Dose	A measure of integral exposure. Examples include: (1) the amount of chemical ingested; (2) the amount of a chemical taken up; and (3) the product of ambient exposure concentration and the duration of exposure.
Dose Response	The quantitative relationship between exposure of an organism to a chemical and the extent of the adverse effect resulting from that exposure.
Drake	A male duck.

Drawdown	A reduction in the height of the water table.
Drill Core	A cylinder of rock taken by a specialized drill bit similar to a hole saw, that can be analysed for various rock and fluid properties.
Echolocation	High frequency sounds (25 to 120 kHz) produced by bats that are beyond the range of human hearing (20 Hz to 25 kHz). These sounds are produced with great intensity. Echoes resulting from sound returning from objects in the bat's environment provide information to the bat.
Ecodistrict	A broad subdivision of the landscape based on differences in landscape pattern, topography and dominant soils.
Ecological Area	As part of the hierarchical classification system outlined in the Field Guide to Ecosites of Northern Alberta, a broad climatic region within the green zone of Alberta.
Ecological Land Classification (ELC)	A means of classifying landscapes by integrating landforms, soils and vegetation components in a hierarchical manner.
Ecosite	Ecosite is a functional unit defined by the moisture and nutrient regime. It is not tied to specific landforms or plant communities, but is based on the combined interaction of biophysical factors that together dictate the availability of moisture and nutrients for plant growth.
Ecosite Phase	A subdivision of the ecosite based on the dominant tree species in the canopy. On some sites where the tree canopy is lacking, the tallest structural vegetation layer determines the ecosite phase.
Ecosystem	An integrated and stable association of living and non-living resources functioning within a defined physical location. For the purposes of assessment, the ecosystem must be defined according to a particular unit and scale.
Edaphic	Referring to the soil. The influence of the soil on plant growth is referred to as an edaphic factor.
Edge	Where different plant communities meet in space on a landscape; and where plant communities meet a disturbance. An outer band of a plant community that usually has an environment significantly different from the interior of the plant community.

Effluent	Stream of water discharging from a source.
Electrical Conductivity	The capability of a solution to transmit an electrical current. A capability closely related to the concentration of salts in soils.
Electrofishing	A 'live' fish capture technique in which negative (anode) and positive (cathode) electrodes are placed in the water and an electrical current is passed between the electrodes. Fish are attracted (galvano-taxis) to the anode and become stunned (galvano-narcosis) by the current, allowing fish to be collected, measured and released.
Energy Resources Conservation Board (ERCB)	An independent, quasi-judicial agency of the Government of Alberta. The purpose of the ERCB is to ensure that the discovery, development, and delivery of Alberta's resources take place in a manner that is fair, responsible and in the public interest.
Endangered	A species facing immediate extinction or extirpation.
Entrenchment Ratio	The ratio of the width of the flood-prone area to the surface width of the bankfull channel, which is used to describe the degree of vertical containment of a river channel.
Environmental Effect	Any change that may cause positive or negative effects to land, air, water, living organisms (including people), cultural, historical or archeological resources.
Environmental Impact	The net change, positive or negative, to land, air, water, living organisms (including people), cultural, historical or archeological resources.
Environmental Impact Assessment (EIA)	A review of the effects that a proposed development will have on the local and regional environment.
***Environmental Protection and Enhancement Act* (EPEA) (Alberta)**	Provincial act created to support and promote the protection, enhancement and wise use of the environment.
Environmental Setting	A surveyed or predicted condition that serves as a reference point to which later surveys are coordinated or correlated.
Eolian	A designation of rocks and soils whose constituents have been carried and laid down by wind.

Ephemeral	A phenomenon or feature that lasts only a short time (e.g., an ephemeral stream is only present for short periods during the year).
Epilimnetic	Localized in the surface layer of a waterbody.
Epilimnion	A freshwater zone of relatively warm water in which mixing occurs as a result of wind action and convection currents.
Epiphyte	A plant that grows upon another plant, but is neither parasitic on it nor rooted in the ground.
Equivalent Land Capability	The ability of land to support various land uses after reclamation is similar to the ability that existed prior to any activity on the land, but the ability to support individual land uses will not necessarily be equal after reclamation.
Ericaceous	Plant species belonging to the heath family (Ericaceae) and typically prefer acid soil.
Erosion	The process by which material, such as rock or soil, is worn away or removed by wind or water.
Escarpment	A cliff or steep slope at the edge of an upland area. The steep face of a river valley.
Estuarine	Formed or deposited in an estuary; estuarine muds: or growing in, inhabiting, or found in an estuary; an estuarine fauna.
Euphotic	The upper surface layer of a body of water where sufficient light penetrates to allow photosynthesis to occur.
Eutrophic	The nutrient-rich status (amount of nitrogen, phosphorus and potassium) of an ecosystem.
Eutrophication	Excessive growth of algae or other primary producers in a stream, lake or wetlands as a result of large amounts of nutrient ions, especially phosphate or nitrate
Evaporation	The process by which water is changed from a liquid to a vapour.
Evaporation, Potential	The maximum amount of water that can be evaporated from a surface (e.g., ground, vegetation) if surface moisture is not limited.
Evaporite	A sediment that is deposited from aqueous solution as a result of extensive or total evaporation.

Evapotranspiration	The process by which water is transmitted as a vapor to the atmosphere as the result of evaporation from any surface and transpiration from plants.
Existing and Approved Case	The Environmental Impact Assessment case that includes existing environmental conditions as well as existing and approved projects or activities.
Facies	A distinctive group of characteristics that distinguish one group from another within a stratigraphic unit; e.g. contrasting river-channel facies and overbank-flood-plain facies in alluvial valley fills.
Fauna	An association of animals living in a particular place or at a particular time.
Fen	A peat-forming wetland. Fens are defined from other peat wetlands by the source of water, which is contributed primarily by flowing surface or underground spring water versus solely from rain (such as bogs). As such, they tend to be more mineral rich than other peat wetlands. Fens can be dominated by grasses, shrubs or trees.
Field Facilities	The surface equipment and pipelines required to deliver steam to the wells and transport fluids to the central plant.
Fish Habitat (*Fisheries Act*)	Spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly to carry out their life processes.
Flark	Wet and sparsely vegetated parts of patterned fens.
Fluvial	Relating to a stream or river.
Fluvial Sediment	Sediment generally consisting of gravel and sand with a minor fraction of silt and rarely clay. The gravels are typically rounded and contain interstitial sand.
Foliose	Having a leaf-like thallus loosely attached to a surface, as certain lichens.
Footprint	The proposed development area that directly affects the soil and vegetation components of the landscape.
Forage Fish	Small fish that provide food for larger fish (e.g., longnose sucker, fathead minnow).

Forb	A broad-leaved herb that is not a grass.
Forest	A growth of trees and underbrush covering a tract of land.
Forest Cover Type	Primary stand groupings based on the percent composition of coniferous or deciduous species. Forest cover type can be deciduous, coniferous or mixedwood. Also, regenerating and selective harvest stands are included as a forest cover type.
Forest Fragmentation	The change in the forest landscape, from extensive and continuous forests.
Forest Productivity	A measure of forest growth based on the volume of wood fibre added to the landbase annually (i.e., mean annual increment) or the rate at which trees grow in height over a given period of time as defined by a timber productivity rating or site index value.
Forest Succession	see Succession.
Formation	A geologic unit of distinct rock types that is large enough in scale to allow its mapping over a region.
Fossiliferous	Contains fossils or the remains of plants and animals.
Fragmentation	The process of reducing size and connectivity of stands of trees that compose a forest.
FRAGSTATS	A spatial pattern analysis software program used to quantify the areal extent and spatial configuration of patches within a landscape. The analysis is done using categorical spatial data (e.g., plant communities).
Frequency Analysis	A statistical procedure involved in interpreting the past record of a hydrometeorological event to occurrences of that event in the future.
Freshet	A flood resulting from a spring thaw resulting from snow and ice melts in rivers.
Fry	The early stage of development for the fish from hatching until it is one year old.
Fuel Gas	Gas used as fuel for the various pieces of equipment. Fuel gas can be purchased gas or a mixture of purchased gas and treated produced gas.

Fugitive Emissions	Substances emitted from any source except those from stacks and vents. Typical sources include gaseous leakage from valves, flanges, drains, volatilization from ponds and lagoons, and open doors and windows. Typical particulate sources include bulk storage areas, open conveyors, construction areas or plant roads.
Furbearer	Mammals that have traditionally been trapped or hunted for their fur.
G Test	A statistical test which tests for a significant difference between sampled and expected frequencies of occurrence. Otherwise known as a likelihood ratio test.
Gathering System	The pipelines and other equipment needed to transport oil, gas or both from wells to a central point.
Genetic Diversity	The range of possible genetic characteristics found within a species and amongst different species (e.g., variations in hair colour, eye colour and height in humans).
Geographic Information System (GIS)	Computer software designed to develop, manage, analyze and display spatially referenced data.
Geomorphic	The natural evolution of surface soils and landscape over long periods.
Geomorphology	The science of surface landforms and their interpretation on the basis of geology and climate. That branch of science which deals with the form of the earth, the general configurations of its surface and the changes that take place in the evolution of landforms.
Glacial Till	Unsorted and unstratified heterogeneous mixture of clay, silt, sand, gravel and boulders deposited directly by a glacier without subsequent reworking by water from the glacier.
Glaciofluvial	Sediments or landforms produced by melt waters originating from glaciers or ice sheets. Glaciofluvial deposits commonly contain rounded cobbles arranged in bedded layers.
Glacolacustrine	Relating to the lakes that formed at the edge of glaciers as the glaciers receded. Glaciolacustrine sediments are commonly laminar deposits of fine sand, silt and clay.
Gleysolic Soil	A great group of soils in the Gleysolic order. A Gleysol has a thin (less than 8 cm) Ah horizon underlain by mottled grey or brownish grey material, or it has no Ah horizon.

Graminoid	Grasses and grass-like plants such as sedges and rushes.
Graupel	Precipitation that forms when supercooled droplets of water condense on a snowflake.
Groundtruth	Visiting locations in the field to confirm or correct information produced from remote sources such as interpreted aerial photographs or classified satellite imagery.
Groundwater	That part of the subsurface water that occurs beneath the water table, in soils and geologic formations that are fully saturated.
Groundwater Level	The level below which the rock and subsoil, to unknown depths, are saturated.
Groundwater Mounding	An area of a groundwater system featuring an increased groundwater surface elevation above the baseline condition for that area.
Groundwater Recharge	Water that enters the saturated zone by a downward movement through soil and contributes to the overall volume of groundwater.
Groundwater Velocity	The speed at which groundwater advances through the ground; the average linear velocity of the groundwater.
Guild	A set of co-existing species that share a common resource.
Habitat	The place or environment where a plant or animal naturally or normally lives or occurs.
Habitat Fragmentation	Reduction of extensive, continuous tracts of habitat into smaller, more isolated patches.
Habitat Generalist	Wildlife species that can survive and reproduce in a variety of habitat types (e.g., red-backed vole).
Hardness	Measure of the calcium and magnesium concentrations in water.
Hazard	A condition with the potential for causing an undesirable consequence.
Hazardous Waste	Any waste material that presents a potential for unwanted consequences to people, property and the environment.

Head	The energy, either kinetic or potential, possessed by each unit weight of a liquid; expressed as the vertical height through which a unit weight would have to fall to release the average energy possessed.
Herb	A vascular plant (forb or graminoid) without a woody stem.
Heterogeneity	Consisting of parts that are unlike each other. For example, the variety and abundance of ecological units (e.g., ecosite phases and wetlands types) comprising a landscape mosaic.
Historical Resources Impact Assessment (HRIA)	A review of the effects that a proposed development will have on the local and regional historic and prehistoric heritage of an area.
Home Range	The area that an animal traverses as part of its annual travel patterns.
Hydraulic Conductivity	Is a measure of how easy water can flow through a porous material.
Hydraulic Head	The elevation, with respect to a specified reference level, at which water stands in a piezometer (a pipe in the ground used to measure water elevations/or a small diameter observation well) connected to the point in question in the soil. Its definition can be extended to soil above the water table if the piezometer is replaced by a tensiometer (instrument used to measure moisture content of soil). The hydraulic head in systems under atmospheric pressure may be identified with a potential expressed in terms of the height of a water column. More specifically, it can be identified with the sum of gravitational and capillary potentials, and may be termed the hydraulic potential.
Hydric	Soil moisture conditions where water is removed so slowly that the water table is at or above the soil surface all year.
Hydrogeology	The study of the factors that deal with subsurface water (groundwater) and the related geologic interactions with surface water.
Hydrology	The science of waters of the earth, their occurrence, distribution, and circulation; their physical and chemical properties; and their reaction with the environment, including living beings.
Hydrometric Station	A station where measurement of hydrological parameters is performed.

Hydrostratigraphic Unit	A formation, part of a formation, or group of formations in which there are similar hydrologic characteristics allowing for grouping into aquifers or confining layers.
Hygric	Soil moisture conditions where water is removed slowly enough to keep the soil wet for most of the growing season. Permanent seepage and mottling are present and possibly weak gleying.
Hypereutrophic	Trophic state classification for lakes characterized by very high productivity and nutrient inputs (particularly total phosphorus).
Hypolimnion	The deep, cold layer of a lake lying below the metalimnion (thermocline) during the time a lake is normally stratified.
Inclined Heterolithic Stratification	Inclined beds of alternating mud and sand that are deposited on the sides of channel bars.
Infaunal	Animals living within the sediment.
In-Situ	Latin for "in place". As used here, refers to methods of extracting deep deposits of oil sands using wells to recover the resources with less impact to the land, air and water than for oil sands mining.
Interbedded Sand and Mud	Alternating beds of sand and mud deposited during times of strong water flow and negligble water flow.
Internal Lawn	Wet depresssional areas within bog or fen wetlands types that are absent of trees and contain species adapted to wetter conditions than the surrounding treed habitat.
Invasive Species	A species that has moved into an ecosystem and reproduced so successfully that it has displaced the original structure of the community.
Isopach Map	A geological map of subsurface strata showing the various thicknesses of a given formation underlying an area.
Isopleth	A line on a map connecting places sharing the same parameter (e.g., ground-level concentration)
Key Indicator Resources (KIRs)	Environmental attributes or components identified as a result of a social scoping exercise as having legal, scientific, cultural, economic or aesthetic value.

Keystone Species	A species that is of particular importance to community integrity and function, without which significant changes to the community would occur.
Lacustrine	Sediment that have been transported or deposited by water or wave action. Generally consisting of stratified sand, silt or clay deposited on a lake bed or moderately well sorted and stratified sand and coarser material.
Land Capability	The ability of the land to support a given land use, based on an evaluation of the physical, chemical and biological characteristics of the land, including topography, drainage, hydrology, soils and vegetation.
Land Capability Class	A land capability class assigned to an area according to the criteria outlined in Land Capability Classification System for Forest Ecosystems in the Oil Sands, 3rd Edition, as amended.
Land Classification	The classification of specific bodies of land according to their characteristics or their capabilities of use.
Land Cover Class	A vegetated or non-vegetated map unit defined here at the regional study area level and classified from LANDSAT 5 satellite imagery.
Land Status Automated System (LSAS)	An online government database containing Alberta Surface Public Land and Crown Mineral dispositions and activities. Includes information about land restrictions and reservations.
LANDSAT 5	A specific satellite or series of satellites used for earth resource remote sensing. Satellite data can be converted to visual images for resource analysis and planning.
Landscape	A heterogeneous land area with interacting ecosystems that are repeated in similar form throughout. From a wildlife perspective, a landscape is an area of land containing a mosaic of habitat patches within which a particular "focal" or "target" habitat patch is embedded.
Landscape Structure	The spatial relations among a landscape's component parts including composition; the presence and amount of each patch type without being spatially explicit; and landscape configuration, the physical distribution or spatial character of patches within a landscape.
Leaf Area Index (LAI)	The ratio of leaf area to soil surface area.

Leakance	A property of a leaky layer. Expressed as K' divided by b', where K' refers to the hydraulic conductivity of the leaky layer confirming an aquifer in units of length/time and b' refers to the thickness of the leaky layer in units of length.
Lichen	Any complex organism of the group Lichenes, composed of a fungus in symbiotic union with an alga and having a greenish, gray, yellow, brown, or blackish thallus that grows in leaflike, crustlike, or branching forms on rocks, trees, etc.
Lift Gas	Gas injected into the reservoir to help it flow from the well.
Lignin	A complex polymer occurring in plant cell walls making the plant rigid.
Linear Corridor	Roads, seismic lines, pipelines and electrical transmission lines, or other long, narrow disturbances.
Listed Species	Species that are provincially or federally identified as potential species of concern.
Lithic	Consolidated bedrock within the control section below a depth of 10 cm. The upper surface of a lithic layer is a lithic contact.
Lithofacies	A rock or sediment with specific lithologic or textural characteristics.
Littoral Zone	The zone in a lake that is closest to the shore. It includes the part of the lake bottom, and its overlying water, between the highest water level and the depth where there is enough light (about 1% of the surface light) for rooted aquatic plants and algae to colonize the bottom sediments.
Local Study Area (LSA)	Defines the spatial extent directly or indirectly affected by the project.
Lognormal	Of, relating to, or being a logarithmic function with a normal distribution.
Long Range Sustained Yield Average (LRSYA)	The sums of Mean Annual Increment (MAI) for all forest cover types in a study area. LRSYA is an estimate for the sustained yield or expected annual growth of the coniferous and deciduous fibre in a study area.

Low Frequency Noise (LFN)	Where a clear tone is present below and inclusive of 250 Hz. Low frequency noise can be determined by subtracting the overall C-weighted from the overall A-weighted sound level, or as the overall C-weighted sound level by itself.
Lowest Observed Adverse Effect Level (LOAEL)	In toxicity testing, it is the lowest concentration at which adverse effects on the measurement end point are observed.
Lowland Areas	Areas with ground slopes of less than 0.5% and typically poorly drained.
Luvisol	An order of soils that have eluvial (Ae) horizons, and illuvial (Bt) horizons in which silicate clay is the main accumulation product. The soils developed under forest or forest-grassland transition in a moderafe to cool climate.
Macrophytes	Plants large enough to be seen by the unaided eye. Aquatic macrophytes are plants that live in or in close proximity to water.
Main Canopy	A well-defined, uppermost layer of trees within a forest.
Make-Up Water	The water required to supplement recycled produced water for steam production.
Marsh	A non-peat-forming, nutrient-rich wetlands characterized by frequent flooding and fluctuating water levels.
Mature Forest	A forest with a multi-layered, multi-species canopy dominated by large overstorey trees and accumulations of downed woody debris.
May be at Risk	Any species that 'May be at Risk' of extinction or extirpation and is therefore a candidate for detailed risk assessment.
Mean Patch Size	The average size of habitat patches within the study area.
Meander	A randomized search pattern used in rare plant surveys to cover the range in micro-habitat variation within a larger ecosystem unit.
Media	The physical form of the environmental sample under study (e.g., soil, water, air).
Merchantable Timber	A forest area with potential to be harvested for production of lumber/timber or wood pulp. Forests with a timber productivity rating of moderate to good.

Mesic A moderate soil moisture regime value whereby water is removed somewhat slowly in relation to supply. Available soil water reflects climatic inputs.

Mesotrophic Trophic state classification for lakes characterized by moderate productivity and nutrient inputs (particularly total phosphorus).

Meteoric Water That which occurs in or is derived from the atmosphere.

Micro-Habitat A small-scale surface in the landscape that has its own unique surface properties different from surrounding surfaces.

Mineral Soil Soils containing low levels of organic matter. Soils that have evolved on fluvial, glaciofluvial, lacustrine and morainal parent material.

Mitigation The elimination, reduction or control of the adverse environmental effects of the project.

Mitigative Measures Procedural, locational and timing constraints and methods employed to address project-related impacts.

Mixedwood A terrestrial forest type that is an assemblage of both deciduous and coniferous tree species.

Mixing Height The depth of surface layer in which atmospheric mixing of emissions occurs.

Modelling A simplified representation of a relationship or system of relationships. Modelling involves calculation techniques used to make quantitative estimates of an output parameter based on its relationship to input parameters.

Moisture Regime The relative moisture supply at a site available for plant growth.

Monitoring Repetitive measurement of specific environmental phenomena to document change primarily for the purpose of: a) testing impact hypotheses and predictions and b) testing mitigative measures.

Moraine Sediment generally consisting of well compacted material that is nonstratified and contains a heterogeneous mixture of particle sizes, often in a mixture of sand, silt, and clay that has been transported beneath, beside, on, within and in front of a glacier and not modified by any intermediate agent.

Multistorey	Forest stands where two or three storeys exist and each storey is significant, clearly observable and evenly distributed.
Muskeg	A soil type comprised primarily of organic matter. Also known as bog peat prevalent in northern Canada.
Native Plant	Plant species that naturally occur in a given area.
Native Species	Species that are known to be historically present in a given area.
Natural Region	The highest level in Alberta's ecological classification hierarchy; defined broadly on the basis of climate, topography, landforms and soil.
Natural Subregion	A division of the natural regions of Alberta. Areas within a natural subregion have a similar climatic regime, which is characterized by modal vegetation distinct for that subregion.
Necrosis	Death of cells and living tissue.
Nitrophillic	Nitrogen-loving plant species.
No Observed Adverse Effect Level (NOAEL)	In toxicity testing, it is the highest concentration at which no adverse effects on the measurement end point are observed.
Non-Condensable Gas	A substance that exists in a gaseous form under reservoir pressure and temperature.
Non-Native Plant	An introduced plant that has been brought over from another ecosystem by man and has established itself within its new environment.
Non-Sport Fish	Large fish which is not caught for food or sport (e.g., longnose sucker, white sucker).
Non-Vascular Plant	Plants that do not possess conductive tissues (e.g., veins) for the transport of water and food.
NO_x	A measure of the oxides of nitrogen comprised of nitric oxide (NO) and nitrogen dioxide (NO_2).
Nutrient Regime	The relative supply of nutrients available for plant growth at a given site.

Nutrients	Substances (elements or compounds), such as nitrogen or phosphorus, that are necessary for the growth and development of plants and animals.
Oil Sands	A sand deposit containing a heavy hydrocarbon (bitumen) in the intergranular pore space of sands and fine grained particles.
Oil Sands Region	The Oil Sands Region includes the Fort McMurray – Athabasca Oil Sands Subregional Integrated Resource Plan (IRP), the Lakeland Subregional IRP and the Cold Lake – Beaver River Subregional IRP.
Old Growth Forest	An ecosystem distinguished by old trees and related structural attributes. Old growth encompasses the later stages of stand development that typically differ from earlier stages in a variety of characteristics which may include tree size, accumulations of large dead woody material, number of canopy layers, species, composition, and ecosystem function. Old growth forests are those forested areas where the annual growth equals annual losses. Mean annual increment of timber volume equals zero. They can be defined as those stands that are self-regenerating (i.e., having a specific structure that is maintained).
Oligotrophic	Trophic state classification for lakes characterized by low productivity and low nutrient inputs (particularly total phosphorus).
Ombrogeneous Bog	A mineral-poor, acid, peat-forming plant community that derives all its water and dissolved nutrients, from rainfall.
Ombrotrophic	Wetlands which receive all water and nutrients from direct precipitation.
Organic Soil	Soils containing high percentages of organic matter (fibric and humic inclusions).
Organics	Organic compounds (organics) include chemicals consisting of chains or rings of carbon atoms, such as hydrocarbons, phenols, PAHs and naphthenic acids.
Orthophoto	A digital image of an aerial photograph.
Outlier	A data point that falls outside of the statistical distribution defined by the mean and standard deviation.

Outwash	A glaciofluvial sediment that is deposited by meltwater streams emanating from a glacier.
Overburden	Material below the soil profile and above the bituminous sand.
Overstorey	Those trees that form the upper canopy in a multi-layered forest.
Overwintering Habitat	Habitat used during the winter as a refuge and for feeding.
Ozone (O_3)	Ozone is a gas that occurs both in the Earth's upper atmosphere and at ground level. Ozone in the upper atmosphere protects living organisms by preventing damaging ultraviolet light from reaching the Earth's surface. Ground-level ozone is an air pollutant with harmful effects on the respiratory systems of animals.
Parasequence	a series of related layers of sediment bounded by shales that were deposited in deeper water.
Patch	An area that is different from the area around it (e.g., vegetation types, non-forested areas). This term is used to recognize that most ecosystems are not homogeneous, but rather exist as a group of patches or ecological islands.
Patterned Fen	Peatlands that display a distinctive pattern due to alterations between open wet areas (flarks) and drier shrubby to wooded areas (strings).
Peat	A material composed almost entirely of organic matter from the partial decomposition of plants growing in wet conditions.
Peatland Complex	Within a given area, a mixture of bog and fen wetlands types have formed usually as a result of variation in groundwater flow regimes.
Peatlands	Areas where there is an accumulation of peat material at least 40 cm thick. These are represented by bog and fen wetlands types.
Permafrost	Permanently frozen ground (subsoil).
Permeability	The capacity of porous rock, sediment, soil or a medium for transmitting a fluid, generally measured in Darcy [D] or millidarcy [mD].
Permissible Sound Level	The allowable overall A-weighted sound level of noise from energy industry sources, as specified by the EUB Directive 038, which may contribute to the sound environment of a residential location.

Petrophysical Well Logs	Charts produced by measuring various physical properties of rocks or sediments in a well bore.
pH	The degree of acidity (or alkalinity) of soil or solution. The pH scale is generally presented from 1 (most acidic) to 14 (most alkaline). A difference of one pH unit represents a ten-fold change in hydrogen ion concentration.
Phosphorus	The key nutrient influencing plant growth in lakes; total phosphorus includes the amount of phosphorus in solution (reactive) and in particulate form.
Photochemistry	The reaction that proceeds with the absorption of light.
Phytotoxic	Toxic or poisonous to plants or plant tissue.
Phytotoxic Metals	Metals in concentrations toxic to plants.
Piezometer	A pipe in the ground in which the elevation of water levels can be measured, or a small diameter observation well.
Pixel	The basic unit of digital imagery data. Shortened from "picture element". The intensity of each pixel corresponds to the average "brightness" measured electronically by the sensor.
Planned Development Case (PDC)	The Planned Development Case includes the Project Case components and planned developments that have been publicly disclosed at least six months prior to submission of the Environmental Impact Assessment.
Plant Community	A group of interacting plant species that exist within a defined space and time.
Plant Community Type	As part of the hierarchical classification system outlined in the Field Guide to Ecosites of Northern Alberta, this ecological unit represents the lowest level taxonomic unit of the ecosite classification system. These units are subdivisions of an ecosite phase based on differences in understorey species composition.
PM_{10}	Airborne particulate matter with a mean diameter less than 10 μm (microns) in diameter. This represents the fraction of airborne particles that can be inhaled into the upper respiratory tract.

$PM_{2.5}$	Airborne particulate matter with a mean diameter less than 2.5 µm (microns) in diameter. This represents the fraction of airborne particles that can be inhaled deeply into the pulmonary tissue.
Polycyclic Aromatic Hydrocarbon (PAH)	A chemical by-product of petroleum-related industry. Aromatics are considered to be highly toxic components of petroleum products. PAHs, many of which are potential carcinogens, are composed of at least two fused benzene rings. Toxicity increases along with molecular size and degree of alkylation of the aromatic nucleus.
Polygon	The spatial area delineated on a map to define one feature unit (e.g., one type of ecosite phase).
Population	A collection of individuals of the same species that potentially interbreed.
Population Sink	A habitat within which reproductive and mortality rates should result in population declines. However, populations may be maintained in such habitat by immigration from nearby habitats that are more productive. The term was introduced by Pulliam (1988).
Pore	The void space between sediment particles.
Porewater	Water filling the void space between sediment particles.
Porosity	The percentage of the bulk volume of a rock or soil that is occupied by pores, whether isolated or connected.
Potential Acid Input (PAI)	A composite measure of acidification determined from the relative quantities of deposition from background and industrial emissions of sulphur, nitrogen and base cations.
Produced Gas	Gas co-produced with the bitumen.
Productive Forest	Forests on lands with a capability rating of equal to or greater than three and stocked with enough trees to meet the standards of a merchantable forest.
Progradation	When a shoreline moves seaward as the result in increased sediment supply or a drop in sea level.
Project Case	The EIA case including the project that is the subject of the application, existing environmental conditions, and existing and approved projects or activities.

Puff Splitting	As the effluent puff is carried away from the source by the wind, it will disperse and break apart into smaller puffs, which in turn will break apart into even smaller puffs.
Rare Plant Community	Plant communities that are described as unusual, uncommon, of limited extent or encountered infrequently.
Rare Plant Potential	A ranking system used to determine and map the likelihood of finding rare plants or the relative abundance of rare plant species among different vegetation types or land cover classes within the landscape.
Rare Plants	A native plant species found in restricted areas, at the edge of its range or in low numbers within a province, state, territory or country.
Raster	A graphic structure where the data is divided into cells on a grid. An example would be a computer screen where an image is represented by horizontal lines of coloured pixels. Shapes are represented by cells of the same colour or content adjacent to each other.
Rating Curve	In hydrology, it typically refers to a curve showing the relation between the discharge of a river or stream and the water level in the stream.
Recharge /Discharge Area	Areas that either contribute (recharge) or take away (discharge) to/from the overall volume of groundwater in an aquifer.
Reclamation	The restoration of disturbed land or wasteland to a state of useful capability. Reclamation is the initiation of the process that leads to a sustainable landscape, including the construction of stable landforms, drainage systems, wetlands, soil reconstruction and addition of nutrients. This provides the basis for natural succession to mature ecosystems suitable for a variety of end uses.
Reclamation Certificate	A certificate issued by an Alberta Environment, Conservation and Reclamation Inspector, signifying that the terms and conditions of a conservation and reclamation approval have been complied with.

Reference Concentration (RfC)	For a specific chemical that is conceptually equivalent to an air quality objective, and is expressed in $\mu g/m^3$. It is an exposure limit that is established for chemicals which are locally acting (e.g., irritant chemicals), whose toxicity is dependent solely on the air concentration and not on the total internal dose received via multiple exposure pathways.
Regional Aquatics Monitoring Program (RAMP)	The RAMP was established to determine, evaluate and communicate the state of the aquatic environment in the Athabasca Oil Sands Region.
Regional Issues Working Group (RIWG)	A group that works to promote the responsible, sustainable development of resources within the Regional Municipality of Wood Buffalo.
Regional Study Area (RSA)	Defines the spatial extent related to the cumulative effects resulting from the project and other regional developments.
Regional Sustainable Development Strategy (RSDS)	A regulatory framework for balancing development of Alberta's oil sands resources with protection of the environment.
Regosol	The only great group in the Regosolic order. The soils in the group have insufficient horizon development to meet the requirements of the other orders.
Relative Abundance	The proportional representation of a species in a sample or a community.
Remediation	The process of planning for, investigating and potentially managing or removing the effects of chemical substances on the environment, including soil or groundwater effects.
Replicate	Duplicate analyses of an individual sample. Replicate analyses are used for measuring precision in quality control.
Resistivity	A measure of how much a material resists the flow of electricity.
Richness	The number of species in a biological community (e.g., habitat).
Rights-of-way	The strip of land over which a power line, railway line, road, etc., extends
Riparian	Refers to terrain, vegetation or simply a position next to or associated with a stream, floodplain or standing waterbody.

Risk	The possibility of injury, loss or environmental incident created by a hazard. The significance of the risk is determined by the probability on an unwanted incident and the severity of the consequences.
Rough Broken	An area having steep slopes and many intermittent drainage channels, but usually covered with vegetation.
Runoff	The portion of water from rain and snow that does not infiltrate into the ground, or evaporate.
Saline Water	Water with total dissolved solids between 1,000 and 10,000 mg/L.
Scale	Level of spatial resolution.
Scavenging	Removal of a pollutant from the air through chemical or physical processes such as dry deposition or washout by precipitation
Secondary Canopy	A well-defined, layer of trees beneath the main canopy within a forest.
Secure	A species that is not 'At Risk', 'May be at Risk', or 'Sensitive'.
Sedge	Any plant of the genus Carex, perennial herbs, often growing in dense tufts in marshy places. They have triangular jointless stems, a spiked inflorescence and long grass-like leaves which are usually rough on the margins and midrib. There are several hundred species.
Sediment	Solid material that is transported by, suspended in, or deposited from water.
Sediment Yield	The amount of sediment transported by a stream system that may be measurable at a particular location. Usually expressed in volume or weight per unit of time.
Sedimentation	The process of the deposition of suspended particles carried by water, wastewater or other liquids, by gravity. It usually occurs through a reduction in the velocity of the liquid below the point which it can transport the suspended material.
Sensitive	Any species that is not at risk of extinction or extirpation but may require special attention or protection to prevent it from becoming at risk.

Sensory Disturbance Visual, auditory, or olfactory stimulus which creates a negative response in wildlife species.

Sentinel Species Species that can be used as an indicator of environmental conditions.

Shadow Population The people who live in work camps, campgrounds or hotels in the Athabasca Oil Sands Region.

Shannon's Evenness Index (SHEI) Distribution of area among or within patch types in the landscape.

Shoreface The portion of the ocean or lake bottom that affected by wave action.

Shredder Insect A herbivorous or detritivorous aquatic insect that chews or gorges vascular plants, decaying plant material or woody material as a food source.

Sink Habitat A habitat within which reproductive and mortality rates should result in population declines. However, populations may be maintained in such habitat by immigration from nearby habitats that are more productive. The term was introduced by Pulliam (1988).

Sinuosity The ratio of the thalweg length (i.e., the line connecting the deepest points along a stream) to valley length, for a specific reach of a river or stream system. This is, in essence, a ratio of the stream's actual "running" length to its down-gradient length.

Site Index The average height of undamaged, dominant and co-dominant trees in a stand at a standard (reference) age that have been free-growing since reaching breast height.

Snag A naturally occurring, standing dead or dying tree often missing a top or most of the smaller branches.

Soil Heat Flux The soil heat flux constant is a function of the surface properties and is used to compute the flux of heat into the soil.

Soil Horizon A layer of mineral or organic soil material approximately parallel to the land surface that has characteristics altered by processes of soil formation. A soil mineral horizon is a horizon with 17% or less total organic carbon by weight. A soil organic horizon is a horizon with more than 17% organic carbon by weight.

Soil Nutrient	A chemical element or compound found in the soil that is essential for plant growth.
Soil Series	The basic unit of soil classification in the Canadian System of Soil Classification and consists of soils that are essentially alike in all major profile characteristics except the texture at the surface.
Solar Radiation	The principal portion of the solar spectrum that spans from approximately 300 nanometres (nm) to 4,000 nm in the electromagnetic spectrum. It is measured in W/m2, which is radiation energy per second per unit area.
Sound Power	The rate of acoustic energy flow across a specified surface, or emitted by a specified sound source. Units W (Watt).
Spawning	The reproductive stage of adult fish which includes fertilization and deposition of eggs.
Special Concern (Vulnerable)	A species is of special concern because of characteristics that make it particularly sensitive to human activities or natural events.
Special Plant Community	Communities that are suspected to be rare or unique but are differentiated from known rare plant communities in that there is less information known about them, and currently, are not included on ANHIC's Preliminary Ecological Community Tracking and Watch List.
Species	A taxonomic grouping of genetically and morphologically similar individuals that actually or potentially interbreed and are reproductively isolated from all other such groups.
Species Abundance	The number of individuals of a particular species within a biological community (e.g., habitat).
Species Composition	The number and abundance of species found within a biological community.
Species Distribution	Where the various species in an ecosystem are found at any given time. Species distribution varies with season.
Species Diversity	A description of a biological community that includes both the number of different species and their relative abundance. Provides a measure of the variation in number of species in a region.
Species Richness	The number of different species occupying a given area.

Spectral Signature	The unique characteristics in solar reflectance of a particular land classification unit based upon multi-spectral satellite imagery.
Sphagnum	A genus of peat-forming moss.
Sport Fish	Large fish caught for food or sport (e.g., northern pike, Arctic grayling).
Stand	A group of trees occupying a specific area and sufficiently uniform in composition, age, arrangement and condition so that it is distinguished from trees in adjoining areas.
Stand Age	The number of years since a forest has been affected by a stand-replacing disturbance event (e.g., fire or logging) and has since been regenerating.
Stand Density	The relative closure of a forest canopy.
Stand Structure	The various horizontal and vertical physical elements of the forest. The physical appearance of canopy and subcanopy trees and snags, shrub and herbaceous layers and downed woody material.
Standard Deviation (SD)	A measure of the variability or spread of the measurements about the mean. It is calculated as the positive square root of the variance.
Steam Assisted Gravity Drainage (SAGD)	An in-situ oil sands recovery technique that involves the use of two horizontal wells, one to inject steam and a second to produce the bitumen.
Stomata	Microscopic pores found on the under side of leaves.
Stomatal Closure	The movement of stomata guard cells to slow or prevent gas exchange between the plant and its environment.
Storativity	The volume of water an aquifer releases from or takes into storage due to pressure change.
Stratify	Layering of lakes into two or more non-mixing layers; in summer, typically a layer of warmer, less dense water lies on a cooler, denser layer; in winter, typically a layer of very cold (<4°C), less dense water overlies warmer, denser water (approximately 4°C).
Stratigraphy (Historical)	The succession and age of strata of rock and unconsolidated material. Also concerns the form, distribution, lithologic composition, fossil content and other properties of the strata.

Stream Flow The movement of surface water in a stream channel, usually measured in cubic metres per second (m^3/s).

Stream-Day Maximum daily production rate (design capacity) for equipment. Takes into account non-operational time due to plant turnarounds, and/or emergencies. Calculated based on 93% plant availability.

Study Area The geographic limits within which an impact to a key indicator resource or social component is likely to be significant.

Subhydric Soil moisture conditions where water is removed slowly enough to keep the water table at or near the surface for most of the year; organic and gleyed mineral soils are present as well as permanent seepage less than 30 cm below the surface.

Subhygric Soil moisture conditions where water is removed slowly enough to keep the soil wet for a significant part of the growing season. There is some temporary seepage and possible mottling below 20 cm.

Submesic Soil moisture conditions where water is removed readily in relation to supply. Water is available for moderately short periods following precipitation.

Subsoil The stratum of weathered material that underlies the surface soil, including one or more of the following:

(i) that portion of the B horizon left after salvage of upland surface soil;

(ii) the C horizon of an upland soil;

(iii) underlying parent material at an upland location that is rated good, fair or poor; and

(iv) mineral material below an organic layer at a location other than upland, that is rated good, fair or poor.

Subxeric Soil moisture conditions where water is removed rapidly in relation to supply. Soil is moist for short periods following precipitation.

Succession A series of dynamic changes by which one group of organisms succeeds another through stages leading to a climax community.

Supernatant The liquidor clear fluid above a precipitate or sediment

Synthetic Crude Oil A mixture of hydrocarbons, similar to crude oil, derived from upgrading bitumen from oil sands.

Taxa	A group of organisms of any taxonomic rank (e.g., family, genus, or species).
Thallus	A simple vegetative body undifferentiated into true leaves, stem and root, ranging from an aggregation of filaments to a complex plantlike form.
Thalweg	A line extending longitudinally along a watercourse following the deepest portion of the channel.
Threatened	A species likely to become endangered if limiting factors are not reversed.
Threshold Chemicals	Chemicals that act via a threshold mechanism of action require a minimal concentration level to produce adverse effects. Below this specific threshold level, there is no potential for adverse effects to occur.
Threshold Limit Value (TLV)	The air concentration of a chemical below which workers may be repeatedly exposed day after day, without any occurrence of health effects. Threshold limit values are recommended occupational exposure limits designed to control potential adverse effects associated with workplace exposure.
Till	Sediments laid down by glacial ice.
Topsoil	Ae, Ah, Ahe, Ahj and gleyed and weakly gleyed versions of these horizons are usually considered to be part of the topsoil.
Total Dissolved Solids (TDS)	The total concentration of all dissolved compounds solids found in a water sample.
Total Recoverable Hydrocarbons	A term that refers to total petroleum hydrocarbons recovered using a solvent-specific extraction procedure.
Total Reduced Sulphur (TRS)	A term used to collectively describe hydrogen sulphide and mercaptans.
Total Suspended Solids (TSS)	The amount of suspended substances in a water sample.
Toxic	A substance, dose or concentration that is harmful to a living organism.

Toxicity	The inherent potential or capacity of a material to cause adverse effects in a living organism.
Toxicity Reference Value (TRV)	The maximum acceptable dose (per unit body weight and unit of time) of a chemical to which a specified receptor can be exposed. Also referred to as exposure limit.
Traditional Ecological Knowledge (TEK)	Knowledge and understanding of traditional resource and land use, harvesting and special places.
Traditional Land Use (TLU)	Activities involving the harvest of traditional resources such as hunting and trapping, fishing, gathering medicinal plants and travelling to engage in these activities.
Traditional Plant Potential	A ranking system used to determine and map the relative abundance of traditional use plant species among different vegetation types or land cover classes within the landscape.
Traditional Resources	Plants, animals and mineral resources that are traditionally used by indigenous populations.
Traditional Use Plants	Plants used by aboriginal people of a region as part of their traditional lifestyle for food, ceremonial, medicinal and other purposes.
Training Site	A group of selected satellite imagery pixels used to define the spectral signature of a particular map unit for land classification purposes.
Transmissivity	The product of the average coefficient of hydraulic conductivity (or permeability) and the thickness of the aquifer. Consequently, transmissivity is the rate of flow under a hydraulic gradient equal to unity through a cross-section of unit width over the whole thickness of the aquifer.
Transpiration	The transfer of water from soil and plant surfaces to the air.
Treater	A vessel in which oil is treated for the removal of sediment and water using heat, chemicals and/or electricity.
Trophic	Pertaining to part of a food chain, for example, the primary producers are a trophic level just as tertiary consumers are another trophic level.

Turbidity	An indirect measure of suspended particles, such as silt, clay, organic matter, plankton and microscopic organisms, in water.
Understorey	Trees or other vegetation in a forest that exist below the main canopy level.
Ungulate	Belonging to the former order Ungulata, now divided into the orders Perissodactyla and Artiodactyla, and composed of the hoofed mammals such as horses, cattle, deer, swine and elephants.
Upland	Areas that have typical ground slopes of 1 to 3% and are better-drainage.
Upset Conditions	An acute time period within which usual conditions become highly unfavourable; severity and duration may vary.
Vascular Plant	Plants possessing conductive tissues (e.g., veins) for the transport of water and food.
Volatile Organic Compounds (VOC)	Volatile Organic Compounds include aldehydes and all of the hydrocarbons except for ethane and methane. VOCs represent the airborne organic compounds likely to undergo or have a role in the chemical transformation of pollutants in the atmosphere.
Water Sand	A water-saturated sand unit occurring within a geological formation.
Water Table	The shallowest saturated ground below ground level – technically, that surface of a body of unconfined groundwater in which the pressure is equal to atmospheric pressure.
Water Yield	Runoff, including groundwater outflow that appears in the stream, plus groundwater outflow that leaves the basin underground. Water yield is the precipitation minus the evapotranspiration.
Waterbody	A standing body of water such as a lake or pond.
Watercourse	A flowing body of water such as a river, stream or creek.
Watershed	The entire surface drainage area that contributes water to a lake or river.
Weeds	Plants that are defined as controlled weeds, nuisance weeds, or noxious weeds by the Weed Control Act, as amended.
Wellbore	Also borehole. The hole drilled by the bit (can be cased or open).

Wetlands	Wetlands are land where the water table is at, near or above the surface or which is saturated for a long enough period to promote such features as wet-altered soils and water tolerant vegetation. Wetlands include organic wetlands or "peatlands," and mineral wetlands or mineral soil areas that are influenced by excess water but produce little or no peat.
Wind Shear	A difference in wind speed and/or direction over a relatively short distance in the atmosphere.
Windrose	Graphic pie-type representation of frequencies of wind directions and speeds over a period of time (e.g., one year) for a meteorological station.
Xeric	Soil moisture conditions where water is removed very rapidly in relation to supply. Soil is only moist for a very short time following precipitation.
Young of the Year (YOY)	Fish at age 0, within the first year after hatching.

ABBREVIATIONS

°	Degree
°C	Temperature in degrees Celsius
%	Percent
%OM	Percent Organic Matter
≥	More than or equal to
<	Less than
>	More than
±	Plus or minus
≤	Less than or equal to
2-D	Two dimensional
3-D	Three dimensional
AAAQO	Alberta Ambient Air Quality Objectives
AAC	Annual Allowable Cut
AADT	Annual Average Daily Traffic Counts
AAFRD	Alberta Agriculture, Food And Rural Development
ACGIH	American Conference of Governmental Industrial Hygienists
AEII	Alberta Employment, Immigration and Industry
AENV	Alberta Environment
AEP	Alberta Environmental Protection
AGL	Above Ground Level
AHW	Alberta Health and Wellness
AICc	Akaike's Information Criterion
Al	Aluminum
Albian Sands	Albian Sands Energy Inc. (Muskeg River Mine)
Al-Pac	Alberta-Pacific Forest Industries Inc.
AMAH	Alberta Municipal Affairs and Housing
ANC	Acid Neutralizing Capacity
ANC_{lim}	Critical value for acid neutralizing capacity
ANC_{org}	Weak Organic Acids
ANHIC	Alberta Natural Heritage Information Centre
ANOVA	Analysis of Variance
ANPC	Alberta Native Plant Council
AOSERP	Alberta Oil Sands Environmental Research Program
AOSP	Athabasca Oil Sands Project
AP	Aquifer Productivity

AQS	Air Quality Monitoring Station
ARC	Alberta Research Council
AREA_CV	Patch Size Coefficient of Variation
AREA_MD	Patch Size Median
AREA_MN	Patch Size Mean
AREA_SD	Patch Size Standard Deviation
ARHA	Aspen Regional Health Authority
ASIR	Age-Standardized Incidence Rates
ASMR	Age-Standardized Mortality Rates
ASRD	Alberta Sustainable Resource Development
ATC	Athabasca Tribal Council
ATC-APCA	Athabasca Tribal Council - All Parties Core Agreement
atm	Atmosphere
ATPRC	Alberta Tourism, Parks, Recreation and Culture
ATSDR	Agency for Toxic Substances and Disease Registry
ATV	All-terrain vehicle
AVI	Alberta Vegetation Inventory
Aw	Aspen (Populus Tremuloides)
AWI	Alberta Wetlands Inventory
B	Bog
BC	Base Cation
BC MWLAP	British Columbia Ministry of Water, Land and Air Protection
BC/Al	Base Cation/Aluminum
BC/H	Base Cation/Hydrogen
BCF	Bioconcentration Factors
BFW	Boiler Feedwater
Bhp	Brake-horsepower
BLFN	Beaver Lake First Nation
BMC	Benchmark Concentration
BMD_{05}	Benchmark Dose
$BMDL_{05}$	Benchmark Dose Confidence Limit
BMI	Body Mass Index
bpcd	Barrels per calendar day
bpd	Barrels per day
Bs	Shallow Bog
BS&W	Basic Sediment and Water
BSE	Bovine Spongiform Encephalopathy

BSL	Basic sound level
BSOD	Biological Species Observation Database
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
BU	Burn/Partial Burn
Bw	White Birch (Betula Papyrifera)
bw/d	Body weight per day
C	Coniferous
C&R	Conservation And Reclamation
C,C&R	Closure, Conservation And Reclamation
C_1	Methane
C_2	Ethane
C_3+	Hydrocarbon molecules with more than three carbon atoms
C_7	Heptane
Ca	Calcium
CA	Class Area
Ca^{2+}	Calcium base cation (particle)
$CaCO_3$	Calcium carbonate
CadnaA	Computer Aided Noise Attenuation
CAI_AM	Core Area Index Area Weighted Mean
Cal/Kg·˚C	Calories per Kilogram degrees Celcius
Cal/m·sec·˚C	Calories per metres seconds degrees Celcius
CAPP	Canadian Association of Petroleum Producers
CARB	California Air Resources Board
CASA	Clean Air Strategic Alliance
CBOD	Carbonaceous Biochemical Oxygen Demand
CC	Clearcut Modifier
CCA	Conklin Community Association
CCIS	Canadian Climate Impact Scenarios
CCME	Canadian Council of Ministers of the Environment
CEA	Cumulative Effects Assessment
CEAA	*Canadian Environmental Assessment Act*
CEC	Cation Exchange Capacity
CEMA	Cumulative Environmental Management Association
CEPA	*Canadian Environmental Protection Act*
CFSA	Child and Family Services Authority
CGCM2	Canadian Global Coupled Model – Version 2
CH_4	Methane

CHA	Cardiovascular Hospital Admissions
CHTD	Canadian Historical Temperature Database
CICS	Canadian Institute for Climate Studies
Cl	Chloride
CL	Clearing
CLI	Canada Land Inventory
CLRP	Christina Lake Regional Project
cm	Centimetre
cm^2	Square centimetre
CNIT	Core Needs Income Threshold
CNS	Central Nervous System
CO	Carbon monoxide
CO_2	Carbon dioxide
CONRAD	Canadian Oil Sands Network for Research and Development
COPC	Chemicals of Potential Concern
COPD	Chronic Obstructive Pulmonary Disease
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPDFN	Chipewyan Prairie Dene First Nation
CST	Central Standard Time
CWS	Canada-Wide Standards
d	Day
D	Deciduous
DAWS	De-Aromatized White Spirit Vapours
dB	Decibel, a measure of sound power
dBA	A-weighted decibels
dBC	C-Weighted decibels
dbh	Diameter at Breast Height
DCA	Detrended Correspondence Analysis
DEM	Digital Elevation Model
Devon	Devon Canada Corporation
df	Degrees of Freedom
DFO	Fisheries and Oceans Canada (Note: formerly Department of Fisheries and Oceans Canada)
dis	Disturbed
DO	Dissolved Oxygen
DOC	Dissolved Organic Carbon
DOE	Department of the Environment
DOW	Dangerous Oilfield Waste

DQRA	Detailed Quantitative Risk Assessment
DST	Drill Stem Test
DW	Drinking Water
E	East
E	Eolian
e.g.	For example
EAC	Existing and Approved Case
EC	Effect Concentration
EC	Electrical Conductivity
Eco-SSLs	Ecological Soil Screening Levels
ECS	Early Childhood Services (Education)
EDI	Estimated daily intake
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EIFAC	European Inland Fisheries Advisory Commission
ELC	Ecological Land Classification
EMS	Emergency Medical Services
EnCana	EnCana Corporation
ENN_CV	Euclidean Nearest Neighbour Median
ENN_MD	Euclidean Nearest Neighbour Coefficient of Variation
ENN_MN	Euclidian Nearest Neighbour Distance
ENN_SD	Euclidean Nearest Neighbour Standard Deviation
EPCM	Engineering, Procurement and Construction Management
EPEA	Alberta *Environmental Protection and Enhancement Act*
ERA	Ecological Risk Assessment
ERCB	Energy Resources Conservation Board
ERP	Emergency Response Plan
ESA	Environmentally Significant Area
ESAR	East Sise of the Athabasca River Caribou Range
ESD	Emergency Shut Down
ESL	Effects Screening Level
ESP	Exchangeable Sodium Percentage
ESR	Environmental Setting Report
ESRI	Environmental Systems Research Institute
EST	Eastern Standard Time
et al.	Group of authors
EUB	Alberta Energy and Utilities Board

F	Fluvial
F	Statistical Test Using F Distribution To Determine If Significant Differences Between 2 Means
Fb	Balsam Fir (Abies Balsamea)
FB	Fractional bias
FCSS	Family and Community Support Services
Fg	Glaciofluvial
FLE	Full Load Equivalent
FMA	Forest Management Agreement
FMES	Fort McKay Environmental Services Ltd.
FMFN	Fort McMurray First Nation
FMFN-IRC	Fort McMurray First Nation – Industrial Relations Corporation
FMU	Forestry Management Unit
FPAC	Forest Products Association of Canada
FPTCCCEA	Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment
FRAC_MN	Mean Patch Fractal Dimension
FWKO	Free Water Knock Out
FWMIS	Fish and Wildlife Management Information System
g	Grams
g/bhp-hr	Grams per brake horsepower-hour
g/d	Grams per day
g/L	Grams per litre
g/m^2/d	Grams per square metres per day
g/s	Grams per second
GCM	Global Climate Models
GCM	General Circulation Model
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIC	Groundwater Information Center
GIS	Geographic Information System
Golder	Golder Associates Ltd.
GPS	Global Positioning System
GSA	Geological Study Area
H:V	Ratio of Horizontal Length (H) to Vertical Length (V) for a Specific Slope
H^+	Hydrogen Ions
H_2O	Water
H_2S	Hydrogen sulphide

H_2SO_4	Sulfuric acid
ha	Hectare
HC	Health Canada
HCO_3	Bicarbonate
HEC	Human Equivalent Concentration
HEMP	Human Exposure Monitoring Program
HHRA	Human Health Risk Assessment
HLFN	Heart Lake First Nation
HLS	Hot Lime Softener
HMW	High Molecular Weight
HNO_3	Nitric acid (gas)
HQ	Hazard Quotient
HRSG	Heat Recovery Steam Generator
HS	Habitat Suitability
HS&E	Health, Safety and Environment
HSDB	National Library of Medicine's Hazardous Substances Data Bank
HSI	Habitat Suitability Index
Husky	Husky Energy
Hwy	Highway
Hz	Hertz
i.e.	That is
ID	Improvement District
ID	Interim Directive
IJI	Interspersion/Juxtaposition
ILCR	Incremental Lifetime Cancer Risk
Imperial Oil	Imperial Oil Resources Ventures Limited
INAC	Indian and Northern Affairs Canada
IPCC	Intergovernmental Panel on Climate Change
IPCS	International Programme on Chemical Safety
IPM	Individual PAH Method
IR	Indian Reserve
IR	Ingestion Rate
IRC	Industry Relations Corporation
IRIS	Integrated Risk Information System
IRP	Integrated Resource Plan
ISC3	Industrial Source Complex Model, Version 3
ISO	International Organization for Standardization

ISQG	Interim Sediment Quality Guidelines
JEMA	Jackpine Expansion Mining Area
K	Carrying Capacity
K	Degrees Kelvin
K	Potassium
keq	Kiloequivalent – equal to 1 kmol of hydrogen ion (H^+)
keq N/ha/yr	Kiloequivalent of nitrogen per hectares per year
keq/ha/yr	Kiloequivalent per hectares per year
kg	Kilogram
kg-ww	Kilogram in wet weight
kHz	Kilohertz
KIRs	Key Indicator Resources
km	Kilometre
km/hr	Kilometre per hour
km^2	Square kilometre
kmol	Kilomole
K_{ow}	Octanol-water partition coefficient
kPa	Kilopascals
kW	Kilowatt
L	Litre
L/d	Litre per day
L/ha/yr	Litre per hectare per year
L/kg	Litres per kilogram
LAI	Leaf Area Index
LC50	Lethal Concentration 50
LCR	Lifetime Cancer Risk
LEC	Lowest Effective Concentration
L_{eq}	Equivalent continuous sound level
LFg/M	Glaciofluvial and Glaciolacustrine Over Moraine
LFH	Litter, Fibric and Humic
LFN	Low Frequency Noise
Lg	Glaciolacustrine
LGP	Low Ground Pressure
LICA	Lakeland Industry and Community Association
LMW	Low Molecular Weight
LOAEL	Lowest Observed Adverse Effect Level
Log	Base 10 logarithm

-log	Negative logarithm
Log K_{ow}	Logarithmic octanol-water partition coefficient
LP	Low Pressure
LRSYA	Long Run Sustained Yield Average
LSA	Local Study Area
LSD	Legal Subdivision
Lt	Tamarack (Larix Laricina)
LZA	Linkage Zone Analysis
m	Metre
M	Moraine
M.D.	Municipal District
m/s	Metres per second
M1	Morainal – Fine Textured
M2	Morainal – Coarse Textured
m^2	Square metres
m^3	Cubic Metre
m^3/cd	Cubic metres per calendar day
m^3/d	Cubic metre per day
m^3/ha	Cubic metres per hectare
m^3/min	Cubic metres per minute
m^3/mol	Cubic metres per mole
m^3/s	Cubic metres per second
m^3/sd	Cubic meters per stream day
m^3/y	Cubic metres per year
M^4/s^3	SI unit for Buoyancy Flux
MA DEP	Massachusetts Department of Environmental Protection
MAC	Maximum Accepatable Concentration
MAI	Mean Annual Increment
masl	Metres above sea level
max.	Maximum
mb	Millibar
mbgs	Meters below ground surface
mbKB	Meters below Kelly Bushing
mbsl	Meters below seal level
mbtc	Meters below top of casing
MCC	Motor Control Centre
MDL	Method detection limit
MEG	MEG Energy Corp.

meq/L	Millequivalent per litre
Mg	Magnesium
mg	Milligrams
mg/kg	Milligrams per kilogram
mg/kg BW/day	Milligrams per kilogram body weight per day
mg/kg/ww	Milligrams per kilogram in wet weight
mg/L	Milligrams per litre
mg/m^2/yr	Milligram per square metre per year
Mg/m^3	Milligrams per cubic metre
Min	Minimum
MJ/m^3	Megajoules per cubic metre
MJ/s	Megajoules per second
mKB	Meters from the Kelly bushing
mm	Millimetre
MM	Mesoscale Model
mm/yr	Millimetre per year
MMBTU/hr	Million British Thermal Units per hour
mmHG	Millimetres of mercury
MN	Mean Patch Size
MNA	Métis Nation of Alberta
mod1	Alberta Vegetation Inventory (AVI) Data Field for Codes Representing Conditions or Treatments Providing Additional Information About the Origin or Condition of the Cover Type
MOU	Memorandum of Understanding
MPOI	Maximum Points of Impingement
MPRL	Maximum Permissible Risk Level
MPS	Mean Patch Size
MRL	Minimum Risk Level
MSC	Meteorological Service of Canada
MSDS	Material Safety Data Sheet
MSI	Municipal Sustainability Initiative
MST	Mountain Standard Time
MW	Megawatt
N	North
N	Fen
N	Nitrogen
n	Number of samples
N/A and n/a	Not applicable

n/d	No data
N_2	Nitrogen Gas
N_2O	Nitrous Oxide
Na	Sodium
NAD	North American Datum
NAIT	Northern Alberta Institute of Technology
NCAR	National Center of Atmospheric Research
NCG	Non-Condensable Gas
ng/g	Nanograms per gram
Ng/m^3	Nanograms per cubic metre
NH_4	Ammonia
NHA	Nunee Health Authority
Ni	Nickel
NLHR	Northern Lights Health Region
NLRHA	Northern Lights Regional Health Authority
NLSD	Northern Lights School Division
NO	Nitric oxide (gas)
NO_2	Nitrogen dioxide (gas)
NO_3^-	Nitrate (particle)
NOAEC	No Observable Adverse Effect Concentration
NOAEL	No Observed Adverse Effect Level
NOEL	No Observed Effect Level
NO_X	Oxides of nitrogen (NO, NO_2) (gas), or all nitrogen species (e.g., NO_X, N_2O, NO_3)
NP	Number of Patches
NPV	Net Present Value
Ns	Shallow Fen
NSD	Northland School Division
NSMWG	NO_x/SO_x Management Working Group
NTP	National Toxicity Program Chemical Repository
NTS	National Topographic Survey
NWT	Northwest Territories
O_2	Oxygen (gas)
O_3	Ozone
OEHHA	Office of Environmental; Health Hazard Assessment
OLDCON	Old Coniferous
OMOE	Ontario Ministry of the Environment
ORF	Oil Removal Filter

ORP	Oxidation Reduction Potential
OSCA	*Oil Sands Conservation Act*
OSE	Oil Sands Exploration
OSHA	Alberta Occupational Safety and Health Act
OSVRC	Oil Sands Vegetation Reclamation Committee
OSWWG	Oil Sands Wetlands Working Group
OTSG	Once Through Steam Generator
P	Phosphorous
Pa	Pascal
PACE	Preparation for Academic and Career Education
PAH	Polycyclic Aromatic Hydrocarbon
PAI	Potential Acid Input
PDA	Project Development Area
PDC	Planned Development Case
PDD	Public Disclosure Document
PDF	Probability Density Function
PEL	Probable Effects Level
Pers. Comm.	Personal Communication
PG	Pasquill-Gifford
PHC	Petroleum Hydrocarbon
PID	Pressure Induced Drawdown
Pj	Jack Pine (Pinus Banksiana)
PM	Particulate matter
PM_{10}	Particulate matter with nominally smaller than 10 μm in diameter
$PM_{2.5}$	Particulate matter with nominally smaller than 2.5 μm in diameter
POI	Point of Impingement
ppb	Parts per billion
PPC	Plume Path Coefficient
ppm	Parts per million
ppmv	Parts per million by volume
ppmw	Parts per million by weight
PQRA	Preliminary Quantitative Risk Assessment
PR	Patch Richness
PRMA	Pierre River Mining Area
PSL	Permissible Sound Level
PST	Pacific Standard Time
PSU	Pennsylvania State University

Pt	Platinum
pTDI	provisional Total Daily Intake
PVA	Population Viability Analysis
P-value	The Probability of Quantifying the Strength of the Evidence Against a Null Hypothesis
Q	Quarter (i.e., three months of a year)
QA/QC	Quality Assurance/Quality Control
RAMP	Regional Aquatics Monitoring Program
REL	Reference Exposure Level
RELAD	Regional Lagrangian Acid Deposition Model
RfC	Reference Concentration
RfD	Reference Dose
RFMA	Registered Fur Management Areas
Rge, Rg or R	Range
RHA	Respiratory Hospital Admissions
RIC	Resources Inventory Commitee
RIVAD/ARM3	Regional Impact in Visibility and Acid Deposition/Acid Rain Mountain Mesoscale Model
RIVM	Netherlands National Institute of Public Health and the Environment
RIWG	Regional Issues Working Group
RMWB	Regional Municipality of Wood Buffalo
ROC	Receiver Operating Characteristic
ROW	Rights-of-Way
RQ	Risk Quotients
RSA	Regional Study Area
RsC	Risk-specific concentration
RsD	Risk Specific Dose
RSDS	Regional Sustainable Development Strategy for the Athabasca Oil Sands
RSF	Resource Selection Function
RV	Recreational Vehicle
RWG	Reclamation Working Group
S	South
S	Sulphur
s/cm	Light soaking time in seconds (s) per 1 centimetre
SAC	Strong Acid Cation
SAF	Slurry-at-face
SAGD	Steam Assisted Gravity Drainage
SAGP	Steam Assisted Gravity Push

SA_{org}	Strong Organic Acids
SAR	Sodium Adsorption Ratio
SARA	*Species At Risk Act*
SAS	Statistical Analysis System
Sb	Black Spruce (Picea Mariana)
SCA	Soil Correlation Area
Sd	Standard Deviation
SDI	Simpsons' Diversity Index
SE	Standard Error
SEIA	Socio-Economic Impact Assessment
SETG	Socio-Economic Task Group
SEWG	Sustainable Ecosystems Working Group of CEMA
SF	Slope Factor
SHEI	Shannon's Evenness Index
Shell	Shell Canada Limited
SI	Suitability Index
SK	Saskatchewan
SLERA	Screening-Level Ecological Risk Assessment
SLWRA	Screening-Level Wildlife Risk Assessment
Sm^3	standard cubic metre
SO_2	Sulphur dioxide
SO_4	Sulphate
SO_4^{2-}	Sulphate (particle)
SOPs	Standard Operating Procedures
sp.	Unknown Species (Singular)
spp	Multiple Species
spp.	Unknown Species (Plural)
Sq. Ft.	Square feet
SQG	Soil Quality Guidelines
SRES	Special Report on Emissions Scenarios, by the Intergovernmental Panel on Climate Change
SRU	Sulphur Recovery Unit
ssp.	Subspecies
SSWC	Steady-State Water Chemistry
Statoil	StatoilHydro Canada Ltd.
STEL	Short-term Exposure Limit

Suncor	Suncor Energy Inc. (Lease 86/17, Steepbank, Millennium, Voyageur, Firebag)
Sw	White Spruce (Picea Glauca)
SWWG	Surface Water Working Group of CEMA
Synenco	Synenco Energy Inc.
t/cd	Tonnes per calendar day
t/d	Tonnes per day
t/sd	Tonnes per stream day
TASA	Terrestrial Air Study Area
TC_{05}	Tumourigenic Concentration
TCA	Tolerable Concentration in Air
TCEQ	Texas Commission on Environmental Quality
TCU	True Colour Unit
TD_{05}	Tolerable Dose
TDGR	Transportation of Dangerous Goods Regulations
TDI	Tolerable Daily Intake
TDS	Total Dissolved Solids
TE	Total Edge
TEEM	Terrestrial Environmental Effects Monitoring Program of WBEA
TEF	Toxic Equivalency Factor
TEK	Traditional Ecological Knowledge
Temp.	Temperature
The Project	Christina Lake Regional Project – Phase 3
TK	Traditional Knowledge
TKN	Total Kjeldahl nitrogen
TLU	Traditional Land Use
TLV	Threshold Limit Values
TN	Total Nitrogen
TOC	Total Organic Carbon
TOR	Terms of Reference
TOXLINE	National Library of Medicine's Toxicology Literature Online
TP	Total Phosphorus
TPR	Timber Productivity Rating
TRS	Total Reduced Sulphur
TRV	Toxicity Reference Value
TSS	Total Suspended Solids
TWA	Time Weighted Average
TWINSPAN	Two-Way Indicator Species Analysis

Twp. Or Tp	Township
U.S.	United States
U.S. EPA	United States Environmental Protection Agency
UCLM	Upper Confidence Limits of the Mean
UL	Tolerable Upper Intake Levels
URE	Unit Risk Estimates
USGS	United States Geological Survey
UTF	Underground Test Facility
UTM	Universal Transverse Mercator
V	Vanadium
VEC	Valued Ecosystem Component
VOC	Volatile Organic Compound
VRU	Vapour Recovery Unit
vs.	Versus
W	West
W/m^2	Watts per square metre
W4M	West of the Fourth Meridian
WAC	Weak Acid Cation
WBEA	Wood Buffalo Environmental Association
WBNP	Wood Buffalo National Park
WDS	Water Data System
WF	Windfall
WHO	World Health Organization
WMU	Wildlife Management Unit
WRS	Western Resource Solutions
wt	Weight
wt%	Weight Percentage
yr	Year
z_0	Roughness Length
λ	Rate of increase
µg/d	Micrograms per day
µg/kg	Micrograms per kilogram
µg/kg/d	Micrograms per kilogram per day
µeq/L	Microequivalent per litre
µg/g	Micrograms per gram
µg/kg bw/d	Micrograms per kilogram body weight per day
µg/L	Micrograms per litre

µg/m^3	Micrograms per cubic metre
µg/m^3/yr	Micrograms per cubic metre per year
µm	Micron or Micrometre
µPa	Micropascal
µS/cm	Microsiemens per centimetre

APPENDIX 2-I

TERMS OF REFERENCE

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APPENDIX 2-II

QUALITY ASSURANCE AND QUALITY CONTROL

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APPENDIX 2-III

CLIMATE CHANGE CONSIDERATIONS

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APPENDIX 2-IV

COMMON AND SCIENTIFIC NAMES

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APPENDIX 2-V

MONITORING PROGRAMS

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APPENDIX 2-VI

REGIONAL DEVELOPMENTS

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APPENDIX 2-VII

CONCORDANCE TABLES

LIST OF TABLES

Table 1 Final Terms of Reference Issued by Alberta Environment - Concordance 1
Table 2 Alberta EPEA Guide to Content for Industrial Approval Applications (AENV 1999).....38
Table 3 ERCB Directive 023 Information Requirements (EUB 1991) 41

Table 1 Final Terms of Reference Issued by Alberta Environment - Concordance

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
1.0 INTRODUCTION		
1.1 Background	MEG Energy Corp. (MEG) is a Calgary-based, private energy company focused on the development and recovery of bitumen, shallow gas reserves and the generation of power in northeast Alberta. MEG owns 80 sections of oil sands lease in the Christina Lake area. MEG currently has approval to construct and operate the first two phases of the Christina Lake Regional Project (CLRP) on 23 sections of land. In addition, MEG has filed a regulatory application (Phase 2B) to increase the production capacity of the Central Processing Facility to 60 000 b/d. The Phase 2B plant will be located immediately adjacent to the existing Phase 1 and 2 processing facilities. MEG is now proposing a further expansion of the CLRP to develop the remainder of its oil sands lease. The Project would be an expansion at the current CLRP site and would utilize the Steam Assisted Gravity Drainage (SAGD) oil recovery technology. The Project would consist of two additional central processing facilities, SAGD wells and additional infrastructure. The Project will be designed and built to produce an incremental 150 000 barrels per day of bitumen (approximately 23 800 cubic metres per day). This production will be in addition to the 60,000 barrels of bitumen per day from the Phase 2 and proposed 2B operation, resulting in a total production of 210,000 barrels of bitumen per day (approximately 33 400 cubic meters per day). The purpose of this document is to identify for MEG and appropriate stakeholders the information required by government agencies for an Environmental Impact Assessment (EIA) report prepared under the *Environmental Protection and Enhancement Act (EPEA)*.	Volume 1, Section 1.2
1.2 Scope of Environmental Impact Assessment Report	MEG will prepare and submit an EIA that examines the environmental and socio-economic effects of the construction, operation and reclamation of the Project. The EIA report shall be prepared with consideration to all applicable provincial and federal legislation, codes of practice, guidelines, standards and directives. The Proponent must identify the legislation, policies, approvals, and current multi-stakeholder planning initiatives applicable to the review of this Project. The EIA report shall be prepared in accordance with these Terms of Reference and the environmental information requirements prescribed under the EPEA and associated regulations and the *Canadian Environmental Assessment Act* if applicable. The EIA report will form part of MEG's application to the Alberta Energy and Utilities Board (EUB). An EIA report summary will also be included as part of the EUB Application.	Volumes 3 to 6
	The EIA report will include a glossary of terms and a list of abbreviations to assist the reader in understanding the material presented. It will also include tables that cross-reference the report (subsections) to the EIA Terms of Reference.	Volumes 1 to 6

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
1.2 Scope of Environmental Impact Assessment Report (continued)	MEG will prepare a summary of the EIA report that will provide the reader with sufficient information to obtain a general understanding of the Project and its potential positive and negative effects. The summary report must be a stand-alone document; however, it can reference more detailed information presented in the EIA report itself. The summary report should provide an overview of the EIA report including: (a) the Project components and development activities which have the potential to affect the environment; (b) existing conditions in the Study Area, including existing uses of land, resources and other activities which have potential in combination with proposed development activities, to affect the environment; (c) the environmental, cultural, and socio-economic impacts of the Project including the regional, temporal and cumulative effects which are anticipated; (d) impact significance in terms of magnitude, extent, duration, frequency and reversibility; (e) proposed environmental protection plans, mitigation measures and monitoring; (f) residual effects; and (g) an overview of modeling techniques used to forecast potential effects and assumptions used in assessing potential impacts.	Volume 2
2.0 PUBLIC ENGAGEMENT AND ABORIGINAL CONSULTATION		
2.0 PUBLIC ENGAGEMENT AND ABORIGINAL CONSULTATION	[A] Document the public engagement program implemented for the Project including: (h) documentation of individual participation and attendance at each meeting including recording of specific comments or issues raised at the meetings; (i) description and documentation of concerns and issues expressed by the public, MEG's analysis of those concerns and issues, and the actions taken to address those concerns and issues; (j) how public input was incorporated into the Project development, impact mitigation and monitoring;	[A] Volume 1, Section 5
	[B] Document the aboriginal consultation program implemented for the Project including: (a) documentation of individual participation and attendance at each meeting including recording of specific comments or issues raised at the meetings; (b) description and documentation of concerns and issues expressed by the aboriginal communities and groups, MEG's analysis of those concerns and issues, and the actions taken to address those concerns and issues; (c) how aboriginal input was incorporated into the Project development, impact mitigation and monitoring; and (d) consultation undertaken with Aboriginal communities with respect to traditional ecological knowledge and traditional use of land.	[B] Volume 1, Section 5 and Volume 6, Section 2

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
2.0 PUBLIC ENGAGEMENT AND ABORIGINAL CONSULTATION (continued)	[C] Describe plans to maintain the public engagement and aboriginal consultation process following completion of the EIA review to ensure that the public and aboriginal peoples will have an appropriate forum for expressing their views on the ongoing development, operation and reclamation of the Project.	[C] Volume 1, Section 5
3.0 PROJECT DESCRIPTION		
3.1 MEG and Lease History	[A] Provide: (a) a corporate profile; and (b) the name of the legal entity that will develop, manage and operate the Project and hold the operating approvals. [B] Describe MEG and its history in Alberta's oil and gas industry, with specific reference to the existing MEG petroleum developments, proposed developments, resource characterization and environmental studies in the Christina Lake region.	[A] and [B] Volume 1, Section 1
3.2 Project Development	[A] Provide a development plan that includes: (a) the phases of development;	(a) Volume 1, Section 1.2 Project Overview
	(b) bitumen/heavy oil recovery facilities;	(b) Volume 1, Section 2.4 Reservoir Recovering Process
	(c) field maintenance operations;	(c) Volume 1, Section 3.2.2 Field Facilities
	(d) processing facilities;	(d) Volume 1, Section 3.2.1 Plants
	(e) steam and/or power generation facilities;	(e) Volume 1, Section 3.2.1 Plants
	(f) infrastructure (pipelines, access roads and power lines)	(f) Volume 1, Section 3.2.2 Field Facilities
	(g) other buildings and structures; and	(g) Volume 1, Section 3.2.3 Offsite Services
	(h) activities associated with construction, operations and decommissioning and reclamation.	(h) Volume 1, Section 6 Conservation and Reclamation Plan
	[B] Provide a schedule outlining the proposed phasing, sequencing and duration of components, including the timing of key steps in the pre-construction, construction, operation, decommissioning and reclamation stages of each phase.	[B] Volume 1, Section 1.2.7 Phase 3 Schedule
	[C] Discuss the key factors controlling the schedule, restrictions for conducting certain development activities, and uncertainties.	[c] Volume 1, Section 1.2.7 Phase 3 Schedule

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
3.3 Evaluation Alternatives		
3.3.1 Project Alternatives	[A] Discuss the need for the Project addressing the following: (a) any alternative means of carrying out the Project that are technically and economically feasible and where applicable indicate their potential environmental effects and impacts; (b) compare identified alternatives to the Project or components of the Project and the anticipated effects and impacts of the alternatives. Discuss reasons for not selecting any identified alternatives; (c) implications resulting from a delay in proceeding with the Project, or any phase of the Project; and (d) potential cooperative development opportunities for the Project (e.g., shared infrastructure). [B] Discuss the implications of not going ahead with the Project.	[A] and [B] Volume 1, Section 1.2.8 Resource and Development Need
3.3.2 Process and Infrastructure Alternatives	[A] Describe the process and criteria used to select sites for facilities and infrastructure.	[A] Volume 1, Section 6.3.1 Siting and Route Selection
	[B] Discuss the route or site selection criteria for any linear or other infrastructure development or modification and provide the rationale for selecting the proposed alignment and design.	[B] Volume 1, Section 6.3.1 Siting and Route Selection
	[C] Discuss the options considered for supplying the thermal energy and electric power required for the Project and their environmental implications. Discuss the implications that alternative fuel sources may have on the selection of pollution abatement equipment or technologies.	[C] Volume 1 Recovery Process Description and Section 2.6 Potential Future Improvements
	[D] Describe the criteria and rationale for selecting the preferred water supply sources. Include options for using saline groundwater and the criteria used to assess the feasibility of its use.	[D] Volume 4, Section 5.1 Hydrogeology
	[E] Discuss the potential for new or additional technology to increase resource recovery at later times in the field development and to affect the number of wells required.	[E] Volume 1, Section 2.6 Potential Future Improvements
	[F] Discuss options and technologies considered for wastewater treatment, wastewater management strategies and wastewater disposal and reasons, including water quality and environmental considerations for selecting the preferred options in the context of best management practices and best available technologies.	[F] Volume 1, Section 3.3
	[G] Discuss the waste disposal options. Discuss the strategy for on-site waste disposal versus off-site waste disposal and identify: (a) the location of on-site waste disposal, including landfills, if applicable; (b) the availability of off-site waste disposal, including landfills, if applicable: (c) the suitability of the site(s) from a groundwater protection perspective (provide geo-technical information to support the siting of disposal facilities); and (d) site suitability with regard to existing and potential human activities in the area.	[G] Volume 1, Section 6.7 Waste Management and Contingency Plans

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
3.4 Project Process and Facilities	[A] Provide maps and/or drawings of the Project components and activities including: (a) existing infrastructure, leases and clearings, including exploration clearings;	(a) Volume 1, Figure 1.2-4
	(b) proposed central processing/treatment and field facilities;	(b) Volume 1, Figure 1.2-3
	(c) other buildings and infrastructure (pipelines and utilities);	(c) Volume 1, Figure 1.2-3
	(d) temporary structures;	(d) Volume 1, Figure 1.2-3
	(e) transportation and access routes;	(e) Volume 1, Figure 1.2-3
	(f) on-site hydrocarbon storage;	(f) Volume 1, Figure 3.2-3
	(g) containment structures such as retention ponds and storage ponds (e.g. lime sludge, stormwater runoff, boiler blowdown);	(g) Volume 1, Figure 3.2-2
	(h) water wells/intakes, pipelines and storage structures;	(h) Volume 1, Figure 1.2-3
	(i) aggregate resources, borrow material and other road construction material and locations of any stockpiles that will be developed; and	(i) Volume 1, Figure 1.2-3 and Figure 3.2-2
	(j) waste storage area and disposal sites.	(j) Volume 1, Figure 1.2-3
	[B] Provide a list the facilities for which locations will be determined later.	[B] n/a
	[C] Discuss planned accommodation for the workforce during the construction and operations stages.	[C] Volume 6, Section 6.5.4 Project Case for Housing
	[D] Describe the primary resource recovery process, any proposed follow-up recovery process, and other related processes and process facilities for the Project.	[D] Volume 1, Section 2
	[E] Discuss the amount and source of energy required for the Project;	[E] Volume 1, Section 1.2.5.1 Plants; Section 3.2.1.14 Optimization and Section 3.2.1.16 Overall Material Balance
	[F] Discuss the proposed method to transport product to markets;	[F] Volume 1, Section 3.2.2.4 Access Roads, Pipelines and Utility Corridors
	[G] Provide a listing of chemical products to be manufactured, processed or otherwise used for the Project and describe, in general terms, how these items will be stored and managed. Identify products containing substances that are: (a) Canadian Environmental Protection Act (CEPA) toxics; (b) listed on the National Pollutant Release Inventory; (c) dangerous goods as defined by the federal *Transportation of Dangerous Goods Act*; and (d) on the Domestic Substances List and categorized as requiring further assessment under Canada's Chemical Management Plan.	[G] Volume 1, Section 3.2.1.13 Chemical Consumption, Table 3.2-3
	[H] Describe the nature and amount of on-site hydrocarbon storage. Discuss contaminant and other environmental protection measures.	[H] Volume 1, Table 3.2-2

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
3.5 Transportation Infrastructure	[A] Provide the results of consultation with Alberta Infrastructure and Transportation and discussions with other industry operators.	[A] Volume 1, Section 5
	[B] Provide a summary of any Traffic Impact Assessment (TIA) carried out for the Project, or where no TIA has been prepared: (a) describe the anticipated changes to traffic (e.g., type and volume) on highways during the life of the Project. Consider other existing and planned uses of the same highways; and (b) identify needs to upgrade existing roads or construct new roads.	[B] Volume 6, Section 6.5.3 Traffic
	[C] Describe access corridors needed and/or planned by other resource stakeholders including those responsible for Forest Management Areas and other timber quota holders. Describe how their needs will be accommodated to reduce overall environmental impact from resource development.	[C] Volume 1, Section 3.2.2.4 Access Roads, Pipelines and Utility Corridors and Appendix V-II
	[D] Describe and locate on maps of appropriate scale the transportation infrastructure requirements for the Project and how they relate to local communities.	[D] Volume 1, Section 3.2.2.4 Access Roads, Pipelines and Utility Corridors
	[E] Describe road access to and road development within the Project Area, and identify the type and location of road construction and reclamation materials, the volume of material needed and the availability of these materials.	[E] Volume 1, Section 3.2.2.4 Access Roads, Pipelines and Utility Corridors
	[F] Indicate where Crown land disposition may be needed for roads or other infrastructure outside the Project Area.	[F] Volume 1, Section 3.2.2.4 Access Roads, Pipelines and Utility Corridors
	[G] Describe any crossings of watercourses or waterbodies required (with appropriate maps and diagrams). Include: (a) timing, (b) construction standards or methods, and (c) environmental protection plans.	[G] Volume 4, Section 3.2.3 Watercourse Crossings
3.6 Land Management	[A] Provide a description and timing of land clearing activities.	[A] Volume 1, Section 6.6.2 Vegetation Clearing
	[B] Provide a timber salvage plan, highlighting end users and identifying proposed volumes for removal (by species and year) for the term of the proposed Project.	[B] Volume 1, Section 6.6.1 Timber Salvage Plan
	[C] identify any access restrictions and, where appropriate, measures taken to control access to Project Areas while ensuring continued access to adjacent wildland areas.	[C] Volume 6, Section 3.5.2 Effects on Environmentally Important Areas
	[D] Provide a fire control plan highlighting: (a) measures taken to ensure continued access for firefighters to adjacent wildland areas; (b) forest fire prevention measures; (c) measures for determining the clearing width of power line rights-of-way; and (d) required mitigation measures for areas adjacent to the Project Area based on the FireSmart Wildfire Assessment System.	[D] Volume 1, Section 3.3.3 Fire Management

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
3.7 Air Emissions Management	[A] Provide an emissions profile (type, rate and source) for the Project 's operating emission including point and non-point sources and fugitive emissions, and for construction emissions. Consider both normal and upset conditions. Discuss the following: (a) odorous or visual emissions from the proposed facilities;	[A] (a) Volume 3, Section 1.8 Project Case Volume 6, Section 4.4 Project Case
	(b) annual and total greenhouse gas (GHG) emissions for the life of the Project;	(b) Volume 3, Section 1.8 Project Case
	(c) the Project's contribution to total provincial and national GHG emissions on an annual basis;	(c) Volume 3, Section 1.8 Project Case
	(d) MEG's overall greenhouse gas management plans;	(d) Volume 3, Section 1.8.8.2 Approach to Managing Greenhouse Gases
	(e) the amount and nature of acidifying emissions, probable deposition patterns and rates;	(e) Volume 1, Section 3.2.1 Plants; Volume 3, Section 1.6 Existing and Approved Case Volume 3, Section 1.8 Project Case Volume 3, Section 1.9 Planned Development Case Volume 3, Appendix 3-III Ambient Air Quality Predictions
	(f) control technologies used to minimize air emissions such as sulphur dioxide (SO_2), hydrogen sulphide (H_2S), oxides of nitrogen (NO_X), volatile organic compounds (VOC), and particulate matter;	(f) Volume 1, Section 3.2.1 Plants, Volume 3, Section 1.1.2 MEG's Commitment to Air Quality Management
	(g) emergency flaring scenarios (e.g. frequency and duration) and proposed measures to ensure flaring events are minimized;	(g) Volume 1, Section 3.3.5 Volume 3, Appendix 3-IV Alternate Modelling Scenarios
	(h) upset condition scenarios (e.g. frequency and duration) and proposed measures to ensure upset conditions are minimized;	(h) Volume 1, Section 3.2.1.9
	(i) gas collection and conservation, and the applicability of vapour recovery technology; and	(i) Volume 1, Section 3.2.1.7
	(j) fugitive emissions control technologies to detect, measure and control emissions and odours from equipment leaks.	(j) Volume 3, Section 1.1.2 Project Air Quality Management Initiatives

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
3.8 Water Resources		
3.8.1 Water Supply	[A] Describe the water supply requirements for the Project, including: (a) the expected water balance during the life of the Project. Discuss assumptions made or methods chosen to arrive at the water balances; (b) the process, potable and non-potable water requirements and sources for construction, start-up, normal and emergency operating situations, decommissioning and reclamation. Identify the volume of water to be withdrawn from each source, considering plans for wastewater reuse; (c) the variability in the amount of water required on an annual and seasonal basis as the Project is implemented; (d) the expected cumulative effects on water losses/gains due to the Project operations; (e) potable water treatment systems for the life of the Project; (f) type and quantity of potable water treatment chemicals used; and (g) measures for ensuring efficient use of water including alternatives to reduce the consumption of non-saline water such as water use minimization, recycling, conservation; and technological improvements.	[A] Volume 1, Section 3.2.2.2 Source and Disposal wells; Volume 4, Section 5.1.1 Hydrogeology
3.8.2 Surface Water Management	[A] Describe MEG's surface water management strategy for construction, operation and reclamation stages, including: (a) Design factors considered such as; i) site drainage; ii) run-on management; iii) road, well pad and plant run-off; iv) erosion/sediment control; v) slumping areas; vi) groundwater protection; vii) groundwater seepage; viii) produced water management; ix) flood protection; and (b) permanent or temporary alterations or realignments of watercourses, wetlands and other waterbodies.	[A] Volume 1, Section 3.3.4 Water Management

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
3.8.2 Surface Water Management (continued)	[B] Describe realignments of crown bed and shore and proposed compensation.	n/a
	[C] Provide results of the navigability assessment(s) for waterways that may be affected by the Project and a description of navigable waterways in the Study Area.	[C] Volume 4, Section 3.2.3 Water course crossings
3.8.3 Wastewater Management	[A] Describe MEG's wastewater management strategy including: (a) the source, quantity and composition of each wastewater stream from the existing and proposed facilities;	(a) Volume 1, Section 3.3.4
	(b) the proposed disposal locations and methods for each wastewater stream;	(b) Volume 4, Section 5.1
	(c) formations for the disposal of wastewater;	(c) Volume 4, Section 5.1
	(d) design of facilities that will collect, treat, store and release wastewater streams;	(d) Volume 1, Section 3.3.4
	(e) type and quantity of chemicals used in wastewater treatment; and	(e) Volume 1, Section 3.3.4
	(f) sewage treatment and disposal.	(f) Volume 1, Section 3.3.4
3.9 Waste Management	[A] Characterize and quantify the anticipated dangerous goods, and hazardous, non-hazardous, and recyclable wastes generated by the Project, and: (a) describe the composition and volume of specific waste streams and identify how each stream will be managed; (b) identify the amount of drilling wastes, the options considered for disposal and the option(s) chosen; (c) describe how the disposal sites and sumps will be constructed; and (d) describe plans for pollution prevention, waste minimization, recycling, and management to reduce waste quantities over the life of the Project.	[A] Volume 1, Section 3.3.6
3.10 Conservation and Reclamation	[A] Provide a conceptual reclamation plan for the Project that considers: (a) any existing Conservation and Reclamation Plan.	[A] a) Volume 1, Section 6 Conservation and Reclamation Plan
	(b) pre-development information with respect to land capability, vegetation, commercial forest land base by commercialism class, forest productivity, recreation, wildlife, aquatic resources, aesthetics and land use resources	b) Volume 1, Section 6 Conservation and Reclamation Plan Volume 6, Section 4.3 Existing and Approved Case
	(c) integration of operations, decommissioning, reclamation planning and reclamation activities. Discuss anticipated timeframes for completion of reclamation stages and release of lands back to the Crown including an outline of the key milestone dates for reclamation and how progress to achieve these targets will be measured;	c) Volume 1, Section 6, Conservation and Reclamation Plan

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
3.10 Conservation and Reclamation (continued)	(d) constraints to reclamation such as timing of activities, availability of reclamation materials and influence of natural processes and cycles;	d) Volume 1, Section 6.6 Detailed Conservation and Reclamation Plan
	(e) post-development land capability with respect to the following: i) self-sustaining topography, drainage and surface watercourses representative of the surrounding area, ii) pre-development traditional use with consideration for traditional vegetation and wildlife species in the reclaimed landscape, iii) wetlands; iv) self-sustaining vegetation communities representative of the surrounding area and reforestation and forest productivity; and v) reforestation and forest productivity;	e) Volume 1 Section 6.5 Equivalent Capability
	(f) a revegetation plan for the disturbed terrestrial and aquatic areas. Identify the species types that will be used for seeding or planting, and the vegetation management practices to be used. Outline how the disturbed areas will be returned to a state capable of supporting a self-sustaining vegetative community capable of ecological successions equivalent to pre-disturbance conditions. Discuss factors such as biological capability and diversity and end land use objectives;	(f) Volume 1, Section 6.6.9 Revegetation Plan
	(g) reclamation material salvage, storage areas and handling procedures;	(g) Volume 1, Section 6.6.3 Topsoil and Subsoil Salvage; Volume 1 Section 6.6.5 Soil Stockpiling
	(h) reclamation material replacement indicating depth, volume and type;	(h) Volume 1, Section 6.6.8 Soil Replacement Plan
	(i) pre-development and final reclaimed site drainage plans;	(i) Volume 1, Section 6.6.6.2 Water Management Plan; Volume 1, Section 6.6.7 Facility Decommissioning Closure and Site Contouring
	(j) integrating surface and near-surface drainage within the development area; and	(j) Volume 1, Section 6.6.10 Component-Specific Revegetation and Reclamation Plans
	(k) promotion of biodiversity.	(k) Volume 1, Section 6.5.2 Biodiversity
	[B] Provide: (a) a conceptual ecological land classification (ELC) map for the post-reclamation landscape considering potential land uses and how the landscape and soils have been designed to accommodate future land use; and	(a) Volume 1, Section 6.6.9 Revegetation Plan
	(b) a discussion of any uncertainties related to the conceptual reclamation plan.	(b) Volume 1, Section 6.6.9 Revegetation Plan

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
3.11 Environmental Management System	[A] Summarize key elements of MEG's existing or proposed environment, health and safety management system.	[A] Volume 1, Section 3.3 Environmental Management and Controls
	[B] Describe adaptive management plans that minimize the impact of the Project. Describe the flexibility built into the plant design and layout to accommodate future modifications required by any change in emission standards, limits and guidelines.	[B] Volume 1, Section 3.2.1.15
	[C] Describe MEG's emergency response system to minimize adverse environmental effects, while protecting the safety of personnel, including; (a) emergency response reporting for spill containment and management; and (b) emergency response, public notification protocol and safety procedures.	[C] Volume 1, Section 3.3.2 Facility Emergency Response Plan – Details
	[D] Describe MEG's current and proposed source monitoring programs with respect to the following: (a) air emissions, including fugitive emissions; (b) wastewater treatment and release; and (c) hazardous and non-hazardous waste treatment and storage.	[D] Volume 2, Appendix 2-V Monitoring Programs
	[E] Provide a conceptual plan to monitor reclamation performance and success (including soils, vegetation, wildlife and aquatic resources).	[E] Volume 1, Section 6.8 Conservation and Reclamation Monitoring
	[F] Discuss how the results of monitoring programs will be integrated with MEG's environmental management system.	[F] Volume 2, Appendix 2-V Monitoring Programs
3.12 Regional and Cooperative Efforts	[A] Discuss MEG's involvement in regional cooperative efforts to address environmental and socio-economic issues associated with oil sands development, including: (a) potential cooperative ventures that MEG has initiated, could initiate or could develop with other oil sands operators and other resource users; (b) how MEG will work to develop and implement such cooperative opportunities; (c) MEG's participation in any regional forums; (d) how MEG would design and implement research programs within the Christina Lake region where necessary; and (e) how regional environmental management initiatives will be incorporated into MEG's management practices.	[A] Volume 2, Appendix 2-V Monitoring Programs
3.12 Regional and Cooperative Efforts (continued)	[B] Discuss MEG's regional monitoring activities including: (a) monitoring that will be undertaken to assist in managing environmental effects, confirm performance of mitigative measures and improve environmental protection strategies; (b) monitoring done independently by MEG; (c) monitoring performed in conjunction with other stakeholders; and (d) new monitoring initiatives that may be required as a result of the Project.	[B] Volume 2, Appendix 2-V Monitoring Programs

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
4.0 ENVIRONMENTAL AND CUMULATIVE EFFECTS ASSESSMENT		
4.1 Assessment Requirements		
4.1.1 Scenarios	[A] Define assessment scenarios including: (a) A Baseline Case, which includes existing environmental conditions, existing and approved Projects or activities; (b) Application Case, which includes the Baseline Case with the effects of the Project added; (c) Planned Development Case, which includes past studies, existing and anticipated future environmental conditions, existing and approved projects or activities plus other planned projects. [B] For the purpose of defining the scenarios, *approved* means approved by any federal, provincial, or municipal regulatory authority. *Planned*, means any project or activity that has been publicly disclosed prior to the issuance of these Terms of Reference or up to six months prior to the submission of an Application and EIA report.	[A] and [B] Volume 2, Section 5 Assessment Cases
4.1.2 Study Areas	***4.1.2.1 Project Area*** [A] The Project Area includes all lands subject to direct disturbance from the Project and associated infrastructure. For the Project Area MEG must provide: (a) the legal land description;	[A] (a) Volume 1, Section 1.2.4 Phase 3
	(b) the boundaries of the land under MEG's control (this may include lands under public land disposition or private lands leased or owned by MEG);	(b) Volume 1, Figure 1.2-3
	(c) the proposed EUB approval area;	(c) Volume 1, Figure 1.2-3
	(d) a map that shows the status of land tenure and identifies the locations of all proposed development activities and facilities; and	(d) Volume 1, Figure 1.2-2
	(e) a topographic map of appropriate scale showing the area proposed to be disturbed in relation to existing township grids, wetlands, watercourses, and waterbodies.	(e) Volume 1, Figure 1.2-4

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
4.1.2 Study Areas (continued)	***4.1.2.2 Local and Regional Study Areas*** [A] The Local Study Area (LSA) is the area existing outside the boundaries of the Project Area where there is a reasonable potential for immediate environmental impacts due to ongoing Project activities. [B] The Regional Study Area (RSA) is the area within which there is the potential for cumulative and socio-economic effects, and that may be relevant to the assessment of any wider-spread effects of the Project. [C] The study area for the EIA report shall include the Project Area as well as, the spatial and temporal limits of individual environmental components outside the Project Area boundaries where an effect can be reasonably expected. The EIA Study Area includes both Local and Regional Study Areas.	n/a
	[D] For each LSA and RSA MEG must: (a) provide the scientific rationale used to define the spatial temporal aspects, considering the location and range of probable Project and cumulative effects; and	(a) Volume 2, Section 4.3 Spatial Considerations
	(b) identify LSA and RSA boundaries on maps of appropriate scale that show existing township grids, wetlands, watercourses, waterbodies and other topographic features.	(b) Volume 2, Figure 4.3-1 and Figure 4.3-2
4.1.3 Cumulative Effects Assessment	[A] MEG will conduct a cumulative environmental effects assessment of the Project based on the EUB/AENV/NRCB Information Letter *Cumulative Effects Assessment in Environmental Impact Assessment Reports under the Alberta Environmental Protection and Enhancement Act* June 2000. MEG will include a summary of all proposed monitoring, research and other strategies or plans to minimize mitigate and manage potential adverse effects.	[A] Volumes 3 to 6 Volume 2, Appendix 2-V Monitoring Programs
	[B] The identification and assessment of the likely cumulative effects of the Project will: (a) define the spatial and temporal Study Area boundaries, and provide the rationale for assumptions used to define those boundaries for each environmental component examined;	[B] Volume 2, Section 4.3 Spatial Considerations
	(b) describe the current (baseline) state of the environment in the Regional Study Area (used for the cumulative effects assessment) and the activities that have created the current conditions;	(b) Volumes 3 to 6
	(c) assess the incremental consequences that are likely to result from the Project in combination with other existing, approved and planned projects in the region;	(c) Volumes 3 to 6
	(d) discuss how relevant information or data used from previous oil sands and other development projects is appropriate for use in this EIA report;	(d) Volumes 3 to 6
	(e) consider and describe deficiencies or limitations in the existing database for relevant components of the environment; and	(e) Volumes 3 to 6
	(f) explain the approach and methods used to identify and assess cumulative impacts, including cooperative opportunities and initiatives undertaken to further the collective understanding of cumulative impacts. Provide a record of relevant assumptions, confidence in data and analysis to support conclusions.	(f) Volume 2, Section 4 Environmental Impact Assessment Methods

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
4.1.4 Information Requirements	[A] The EIA Report will include the following environmental information for each assessment scenario: (a) a description of and rationale for the selection of environmental attributes, parameters, or properties examined:	(a) Volumes 3 to 6
	(b) for each selected environmental attribute, parameter, or property; i) describe existing conditions. Comment on whether the available data are sufficient to assess impacts and mitigative measures. Identify environmental disturbance from previous, current, and approved activities that have become part of the baseline conditions,	(b) i) Volumes 3 to 6
	ii) describe the nature and significance of the environmental effects and impacts associated with the development activities,	(b) ii) Volumes 3 to 6
	iii) present plans to minimize, mitigate or eliminate negative effects and impacts. Discuss the key elements of such plans,	(b) iii) Volumes 3 to 6
	iv) a description of the process and criteria used to determine the significance of environmental effects,	(b) iv) Volume 2, Section 4.7 Impact Analyses; Volume 2, Section 4.8 Impact Description Criteria
	v) present a plan to manage environmental changes and identify any follow-up programs necessary to verify the accuracy of the environmental assessment and to determine effectiveness of measures taken to mitigate adverse environmental affects, and	(b) v) Volume 2, Section 4.8.3 Management and Monitoring
	vi) identify residual impacts and comment on their significance;	(b) vi) Volumes 3 to 6
	(c) a discussion of the sources of information used in the assessment including; i) a summary of previously conducted environmental assessments related to MEG's operations,	(c) i) Volume 1, Section 1.2.1 History
	ii) literature and previous EIA reports and environmental studies, operating experience from current, similar operations; industry study groups; traditional knowledge; and government sources, and	(c) ii) Volume 2, Section 3.1 Impact Assessment Overview
	iii) limitations or deficiencies that the information may place on the analysis or conclusions in the EIA report. Discuss how these limitations or deficiencies will be addressed within the EIA report;	(c) iii) Volume 2, Section 4.8.1 Certainty and Prediction Confidence
	(d) a description of the techniques used to identify and evaluate the environmental impacts and effects resulting from the project;	(d) Volume 2, Section 4.7 Impact Analyses and Section 4.8 Impact Description Criteria

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
4.1.4 Information Requirements (continued)	(e) a description of where deficiencies in information exist and MEG's plan, including rationale, for providing the necessary information. Where required, undertake studies and investigations to obtain additional information to address the information deficiencies;	n/a
	(f) a sufficient base for the prediction of positive and negative impacts and the extent to which negative impacts may be mitigated by planning, Project design, construction techniques, operational practices and reclamation techniques. Impact significance will be quantified where possible and assessed including consideration of spatial, temporal and cumulative aspects;	(f) Volumes 3 to 6
	(g) a plan that addressed the adverse impacts associated with the Project that may require joint resolution by government, industry, and the community. Describe how this plan will be implemented and how it will incorporate the participation of government, industry and the community; and	(g) Volume 2, Appendix 2-V and Volumes 3 to 6
	(h) baseline biophysical information in a manner that enables an ecological land classification (ELC) map of the Project Area to be completed to the ecosite classification.	(h) Volume 5, Appendix 5-II Vegetation Baseline Report
4.1.5 Modeling	[A] For each model used in the in the assessment scenarios, provide: (a) a justification for the model used. Air quality modeling should be conducted in accordance with the latest edition of the Air Quality Modeling Guidelines published by Alberta Environment; (b) a documentation of the assumptions used to obtain the modeling predictions; and (c) a discussion of the limitations of the models used and how these limitations were addressed, including sources of error and relative accuracy.	**Air:** Volume 3, Appendix 3-II, Section 2 Modelling Methods **Noise:** Volume 3, Appendix 3-V **Hydrogeology:** Volume 4, Appendix 4-VII **Wildlife and Biodiversity:** Volume 5, Appendix 5-V **Air Emissions Effects:** Volume 3, Appendix 3-XII, Section 4 Air Emissions Assessment Methods **Visual Resources:** Volume 6, Section 4.2.4 Assessment Methods
4.2 Climate, Air Quality and Noise		
4.2.1 Baseline Information	[A] Discuss baseline climatic and air quality conditions in the area including the following: a) the type and frequency of meteorological conditions that may result in poor air quality; and	a) Volume 3, Appendix 3-I Existing Air Quality and Meteorology
	b) appropriate ambient air quality parameters such as SO_2, H_2S, total hydrocarbons (THC), NO_X, VOC, individual hydrocarbons of concern in the THC and VOC mixtures, ground-level ozone (O_3), visibility, representative heavy metals, and particulates (road dust, PM_{10} and $PM_{2.5}$).	b) Volume 3, Appendix 3-I Existing Air Quality and Meteorology Volume 6, Section 4.2.1 Baseline Information
	[B] Provide representative baseline noise levels at receptor location.	[B] Volume 3, Section 2.4.3 Existing and Approved Case Noise Levels

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
4.2.2 Impact Assessment	[A] Identify components of the Project that will affect local and regional air quality, and	[A] Volume 3, Appendix 3-II, Section 3.1.1 MEG Project Emissions in the Project Case
	(a) describe the potential for reduced air quality (including odours and visibility) resulting from the Project and discuss any implications of the expected air quality for environmental protection and public health;	(a) Volume 3, Section 1.8 Project Case; Volume 6, Section 4.5 Project Case Volume 6, Section 4.2.2 Impact Assessment
	(b) estimate ground-level concentrations of appropriate air quality parameters;	(b) Volume 3, Section 1.6 Existing and Approved Case Volume 3, Section 1.8 Project Case Volume 3, Section 1.9 Planned Development Case Volume 3, Appendix 3-III Ambient Air Quality Predictions
	(c) discuss any expected changes to particulate deposition or acidic deposition patterns; (d) identify areas that exceed potential Acid Input (PAI) critical loading criteria;	(c), (d) Volume 3, Section 1.6 Existing and Approved Case Volume 3, Section 1.8 Project Case Volume 3, Section 1.9; Planned Development Case Volume 3, Appendix 3-III Ambient Air Quality Predictions
	(e) discuss interactive effects that may occur as a result of co-exposure of a receptor to all emissions; and	(e) Volume 3, Section 1.8 Project Case
	(f) describe air quality impacts resulting from the Project, and their implications for other environmental resources, including habitat diversity and quantity, vegetation resources, water quality and soil conservation.	(f) Volume 3, Section 4

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
4.2.2 Impact Assessment (continued)	[B] Identify stages or elements of the Project that are sensitive to changes or variability in climate parameters, including frequency and severity of extreme weather events. Discuss what impacts the change to climate parameters may have on elements of the Project that are sensitive to climate parameters.	[B] Volume 3, Appendix 2-III Climate Change
	[C] Identify components of the Project that have the potential for creating increased noise levels and discuss the implications. Present the results of a noise assessment. Include:	[C] Volume 3, Section 2.6 Project Case Assessment
	(a) potentially-affected people and wildlife;	(a) Volume 3, Section 2.6.3 and 2.6.4 Project Case Noise Level Predictions and Low Frequency Noise Volume 3, Section 2.6.4 Project Case Assessment; Volume 3, Appendix 3-VI Screening Level Wildlife Risk Assessment
	(b) an estimate of the potential for increased noise resulting from the development; and	(b) Volume 3, Section 2.6.5 Project Case Impact Assessment
	(c) the implications of any increased noise levels.	(c) Volume 3, Section 2.6.3 to 2.6.5 Project Case Impact Assessment
	[D] Describe how air quality and noise impacts resulting from the Project will be mitigated.	[D] Volume 3, Section 1.1.2.1 Project Air Quality Management Initiatives Volume 3, Section 2.3 Mitigation
	[E] Describe the residual air quality and noise effects of the Project and MEG's plans to manage those effects.	[E] Volume 3, Section 1.1.2 MEG's Commitment to Air Quality Management Volume 3, Section 2.7 Monitoring
4.2.3 Monitoring	[A] Describe ambient air quality monitoring that will be conducted during each phase of the Project to assess air quality and the effectiveness of mitigation.	[A] Volume 3, Section 1.10 Monitoring
	[B] Describe monitoring programs MEG may implement to monitor the effects of acid deposition.	[B] Volume 3, Section 1.10 Monitoring
4.3 Hydrogeology		
4.3.1 Baseline Information	[A] Provide an overview of the existing geologic and hydrogeologic setting in the Project and EIA Study Areas from the ground surface down to, and including, the oil producing zones and disposal zones. Document any new hydrogeological investigations, including methodology and results, undertaken as part of the EIA study and:	[A] Volume 1, Section 2.2 Stratigraphic Overview; Volume 4 Section 4.1.1 Baseline Geology and Hydrogeology; Volume 4 Appendix 4-II Hydrogeology baseline
	(a) present regional and Project Area geology using structure contour maps, geologic cross-sections and isopach maps to illustrate depth, thickness and spatial extent of lithology, stratigraphic units and structural features;	(a) Volume 4 Section 4.1.1 Baseline Geology and Hydrogeology; Appendix 4-II Hydrogeology Baseline

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
4.3.1 Baseline Information (continued)	(b) present regional and Project Area hydrogeology describing: i) the major aquifers, aquitards and aquicludes (Quaternary and bedrock), their spatial distribution, properties, hydraulic connections between aquifers, hydraulic heads, gradients, groundwater flow directions and velocities; include maps and cross sections,	(b) i) Volume 4 Appendix 4-II Hydrogeology Baseline
	ii) the chemistry of groundwater aquifers including baseline concentrations of major ions, metals and hydrocarbon indicators,	(b) ii) Volume 4 Section 4.1.1 Baseline Geology and Hydrogeology; Appendix 4-II Hydrogeology Baseline
	iii) the potential discharge zones, potential recharge zones and sources, areas of groundwater-surface water interaction and areas of Quaternary aquifer-bedrock groundwater interaction,	(b) iii) Volume 4 Section 4.1.1 Baseline Geology and Hydrogeology; Appendix 4-II Hydrogeology Baseline
	iv) water well development and groundwater use, including an inventory of groundwater users,	(b) iv) Volume 4 Section 4.1.1 Baseline Geology and Hydrogeology; Appendix 4-II Hydrogeology Baseline
	v) the recharge potential for Quaternary aquifers,	(b) v) Volume 4 Section 4.1.1 Baseline Geology and Hydrogeology; Appendix 4-II Hydrogeology Baseline
	vi) potential hydraulic connection between bitumen production zones, deep disposal formations and other aquifers due to Project operations;	(b) vi) Volume 4 Section 4.1.1 Baseline Geology and Hydrogeology; Appendix 4-II Hydrogeology Baseline
	vii) the characterization of formations chosen for deep well disposal, including chemical compatibility and containment potential, and water quality assessments. The suitability of any onsite waste disposal sites should be discussed and supporting geological information provided, and	(b) vii) Volume 4 Section 4.1.1 Baseline Geology and Hydrogeology; Appendix 4-II Hydrogeology Baseline
	viii) the locations of major facilities associated with the Project including facilities for waste storage, treatment and disposal (e.g., deep well disposal) and describe site-specific aquifer and shallow groundwater conditions beneath these proposed facilities.	(b) viii) Volume 4 Section 4.1.1 Baseline Geology and Hydrogeology; Appendix 4-II Hydrogeology Baseline

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
4.3.2 Impact Assessment	[A] Describe Project components and activities which have the potential to affect groundwater resource quantity and quality during the life of the Project.	[A] Volume 4, Section 5.1.1 Hydrogeology: Linkage Analysis
	[B] Describe the nature and significance of the potential Project impacts on groundwater with respect to: (a) inter-relationship between groundwater and surface water in terms of surface water quantity and quality;	(a) Volume 4, Section 5.1.2 Impact Analysis of Groundwater Quantities, Levels and Flow Patterns; Volume 4, Section 5.1.3 Impact Analysis for Effects on Groundwater Quality
	(b) implications for terrestrial or riparian vegetation, wildlife and aquatic resources including wetlands;	(b) Volume 4, Section 5.4.1 Fish and Fish Habitat : Linkage Analysis
	(c) changes in groundwater quality;	(c) Volume 4, Section 5.1.3 Impact Analysis of Effects on Groundwater Quality
	(d) conflicts with other groundwater users, and proposed resolutions to these conflicts;	(d) Volume 4, Section 5.1.2 Impact Analysis of Groundwater Quantities, Levels and Flow Patterns
	(e) potential implications of seasonal variations; and	(e) Volume 4, Section 5.1.2 Linkage Analysis of Groundwater Quantities, Levels and Flow Patterns Volume 2, Appendix 2-III, Section 4
	(f) groundwater withdrawal for Project operations.	(f) Volume 4, Section 5.1.2 Impact Analysis of Groundwater Quantities, Levels and Flow Patterns
	[C] Describe programs to manage and protect groundwater resources including, but not limited to, response/mitigation plans that may be considered in the event that adverse effects are detected.	[C] Volume 4, Section 3.1 Mitigation: Subsurface Facilities and Infrastructure
	[D] Identify measures to reduce the environmental risks from casing failures.	[D] Volume 4, Section 3.1.3 Mitigation: Potential Impacts to Groundwater Quality
	[E] Describe the residual effects of the Project on groundwater quality and quantity and MEG's plans to manage those effects.	[E] Volume 4, Section 5.1.4 Hydrogeology: Summary of Hydrogeology Assessment

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
4.3.3 Monitoring	[A] Describe the monitoring programs proposed to identify impacts to groundwater quality and quantity resulting from the Project to measure the effectiveness of mitigation plans.	[A] Volume 4, Section 7.1 Monitoring: Hydrogeology
4.4 Hydrology		
4.4.1 Baseline information	[A] Describe and map the surface hydrology. Include flow regimes of streams in the Project Area.	[A] Volume 4, Section 4.2.2 Hydrology: Hydrology and Sediment Yield; Volume 4, Appendix 4-III, Section 4.2.2 Flow and Water Level Characteristics at Temporary Monitoring Stations in the Local Study Area
	[B] Provide surface flow baseline data for both the Local and Regional Study Area, including; (a) seasonal variation, low, average and peak flows for watercourses; and	a) Volume 4, Section 4.2.2 Hydrology: Hydrology and Sediment Yield; Appendix 4-III, Sections 4.2.1 and 4.2.2
	(b) low, average and peak levels for waterbodies.	b) Volume 4, Appendix 4-III, Sections 4.2.1 and 4.2.2
	[C] Identify any surface water users who have existing approvals, permits or licenses.	[C] Volume 4, Appendix 4-III, Section 4.1.1 Surface Water Withdrawal Licenses
4.4.2 Impact Assessment	[A] Discuss changes to watershed(s), including surface and near-surface drainage conditions, potential flow impediment, and potential changes in open-water surface areas caused by the Project.	[A] Volume 4, Section 5.2.2 Impact Analysis of Effects on Open Water Areas, Flows and Water Levels
	[B] Describe the extent of hydrological changes that will result from disturbances to groundwater and surface water movement:	[B] Volume 4, Section 5.2.2 Impact Analysis of Effects on Open Water Areas, Flows and Water Levels
	(a) include changes to the quantity of surface flow, water levels and channel regime in local watercourses (during minimum, average and peak flows) and water levels in local waterbodies;	(a) Volume 4, Section 5.2.2 Impact Analysis of Effects on Open Water Areas, Flows and Water Levels
	(b) assess the potential impact of any alterations in flow on hydrology in both the Local and Regional Study Areas and identify all temporary and permanent alterations, channel realignments, disturbances or surface water withdrawals;	(b) Volume 4, Section 5.2.2 Impact Analysis of Effects on Open Water Areas, Flows and Water Levels
	(c) discuss both the Project and cumulative effect of these changes on hydrology (e.g., timing, volume, peak and minimum flow rates, river regime and lake levels), including the significance of effects for downstream watercourses; and	(c) Volume 4, Section 5.2.2 Impact Analysis of Effects on Open Water Areas, Flows and Water Levels
	(d) identify any potential erosion problems in watercourses due to the Project.	(d) Volume 4, Section 5.2.3 Impact Analysis of Effects on Geomorphic Conditions of Watercourses and the Concentrations of Suspended Sediments

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
4.4.2 Impact Assessment (continued)	[C] Discuss changes in sedimentation patterns in receiving waters caused by the Project.	[C] Volume 4, Section 5.2.3 Impact Analysis of Effects on Geomorphic Conditions of Watercourses and the Concentrations of Suspended Sediments
	[D] Describe impacts on other surface water users due to the Project. Identify any potential water use conflicts	[D] Volume 4, Section 5.2.4 Summary of Hydrology Assessment
	[E] Describe potential downstream impact if surface water is removed.	[E] Volume 4, Section 5.2.2 Impact Analysis of Effects on Open Water Areas, Flows and Water Levels
	[F] Discuss the impact of low flow conditions and in-stream flow needs (IFN) on water supply, and water and wastewater management strategies.	[F] Volume 1, Sections 3.3.4 Water Management and Section 3.3.6 Waste Management
	[G] Discuss how potential impacts of temporary and permanent roads and well pads on peatland/wetland types will be minimized and mitigated.	[G] Volume 4, Section 3.2 Surface Facilities and Infrastructure
	[H] Describe mitigation measures to address negative impacts during the construction, operation, and reclamation stages including the following; (a) alteration in flow regimes, (b) potential water use conflicts, and (c) increased sediment loadings.	[H] Volume 4, Section 3.2 Surface Facilities and Infrastructure
	[I] Describe the residual effects of the Project on hydrology in the Local and Regional Study Areas and MEG's plans to manage those effects.	[I] Volume 4, Section 5.2.4, Summary of Hydrology Assessment
4.4.3 Monitoring	[A] Describe monitoring programs to measure the effectiveness of mitigation plans.	[A] Volume 4, Section 7.2.1 Monitoring - Hydrology
	[B] Discuss any monitoring programs that may be considered to assess the impacts of changes in surface water flows and levels on aquatic resources, wildlife and vegetation.	[B] Volume 4, Section 7.2.2 Monitoring – Watercourse Crossings
4.5 Surface Water Quality		
4.5.1 Baseline Information	[A] Describe the baseline water quality of watercourses and waterbodies and their seasonal variations and relationships to flow and other controlling factors.	[A] Volume 4, Section 4.3 Water Quality; Volume 4, Appendix 4-III Hydrology Baseline

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
4.5.2 Impact Assessment	[A] Identify Project components that may influence or impact surface water quality.	[A] Volume 4, Section 5.3.1 Linkage Analysis
	[B] Describe the potential impacts of the Project on surface water quality:	[B] Volume 4, Section 5.3.2 Impact Analysis of Effects on Water Quality
	(a) discuss any changes in water quality resulting from the Project that may exceed the *Surface Water Quality Guidelines for Use in Alberta* or *Canadian Water Quality Guidelines;*	(a) Volume 4, Section 5.3.2 Impact Analysis of Effects on Water Quality
	(b) discuss the significance of any impacts on water quality and implications to aquatic resources (e.g., biota, biodiversity and habitat);	(b) Volume 4, Section 5.4.1 Linkage Analysis
	(c) discuss seasonal variation and potential effects on surface water quality;	(c) Volume 4, Section 5.3.2 Impact Analysis of Effects on Water Quality
	(d) assess the potential Project related and cumulative impacts of acidifying and other air emissions on surface water quality; and	(d) Volume 3 Sections 4.4 Linkage Analysis and Section 4.7 Conclusions
	(e) discuss the effect of changes in surface runoff or groundwater discharge on water quality in surface waterbodies.	(e) Volume 4, Section 5.3.2 Impact Analysis of Effects on Water Quality
	[C] Describe proposed mitigation measures to maintain surface water quality during the construction, operation and reclamation stages of the Project.	[C] Volume 4, Section 3.2 Surface Facilities and Infrastructure
	[D] Describe the residual effects of the Project on surface water quality and MEG's plans to manage those effects.	[D] Volume 4, Section 5.3.3 Summary of Water Quality Assessment
4.5.3 Monitoring	[A] Describe the monitoring programs that may be proposed to assess surface water quality impacts from the Project and the success of mitigations measures. Discuss the location of monitoring sites, the frequency of monitoring, the parameters to be monitored, the implementation of quality assurance programs, and the numerical methodology.	[A] Volume 4, Section 7.3 Water Quality
	[B] Describe how continuous monitoring will be used to evaluate Project effects, and how such monitoring will be used to identify the need for mitigation.	[B] Volume 4, Section 7.3 Water Quality
4.6. Aquatic Ecology		
4.6.1 Baseline Information	[A] Describe the existing fish and other aquatic resources (e.g., benthic invertebrates). Identify species composition, distribution, relative abundance, movements and general life history parameters.	[A] Volume 4, Section 4.4 Fish and Fish Habitat; Appendix 4-V Fish and Fish Habitat Baseline
	[B] Describe and map, as appropriate, the fish habitat and aquatic resources of the lakes, rivers and other waters and identify:	[B] Volume 4, Section 4.4 Existing and Approved Case: Fish and Fish Habitat; Volume 4, Appendix 4-V Fish and Fish Habitat Baseline
	(a) identify key indicator species and provide the rationale and selection criteria used;	(a) Volume 4, Section 2.7 Key Indicator Resources Volume 4, Appendix 4-I Fish KIRs

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
4.6.1 Baseline Information (continued)	(b) critical or sensitive areas such as spawning, rearing, and over-wintering habitats. Discuss seasonal habitat use including migration and spawning routes; and	(b) Volume 4, Appendix 4-V, Fish and Fish Habitat Baseline
	(c) current and potential use of the fish resources by Aboriginal, sport or commercial fisheries	(c) Volume 6, Appendix 6-II Resource Use Baseline; Volume 4, Appendix 4-V, Fish and Fish Habitat Baseline
4.6.2 Impact Assessment	[A] Describe the potential impacts to fish, fish habitat and other aquatic resources (e.g., stream alterations and changes to substrate conditions, water quality and quantity) considering: (a) fish tainting, survival of eggs and fry, chronic or acute health effects, and increased stress on fish populations from release of contaminants, sedimentation, flow alterations, temperature and habitat changes;	(a) Volume 4, Section 5.4.3 Impact Analysis of Effects on Fish Health
	(b) potential impacts on riparian areas that could impact aquatic biological resources and productivity;	(b) Volume 4, Section 5.4.2 Impact Analysis on Effects on Fish Habitat
	(c) the potential for increased fishing pressures could arise from the increased workforce and improved access as a result of the Project. Identify the implications on the fish resource and describe any mitigation strategies that might be planned to minimize these effects; and	(c) Volume 4, Section 5.4.4 Impact Analysis on Fish Abundance
	(d) changes to benthic invertebrate communities that may affect food quality and availability for fish.	(d) Volume 4, Section 5.4.2 Impact Analysis on Effects on Fish Habitat
	[B] As applicable, discuss the design, construction and operational factors to be incorporated into the Project to minimize effects to fish and fish habitat and protect aquatic resources.	[B] Volume 4, Section 3.2 Surface Facilities and Infrastructure
	[C] Identify plans proposed to offset any loss in the productivity of fish habitats. Indicate how environmental protection plans address applicable provincial and federal policies on fish habitat including the development of a "No Net Loss" fish habitat objective.	[C] Volume 4, Section 5.4.2 Impact Analysis on Effects on Fish Habitat
	[D] Describe residual effects of the Project on fish, fish habitat, and other aquatic resources and discuss their significance in the context of local and regional fisheries. Describe MEG's plans to manage these effects.	[D] Volume 4, Section 5.4 Fish and Fish Habitat
4.6.3 Monitoring	[A] Describe monitoring programs that may be proposed to assess fisheries impacts from the Project and the success of mitigation measures.	[A] Volume 2, Appendix 2-V Monitoring Programs; Volume 4, Section 7.4 Fish and Fish Habitat
4.7 Vegetation		
4.7.1 Baseline Information	[A] Describe the existing vegetation and map vegetation communities for each ecosite phase.	[A] Volume 5, Appendix 5-II, Terrestrial Vegetation and Wetlands Baseline; Volume 5, Section 4.1 Terrestrial Vegetation and Wetlands Types

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
4.7.1 Baseline Information (continued)	[B] Describe and map peatlands and wetlands and discuss the distribution and relative abundance of wetlands.	[B] Volume 5, Appendix 5-II, Section 3.1 Terrestrial Vegetation and Wetlands; Section 3.3.1.3 Peatlands; Section 4.1 Terrestrial Vegetation and Wetlands Types; Section 4.6 Landscape Level Analyses
	[C] Identify, verify and map the relative abundance of species of rare plants and the ecosite phases where they are found.	[C] Volume 5, Appendix 5-II, Section 4.3, Local Study Area, Rare Plants; Volume 5, Section 6.2 Terrestrial Vegetation, Wetlands and Forestry
	[D] Identify key indicator species and discuss the rationale for their selection. Identify composition, distribution, relative abundance, habitat requirements and general life history. Address those species listed as "at Risk, May be at Risk, and Sensitive" as listed in *The Status of Alberta Species* (Alberta Sustainable Resources Development).	[D] Volume 5, Appendix 5-II, Section 4.3, Local Study Area, Rare Plants; Volume 5, Section 6.2 Terrestrial Vegetation, Wetlands and Forestry
	[E] Discuss the potential of each ecosite phase to support rare plant species, plants for traditional and medicinal purposes, old growth forests and communities of limited distribution. Consider their importance for local and regional habitat, sustained forest growth, rare plant habitat and the hydrologic regime.	[E] Volume 5, Appendix 5-II, Section 3.3 Key Indicator Resources
	[F] Describe the regional significance of landscape units that are identified as rare.	[F] Volume 5, Appendix 5-VI, Section 4.2 Ecosystem Level
	[G] Provide Timber Productivity Ratings for the Local Study Area lands, including identification of productive forested, non-productive forested and non-forested lands.	[G] Volume 5, Appendix 5-III, Section 3.2 Forest Cover Area
4.7.2 Impact Assessment	[A] Identify the amount of vegetation and wetlands to be disturbed during the life of the Project.	[A] Volume 5, Section 6.2.2. Terrestrial Vegetation, Wetlands and Forestry Impact Analysis.
	[B] Discuss any potential effects the Project may have on rare plants or endangered species, as listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Alberta Natural Heritage Information Centre (ANHIC).	[B] Volume 5, Section 6.2.3.9 Rare Plants
	[C] Discuss temporary (include timeframe) and permanent changes to vegetation and wetland communities:	[C] Volume 5, Section 6.2.2. Terrestrial Vegetation, Wetlands and Forestry Impact Analysis
	(a) comment on the effects and their implications for other environmental resources (habitat diversity and quantity, water quality and quantity, erosion potential, soil conservation, recreation and other uses), and	(a) Volume 5, Section 6.1 Soil and Terrain and Section 6.2 Terrestrial Vegetation, Wetlands and Forestry

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
4.7.2 Impact Assessment (continued)	(b) comment on the sensitivity to disturbance (including acid deposition), as well as the techniques used to estimate sensitivity to disturbance and reclamation, of each vegetation community.	(b) Volume 5, Section 6.2 Terrestrial Vegetation, Wetlands and Forestry
	[D] Describe the regional relevance of any ecosite to be removed.	[D] Volume 5, Section 6.2 Terrestrial Vegetation, Wetlands and Forestry Impact Analysis
	[E] Discuss from an ecological perspective, the expected timelines for establishment and recovery of vegetative communities and the expected differences in the resulting vegetative community structures	[E] Volume 5, Section 6.2 Terrestrial Vegetation, Wetlands and Forestry Impact Analysis
	[F] Provide an ELC map that shows the reclaimed vegetation. Comment on the importance of the size, distribution and variety of these reclaimed landscape units from both a local and regional perspective	[F] Volume 5, Appendix 5-II, Section 4.1 Terrestrial Vegetation and Wetlands Types and Section 4.5 Landscape-Level Analyses; Volume 1, Section 6, Section 5.8 Vegetation Management Plan
	[G] Compare the pre-disturbance and reclaimed percentages and distribution of all forested communities in the Project Area and determine the amount of commercial and non-commercial forest land base that will be disturbed by the Project.	[G] Volume 5, Section 6.2 Terrestrial Vegetation, Wetlands and Forestry
	[H] Discuss the impact of any loss of peatlands or wetlands, as well as how this will affect land use, fragmentation and biodiversity. Discuss measures and techniques that will be used to minimize the impact.	[H] Volume 5, Section 6.2 Terrestrial Vegetation, Wetlands and Forestry and Section 3.1 Mitigation
	[I] Provide a mitigation strategy that will minimize Project impacts addressing the following: (a) mitigation of the adverse effects of site clearing on rare plants and plant communities. Identify any setbacks proposed around environmentally sensitive areas such as surface waterbodies, riparian areas and peatlands/wetlands; and	(a) Volume 5, Section 3.1 Mitigation
	(b) measures and techniques that will be used to minimize the impact of loss of peatlands or wetlands on land use, fragmentation and biodiversity.	(b) Volume 5, Section 3.1 Mitigation
	[J] Describe the residual effects of the Project on vegetation and MEG's plans to manage those effects.	[J] Volume 5, Section 6.2.Terrestrial Vegetation, Wetlands and Forestry
4.7.3 Monitoring	[A] Describe monitoring programs that may be proposed to assess vegetation impacts from the Project and the success of mitigation measures.	[A] Volume 5, Section 8.1 Monitoring

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
4.8 Wildlife		
4.8.1 Baseline Information	[A] Describe and map existing wildlife resources (amphibians, reptiles, birds and terrestrial and aquatic mammals), their use and potential use of habitats.	[A] Volume 5, Section 6.3 and Volume 5, Appendix 5-IV, Sections 3.0 to 7.0 Results;
	[B] Identify key indicator species and discuss rationale for their selection. Identify composition, distribution, relative abundance, seasonal movements, movement corridors, habitat requirements, key habitat areas, and general life history. Address those species listed as "at Risk, May be at Risk, and Sensitive" as listed in The Status of Alberta Species (Alberta Sustainable Resources Development).	[B] Volume 5, Appendix 5-IV, Sections 3.0 to 7.0 Results; Volume 5, Appendix 5-V, Section 1.2 and 1.3 Results; Volume 5, Sections 4.3 and 6.3 Wildlife
4.8.2 Impact Assessment	[A] Describe Project components and activities that may affect wildlife and wildlife habitats.	[A] Volume 1, Section 4.3.6.3 Wildlife; Volume 5, Sections 6.3 and 7.3 Wildlife; Volume 5, Appendix 5-IV Sections 1 Introduction and Sections 5 to 7 Results
	[B] Document the potential changes to wildlife in the EIA Study Areas as follows: (a) evaluate potential impacts on wildlife populations, habitat use, habitat availability/quality and food supply during all phases of the Project. Consider habitat loss, abandonment, reduced effectiveness, fragmentation or alteration as it relates to reproductive potential and recruitment for regional wildlife populations over the life of the Project;	(a) Volume 5, Appendix 5-V, Sections 1.3, 2.3, 3.3 and Section 4.3 Results; Volume 5, Section 6.3 Wildlife
	(b) describe the spatial and temporal changes to habitat (type, quality, quantity, diversity and distribution) and to wildlife distribution, relative abundance, movements, habitat availability and the potential to return the area to pre-disturbed wildlife habitat/population conditions, including:	(b) Volume 5, Appendix 5-V, Sections 1.3, 2.3, 3.3 and Section 4.3 Results; Volume 5, Section 6.3 Wildlife
	i) potential effects on wildlife as a result of changes to air, water, including both acute and chronic effects on animal health, and	(b) i) Volume 3, Section 4.5.2.3 Wildlife and Wildlife Habitat Effects Analysis and Section 4.6.2.3 Wildlife and Wildlife Habitat Analysis, 4.7.2 Terrestrial Resources; Volume 3, Appendix 3-VI
	ii) potential effects on wildlife due to improved or altered access into the area; e.g., vehicle collisions with wildlife, obstructions to daily or seasonal movements, noise and hunting mortality during operations and after reclamation; and	(b) ii) Volume 5, Appendix 5-V, Section 2.3 Results; Volume 5, Section 6.3 Wildlife
	(c) map the anticipated changes due to the Project and other planned activities in both the Local and Regional Study Areas to describe potential effects of habitat fragmentation and the implications to wildlife.	(c) Volume 5, Section 6.3.2 Effects Assessment
	[C] Provide a strategy and mitigation plan to minimize impacts on wildlife habitat during the life of the Project and to return productive wildlife habitat to the area, considering: (a) consistency of the plan with applicable regional, provincial and federal wildlife habitat objectives and policies;	(a) Volume 5, Section 8.2 Wildlife Monitoring and Section 3 Mitigation

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
4.8.2 Impact Assessment (continued)	(b) habitat enhancement measures and a schedule for the return of habitat capability to areas impacted by the Project;	(b) Volume 1, Section 6 Conservation and Reclamation Plan; Volume 5, Section 3 Mitigation and Section 8.3 Reclamation Monitoring
	(c) the use of setbacks to provide for the protection of riparian habitats, interconnectivity of such habitat and the unimpeded movement by wildlife species using the habitat;	(c) Volume 5, Section 3 Mitigation and Section 8.2 Wildlife Monitoring
	(d) the need for access controls or other management strategies to protect wildlife during and after Project operations; and	(d) Volume 5, Section 3 Mitigation and Section 8.2 Wildlife Monitoring
	(e) measures to prevent habituation of wildlife, increasing the potential for human-wildlife encounters and consequent destruction of wildlife (e.g., black bears), including any staff training program, garbage containment or regular follow-up.	(e) Volume 5, Section 3 Mitigation, Section 8.2 Wildlife Monitoring
	[D] Describe the residual effects of the Project on wildlife and wildlife habitat in Local and Regional Study Areas and MEG's plans to manage those effects.	[D] Volume 5, Section 6.3 and Section 3.1. Monitoring
4.8.3 Monitoring	[A] Describe monitoring programs proposed to assess wildlife impacts from the Project and the effectiveness of mitigation strategies and habitat enhancement measures, giving special attention to sensitive species.	[A] Volume 5, Section 3 Mitigation, Section 6.3 Wildlife Monitoring
4.9 Biodiversity and Fragmentation		
4.9.1 Baseline Information	[A] Describe the terrestrial and aquatic biodiversity metrics that will be used to characterize the existing ecosystems and probable effects of Project development and that will represent broad taxonomic assemblages, and:	[A] Volume 5, Appendix 5-II, Attachment C, Section 2.0 Analysis of Landscape Structure; Volume 5, Appendix 5-VI, Section 3.2. Biodiversity Analysis
	(a) describe the process and rationale used to select biotic and abiotic indicators for biodiversity within selected taxonomic groups;	(a) Volume 5, Section 6.4; Volume 5, Appendix 5-VI, Attachment A, Section 2.3 Scoring of Indices and Section 3.0 Results and Discussion
	(b) determine the relative abundance of species in each ecological unit (e.g., ecosite phase);	(b) Volume 5, Appendix 5-VI, Attachment A, Section 3.0 Results and Discussion
	(c) provide species locations, lists and summaries of observed and estimated species richness and evenness for each ecosite phase;	(c) Volume 5, Appendix 5-VI, Attachment A, Section 3.0 Results and Discussion
	(d) provide a measure of biodiversity on baseline sites that are representative of the proposed reclamation ecosites; and	(d) Volume 5, Appendix 5-VI, Section 4.2.1.2 Biodiversity Potential of Regional Land Cover Classes and Section 4.2.2.1 Biodiversity Potential of Ecosystem Types; Volume 5, Section 6.4 Biodiversity

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
4.9.1 Baseline Information	(e) rank each ecological unit for biodiversity potential. Describe the techniques used in the ranking process.	(e) Volume 5, Appendix 5-VI, Attachment A, Section 4.0 Ranking of Vegetation Types and Section 5.0 Ranking of Regional Land Cover Classes; Volume 5, Section 6.4 Biodiversity
	[B] Describe the current level of habitat fragmentation.	[B] Volume 5, Appendix 5-II, Sections 2.3.4, 3.2 and 4.5 Landscape-Level Analyses; Volume 5, Section 6.4 Biodiversity
4.9.2 Impact Assessment	[A] Describe the metrics that will be used to assess the probable effects of Project development. The Alberta Biodiversity Monitoring Program protocols should be used wherever possible to conduct the biodiversity assessment. Discuss the contribution of the Project to any anticipated changes in regional biodiversity and the potential impact to local and regional ecosystems.	[A] Volume 5, Section 6.4 Biodiversity; Volume 5, Appendix 5-V, Section 2 Habitat Fragmentation Analysis
	[B] Identify and evaluate the extent of potential effects from fragmentation that may result from the Project.	[B] Volume 5, Section 6.4 Biodiversity
	[C] Discuss the measures to minimize any anticipated changes in regional biodiversity.	[C] Volume 5, Section 3 Mitigation, Volume 1, Section 6.5 Equivalent Capability Restoring Biodiversity With Reclamation
	[D] Describe the residual effects of the Project on biodiversity and fragmentation and MEG's plans to manage those effects.	[D] Volume 5, Appendix 5-VII, Section 3.2.2 Restoring Biodiversity With Reclamation; Volume 5, Section 6.4.2 Biodiversity Impact Analysis
4.9.3 Monitoring	[A] Describe monitoring programs proposed to measure changes to biodiversity and increased fragmentation caused by the Project and the effectiveness of mitigation measures.	[A] Volume 5, Section 3 Mitigation and Section 8.4 Biodiversity Monitoring
4.10 Terrain and Soils		
4.10.1 Baseline Information	[A] Describe and map the terrain and soils conditions including: (a) surficial geology and topography;	(a) Volume 5, Appendix 5-I, Section 1.2.2 Local Study Area
	(b) the soil types and their distribution. Provide an ecological context to the soil resource by supplying a soil survey report and maps to include Survey Intensity Level (SIL) 2 for the Project Area;	(b) Volume 5, Appendix 5-I, Section 3.2.1 Soil Classification
	(c) the suitability and availability of soils within the Project Area for reclamation; and	(c) Volume 5, Appendix 5-I, Table 7; Volume 1, Section 6, Section 5.3
	(d) soils that could be affected by the Project with emphasis on potential acidification (by soil type); and	(d) Volume 5, Appendix 5-I, Section 3.1.1.2 Soil Sensitivity to Acidification in the RSA
	(e) the location of erosion sensitive soils.	(e) Volume 5, Appendix 5-I, Section 3.2.1.2 Wind and Water Erosion Risk

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
4.10.2 Impact Assessment	[A] Describe Project activities and other related issues that could affect soil quality (e.g., compaction, contaminants) and:	[A] Volume 5, Section 6.1 Soil and Terrain; Appendix 5-1, Section 2 Project Description
	(a) indicate the amount (ha) of surface disturbance from plant, field (pads, pipeline, access roads), aggregate and borrow sites, construction camps, drilling waste disposal and infrastructure-related activities;	(a) Volume 5, Section 6.1 Soil and Terrain; Volume 1, Section 5 Waste Management and Contingency Plans; Volume 5, Appendix 5-I, Section 2 Project Description
	(b) provide an inventory of the pre- and post-disturbance land capability, classes for soils in the Local Study Area and describe the impacts to land capability due to the Project. Indicate the size and location of soil types and land capability classes that will be disturbed;	(b) Volume 5, Section 6.1.2.Terrain Impact Analysis
	(c) discuss the relevance of any changes for the local and regional landscapes, biodiversity, productivity, ecological integrity, aesthetics and future use resulting from disturbance during the life of the Project;	(c) Volume 5, Section 6.1 Soil and Terrain; Volume 6, Section 4.2.2 Impact Assessment
	(d) identify the potential acidification impact on soils and discuss the significance of predicted impacts by acidifying emissions resulting from the Project;	(d) Volume 3, Section 4 Air Emission Effects on Ecological Receptors; Volume 3, Section 4.4 Mitigation and Monitoring; Volume 3, Section 4.5 Existing and Approved Conditions; Volume 3, Section 4.6 Project Case; Volume 3, Section 4.7 Planned Development Case
	(e) describe the impact of the Project development on soil types and reclamation suitability and the approximate volume of soil materials for reclamation. Discuss any constraints or limitations to achieving vegetation/habitat reclamation based on anticipated soil conditions (e.g. compaction, contaminants, soil moisture, nutrient depletion, erosion, etc.);	(e) Volume 5, Section 6.1, Soil and Terrain
	(f) discuss potential for soil erosion during the life of the Project;	(f) Volume 1, Section 6.7.4.2 Soil Erosion
	(g) identify the environmental effects of proposed drilling methods on the landscape and surficial and bedrock geology during the life of the Project;	(g) Volume 4, Section 5.1, Hydrogeology
	(h) discuss the potential for casing and pipeline failures and their environmental effects; and	(h) Volume 1, Section 3.2.2
	(i) discuss the potential for changes in the ground surface during operations (e.g., ground heave and/or subsidence). Discuss the environmental implications of any terrain changes during the steaming and recovery operations.	(i) Volume 5, Section 5 Linkage Analysis and Section 6.1 Soil and Terrain

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
4.10.2 Impact Assessment **(continued)**	[B] Provide a mitigation plan to address: (a) possible measures to minimize surface disturbance including the use of existing clearings for Project development;	(a) Volume 1, Section 6 Conservation and Reclamation Plan
	(b) possible actions to address potential effects of acid deposition;	(b) Volume 3, Section 1.1.2.1 Project Air Quality Initiatives
	(c) actions to mitigate effects of any constraint or limitations to habitat restorations such as compaction, contaminants, soil moisture, erosion, nutrient regimes, etc.;	(c) Volume 1, Section 6.7 Waste Management and Contingency Plans
	(d) possible measure to mitigate changes to ground surface (temperature, heave and subsidence) during operations;	(d) n/a
	(e) possible actions to address impacts to land capability; and	(e) Volume 5, Section 6.1.3.2 Soil Quality/Capability
	(f) any other measures to reduce or eliminate the potential impacts that the Project may have on soil capability and/or quality.	(f) Volume 1, Section 6.6.7 Soil Replacement Plan and Section 6.6.8, Vegetation Management Plan
	[C] Describe the residual effects of the Project on terrain and soils and MEG's plans to manage those effects.	[C] Volume 5, Section 6.1 Soil and Terrain
4.10.3 Monitoring	[A] Describe monitoring programs proposed to measure impacts due to the Project on terrains and soils and the success of mitigation measures.	[A] Volume 1, Section 6.8 Monitoring Conservation and Reclamation
4.11 Land Use		
4.11.1 Baseline Information	[A] Identify the current land uses, including oil and gas development, agriculture, forestry, tourism, cultural use, food collection, trapping, fishing, hunting and other outdoor recreational activities.	[A] Volume 6, Appendix 6-II, Section 2.2 Land Use Disposition; Section 2.3 Existing and Applied Development; Section 2.4 Existing Conditions
	[B] Identify and map all Crown land, including bed and shore.	[B] Volume 5, Appendix 5-III, Figure 1
	[C] Identify and map unique sites or special features such as Natural Areas, Environmentally Significant Areas, and Heritage Rivers.	[C] Volume 6, Appendix 6-II, Section 2.4.3 Environmentally Important Areas
	[D] Identify any land use policies and resource management initiatives that pertain to the Project, and discuss how the Project will be consistent with these initiatives.	[D] Volume 6, Appendix 6-II, Section 2.1 Resource Use Plans and Zoning

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
4.11.2 Impact Assessment	[A] Identify the potential impact of the Project on these land uses, including:	
	(a) impacts to unique sites or special features	(a) Volume 6, Section 3.5.2 Effects on Environmentally Important Areas
	(b) anticipated impacts related to changes in public access;	(b) Volume 6, Sections 3.5.2 Effects on Environmentally Important Areas and 3.5.3 Effects on Resource Use and Users
	(c) secondary effects, such as increased hunter, angler and other recreational access and facilitated predator movement, that may result from linear development;	(c) Volume 6, Section 3.5.3 Effects on Resource Use and Users and Volume 5, Section 6.3.2
	(d) the implications of relevant land use policies and resource management initiatives for the Project, including any constraints to development;	(d) Volume 6, Section 3.3.1 Resource Use Plans and Zoning
	(e) potential impacts to aggregate reserves that may be located on land under MEG's control and reserves in the region;	(e) Volume 6, Section 3.5.3 Effects on Resource Use and Users
	(f) the impact of development and reclamation on commercial forest harvesting in the Project Area. Include opportunities for timber salvage, revegetation, reforestation and harvest for the reduction of fuel hazard;	(f) Volume 6, Sections 3.5.2.3 Effects on Environmentally Important Areas and 3.5.3.3 Effects on Resource Use and Users
	(g) the amount of commercial and non-commercial forest land base that will be disturbed by the Project. Compare the pre-disturbance and reclaimed percentages and distribution of all forested communities in the Project Area;	(g) Volume 6, Section 3.5.3 Effects on Resource Use and Users and Table 3.5-5
	(h) how the Project disturbance impacts Annual Allowable Cuts and quotas within the Forest Management Area;	(h) Volume 5, Section 5.2.2.2, Terrestrial Vegetation, Wetland and Forest Resources; Volume 6, Section 3.5.3 Effects on Resource Use and Users
	(i) the potential impact on existing land uses of anticipated changes (type and extent) to the pre- disturbance topography, elevation and drainage pattern within the Project Area resulting from disturbance during construction, operation and reclamation activities; and	(i) Volume 4, Section 5.2.2 Impact Analysis of Effects on Open Water Areas, Flows and Water Levels; Volume 5, Section 6.1.2 Terrain Impact Analysis; Volume 5, Section 6.2.2 Terrestrial Vegetation and Wetlands Impact Analysis; Volume 6, Section 3.5.3.1 Linkage Analysis; and Volume 6, Section 3.5.3.3 Effects Analysis
	(j) implications of the Project on regional recreational activities, public access and other land uses during and after development activities.	(j) Volume 6, Section 3.5.3 Effects on Resource Use and Users
4.11.2 Impact Assessment (continued)	[B] Discuss possible mitigative strategies to address: (a) access management during and after Project operations;	(a) Volume 6, Section 3.5.3 Effects on Resource Use and Users

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
	(b) the needs of other users in the Local Study Area;	(b) Volume 6, Section 3.5.3 Effects on Resource Use and Users
	(c) measures to mitigate impacts on land use created by the Project; and	(c) Volume 6, Section 3.5.3 Effects on Resource Use and Users
	(d) how potentially-affected aggregate reserves will be salvaged and stockpiled with input provided by Alberta Infrastructure and Transportation and Alberta Sustainable Resource Development.	(d) Volume 6, Section 3.5.3 Effects on Resource Use and Users
	[C] Describe the residual effects of the Project on land use and MEG's plans to manage those effects.	[C] Volume 6, Section 3.5.3 Effects on Resource Use and Users
4.11.3 Monitoring	[A] Describe the monitoring programs proposed to measure land use impacts resulting form the Project and the effectiveness of mitigation measures.	[A] Volume 6, Section 3.5.3 Effects on Resource Use and Users
5.0 HISTORICAL RESOURCES		
5.0 HISTORICAL RESOURCES	[A] Describe consultation with Alberta Tourism, Parks, Recreation and Culture (TPRC) and Aboriginal communities concerning the need for Historical Resource Impact Assessment (HRIA) for the Project and:	[A] Volume 6, Section 2
	(a) provide a general overview of the results of any previous historical resource studies that have been conducted in the Study Area, including archaeological resources, palaeontological resources, historical period sites, and any other historical resources as defined within the *Historical Resources Act*	(a) Volume 6, Section 5.3.2 Regional Study Area
	(b) summarize the results from the field program performed to assess archaeological, palaeontological and historical significance of the Local Study Area;	(b) Volume 6, Section 5.3 Approved and Existing Conditions
	(c) provide a summary of the results of the HRIA conducted to assess the potential impact of the Project on archaeological, palaeontological and historical resources;	(c) Volume 6, Section 5.3 Approved and Existing Conditions
	(d) provide an outline of the program and schedule of field investigations that TPRC may require MEG to undertake to further assess and mitigate the effects of the Project on historical resources; and	(d) Volume 6, Section 5.6,Planned Development Case
	(e) document any stakeholder concerns with respect to the development of the Project based on the historical significance of the EIA Study Areas.	(e) Volume 6, Section 2 TLU Assessment
6.0 TRADITIONAL ECOLOGICAL KNOWLEDGE AND TRADITIONAL LAND USE		
6.0 TRADTIONAL ECOLOGICAL KNOWLEDGE AND TRADITIONAL LAND USE	[A] Describe: (a) the extent of traditional use of land in the Local Study Area. Discuss the vegetation and wildlife used for traditional, food, ceremonial, medicinal and other purposes, and any potential effects the Project may have;	(a) Volume 6, Section 2 TLU Assessment
	(b) traditional uses including fishing, hunting, nutritional or medicinal plant harvesting and cultural use by local aboriginal peoples; and	(b) Volume 6, Section 2 TLU Assessment

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
	(c) a map of cabin sites, spiritual sites, graves and other traditional use sites consider4ed as historic resources under the Historic Resources Act (if the Aboriginal community is willing to have these locations disclosed); and.	(c) Volume 6, Section 2 TLU Assessment
	(d) how Traditional Ecological Knowledge and Traditional Land Use Information was gathered and incorporated into the EIA report.	(d) Volume 6, Section 2 TLU Assessment
	[B] Discuss the impact of development on these uses and identify possible mitigation strategies.	[B] Volume 6, Section 2 TLU Assessment
7.0 PUBLIC HEALTH AND SAFETY ASSESSMENT		
7.0 PUBLIC HEALTH AND SAFETY ASSESSMENT	[A] Describe those aspects of the Project that may have implications for public health or the delivery of regional health services. Determine whether there may be implications for public health arising from the Project. Specifically: (a) assess the potential health implications of the compounds that will be released to the environment from the proposed operation in relation to exposure limits established to prevent acute and chronic adverse effects on human health;	(a) Volume 3, Section 3.6, Existing and Approved Case, Project Case and Planned Development Case Assessment
	(b) provide the data, exposure modeling calculations, and described the methods MEG used to assess impacts of the Project on human health and safety;	(b) Volume 3, Section 3.4, Assessment Methods; Volume 3, Appendix 3-VIII Multiple Pathway Exposure Model and Predicted Exposure Point Concentrations
	(c) provide information, including chemical analysis and modeling results, on samples of selected environmental media (e.g. soil, water, air, vegetation, wild game, etc.) used in the assessment;	(c) Volume 3, Section 3.4.4.2 Exposure Assessment; Volume 3, Appendix 3-VIII Multiple Pathway Exposure Model and Predicted Exposure Point Concentrations; Appendix 3-II Air Modelling Methods
	(d) discuss the potential for changes to water quality, air quality and soil quality to increase human exposure to contaminants taking into consideration all Project activities;	(d) Volume 3, Section 3.4 Assessment Methods and Section 3.5 Mitigation

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
7.0 PUBLIC HEALTH AND SAFETY ASSESSMENT (continued)	(e) identify the human health impact of the potential contamination to country foods and natural food sources taking into consideration all Project activities	(e) Volume 3, Section 3.6 Existing and Approved Case, Project Case and Planned Development Case Assessment
	(f) document the health concerns raised by stakeholders during consultation on the Project;	(f) Volume 1, Section 5.4; Volume 3, Section 3.2 Scope of Assessment
	(g) document any health concerns identified by aboriginal communities or groups due to impacts of existing development and of the Project specifically on their traditional lifestyle and include an aboriginal receptor type in the assessment;	(g) Volume 3, Section 3.2 Scope of Assessment
	(h) assess the cumulative human health effects to receptors, including the First Nations and Metis receptors;	(h) Volume 3, Section 3.6 Existing and Approved Case, Project Case and Planned Development Case Assessment
	(i) as appropriate, describe anticipated follow-up work, including regional cooperative studies. Discuss how such work will be implemented and coordinated with ongoing air, soil and water quality initiatives;	(i) Volume 3, Section 3.7 Monitoring
	(j) describe the potential health impacts due to higher regional traffic volumes and the increased risk of accidental leaks and spills; and	(j) Volume 3, Section 3.6 Existing and Approved Case, Project Case and Planned Development Case Assessment
	(k) discuss mitigation strategies to minimize the potential impact of the Project on human health.	(k) Volume 3, Section 3.5 Mitigation
	[B] Describe those aspects of the Project that may have implications for public safety. Determine whether there may be implications for public safety arising from the Project. Specifically: (a) provide a summary of the Project's emergency response plan;	(a) Volume 1, Section 3.3.2 Facility Emergency Response Plan - Details
	(b) document the safety concerns raised by stakeholders during consultation on the Project;	(b) Volume 1, Section 5.4
	(c) describe how local residents will be contacted during an emergency and the type of information that will be communicated to them;	(c) Volume 1, Section 3.3.2 Facility Emergency Response Plan - Details
	(d) describe the existing agreements with area municipalities or industry groups such as safety cooperatives, emergency response associations and municipal emergency response agencies;	(d) Volume 1, Section 3.3.2 Facility Emergency Response Plan - Details
	(e) describe the potential safety impacts due to higher regional traffic volumes; and	(e) Volume 6, Section 6.5.3 Traffic
	(f) discuss mitigation plans to ensure workforce and public safety during the life of the Project. Include prevention and safety measures for wildfire occurrences, water saturated plume from the cooling towers, icy roads in the winter months, accidental release or spill of chemicals to the environment and failures of structures retaining water or fluid wastes.	(f) Volume 6, Section 6.3.1 Traffic

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
8.0 SOCIO-ECONOMIC ASSESSMENT		
8.1 Baseline Information	[A] Describe the existing socio-economic conditions for communities in the region and for the region as a whole	[A] Volume 6, Appendix 6-III; Section 2.1 Study Areas Overview, Section 2.2 Demographics, Section 2.3 Economic Setting, and Section 2.4 Social Setting
	[B] Describe the factors that may affect existing socio-economic conditions including: (a) population changes;	(a) Volume 6, Appendix 6-III, Section 2.2. Population
	(b) MEG's policies and programs regarding the use of regional and Alberta goods and services;	(b) Volume 6, Section 6.3.4 Local Opportunities, and Section 6.4.2 Project Case for Economic Effects
	(c) a Project schedule and a general description of the overall engineering and contracting plan for the Project;	(c) Volume 1, Section 1.2 Project Overview, and Section 3.2 Process Description
	(d) workforce requirements for the Project including a description of when peak activity periods will occur; and	(d) Volume 6, Section 6.4.2 Project Case for Economic Effects
	(e) planned accommodations for the workforce.	(e) Volume 6, Section 6.5.2 Project Case for Housing
8.2 Impact Assessment	[A] Describe the socio-economic effects of construction and operation of the Project, including: (a) impacts related to:	(a) Volume 6, Section 6.4 Economic Effects, and Section 6.5 Social Effects
	i) local employment opportunities,	i) Volume 6, Section 6.4.2 Project Case for Economic Effects
	ii) local business opportunities,	ii) Volume 6, Section 6.3.4 Local Opportunities
	iii) regional and provincial economic benefits;	ii) Volume 6, Section 6.4.2 Project Case for Economic Effects
	iv) housing,	iv) Volume 6, Section 6.5.2 Housing

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
8.2 Impact Assessment (continued)	v) construction camps,	v) Volume 6, Section 6.5.4, Project Case for Housing; Section 6.5.6 Project Case for Traffic, Section 6.5.10 Project Case for Health Services, Section 6.5.12 Project Case for Social Services, Section 6.5.14 Project Case for Emergency and Protective Services, Section 6.5.16 Project Case for Municipal Services and Infrastructure, Section 6.5.18 Project Case for Recreation, and Volume 1, Section 3.2.3.1 Camps
	vi) recreational activities,	vi) Volume 6, Section 6.5.18 Project Case for Recreation
	vii) trapping, hunting and fishing,	vii) Volume 6, Section 3.5.3 Effects on Resource Use and Resource Users
	viiii) effects on First Nations and Métis (e.g., traditional land use and culture),	viii) Volume 6, Section 2.5 TLU Assessment
	(b) estimated total Project cost including a breakdown for engineering and Project management, equipment and materials, and labour for both construction and operations stages. Indicate the percentage of expenditures expected to occur in the region, Canada outside Alberta, and outside Canada;	(b) Volume 6, Section 6.4.2 Project Case for Economic Effects
	(c) impacts of the Project on the availability of affordable housing and the quality of health care services. Provide a summary of any discussions that have taken place with the local municipalities and the Regional Health Authority concerning housing availability and health care services respectively;	(c) Volume 6, Section 6.5.4 Project Case for Housing, Section 6.5.10 Project Case for Health Services, Section 6.3.2 Health Services, Volume 6, Appendix 6-III, Section 2.4.2 Housing, and Section 2.4.4 Health Services
	(d) any effects expected on primary and secondary highway systems and other regional roads caused by anticipated traffic changes;	(d) Volume 6, Section 6.5.3 Traffic
	(e) if a construction camp is needed, identify: i) its location,	(e) i) Volume 1, Figure 1.2-3
	ii) the number of workers it is intended to house,	(e) ii) Volume 1, Section 3.2.3.1 Camps
	iii) whether the camp will service the Project only or other clients,	(e) iii) Volume 1, Section 3.2.3.1 Camps

Table 1 Final Terms of Reference Issued by Alberta Environment – Concordance (continued)

TOR Section	Environmental Assessment or Topic	Location TOR Addressed
8.2 Impact Assessment (continued)	iv) the length of time the camp will be in service, and	(e) iv) Volume 1, Section 3.2.3.1 Camps
	v) what services will be provided in the camp (e.g., security, recreation and leisure, medical services).	(e) v) Volume 1, Section 3.2.3.1 Camps
	(f) the impact on local and regional infrastructure and community services, including consideration of municipal "hard services", education/training services, social services, urban and regional recreation services, law enforcement and emergency services.	(f) Volume 6, Section 6.5.16 Project Case for Municipal Services and Infrastructure, Section 6.6 Planned Development Case, Section 6.5.6 Traffic, Section 6.3.1 Traffic, Section 6.3.3 Education and Training, Section 6.5.8 Project Case for Education, Section 6.5.12 Project Case for Social Services, Section 6.5.18 Project Case for Recreation, and Section 6.5.14 Project Case for Emergency and Protective Services
	[B] Discuss options for mitigating impacts including: (a) MEG's policies and programs regarding the use of regional and Alberta goods and services;	(a) Volume 6, Section 6.3.3 Education and Training, Section 6.3.4 Local Opportunities
	(b) plans to work with First Nation and Metis communities and other local residents and businesses with regards to employment, training needs, and other economic development opportunities arising from the Project;	(b) Volume 6, Section 6.3.3 Education and Training, and Section 6.3.4, Local Opportunities
	(c) steps that have been undertaken by industry, the municipality, provincial government or through regional and cooperative initiatives to address socio-economic issues and impacts to local and regional infrastructure;	(c) Volume 6, Section 6.3 Mitigation and Benefit Enhancement
	(d) the potential to overlap with other projects that are reasonably anticipated during the life of the Project;	(d) Volume 6, Section 6.6 Planned Development Case
	(e) mitigation plans that will be undertaken to address issues related to the availability of affordable housing and the quality of health care services; and	(e) Volume 6, Section 6.3.2 Health Services, and Section 6.5.4 Project Case for Housing
	(f) strategies to mitigate socio-economic concerns raised by the local municipality and other stakeholders in the region.	(f) Volume 6, Section 6.3 Mitigation and Benefit Enhancement; Volume 1, Section 5.4 Ongoing Consultation
	[C] Describe the significance of any residual effects of the Project on socio-economic conditions and MEG's plans to manage those effects.	[C] Volume 6, Section 6.4 Economic Effects, and Section 6.5 Social Effects
8.3 Monitoring	[A] Discuss monitoring plans proposed to measure the success of mitigation activities.	[A] Volume 6, Section 6.7 Monitoring

Table 2 Alberta EPEA Guide to Content for Industrial Approval Applications (AENV 1999)

AEPEA Guide to Content 3(1)	Information Required for New Plants	Locations in Volume 1 unless otherwise noted
(a)1	applicant information	1.1
(b)	location, size and capacity of the activity	1.2.4
2.1	legal land description	1.2.4
2.2	relation to nearest town, city, village and users of the land	1
2.3	geographical description of the surrounding topography and relation to nearby watercourses	Volume 4, Appendix 4-III, Section 2.2 Local Study Area
3	capacity	3.1
4.1	size of the affected area	1.2.4 and Volumes 2 to 6
4.2	physical dimensions of the plant site including a plot plan	3.2
4.3	number of employees working at the facility	Volume 6, Section 6
(c)	nature of the activity	1
5.1	classification of this facility under AEPEA Activities Designation Regulation 276/2003	1.5.2.1
5.2	general purpose, products, by-products	3.2
5.3	major unit operations including a process flow diagram and description of the process	3.2
5.4	project cost and scheduling	Volume 6, Section 6
5.5	scale diagrams of the plant, site and surrounding area, including environmental features	1.2, 3.2 and Volumes 2 to 6
5.6	process flow diagrams	3.2
5.7	material balance	3.2.1.16
5.8	industrial wastewater and air emission stream information	3.3.4, 3.3.5, Volume 3, Appendix 3-II, Attachments A to C, and Volume 4, Section 5.3
5.9	components of the wastewater and air emission streams	3.3.4, 3.3.5, Volume 3, Appendix 3-II, Attachments A to C and Volume 4, Section 5.3
5.10	cooling system	3.2.1.10
5.11	raw water treatment	3.2.1.2
5.12	sanitary waste treatment	3.2.3.1
5.13	major environmental control operations	3.3 and Volumes 2 to 6
5.14	underground and aboveground tank details	3.2.1.6

Table 2 Alberta EPEA Guide to Content for Industrial Approval Applications (AENV 1999) (continued)

AEPEA Guide to Content 3(1)	Information Required for New Plants	Locations in Volume 1 unless otherwise noted
5.15	underground storage tank integrity and overfilling prevention details	n/a
5.16	potable water source, description of water treatment system used, sanitary sewage handling procedures or septic tank details	3.2.1.12 and 3.2.2.2
5.17	details on the reciprocating or turbine engines	n/a
5.18	plot plan showing the exhaust stack locations	3.2
5.19	the peak height of compressor buildings	Volume 3, Appendix 3-II
5.20	details on all natural gas fired heaters, treaters, boilers and steam generators	3.2
5.21	details on any auxiliary or standby process equipment or other sources of emission	3.2
5.22	details on flare stacks	3.2.1.9
5.23	details on any active flare pit on-site	n/a
5.24	details of any inactive or former flare pit on-site	n/a
5.25	emergency flaring scenario so_2 dispersion modeling and rates and composition of flared streams	Volume 3, Appendix 3-IV, Alternate Modelling Scenarios
5.26	description of any on site incineration of solid waste	n/a
5.27	no_2 and so_2 dispersion computer modelling input and output	Volume 3, Appendix 3-II, Section 2 Modelling Methods and 2.3.4 Model Options
(d) 8	ERCB approval status	1.5
(e) 9	environmental impact assessment	Volumes 2 to 6
(f) 10	existing AEPEA approvals (not applicable for new plants)	1.5.1
(g) 11	schedule	1.2.7
(h)	substance releases	See specifics below
14.1	a list and quantity of substances used in the production process	3.2.1.13
14.2	water demand; sources, purpose and quantities	3.2.2.2 and 3.3.4
14.3	sources of the substances to be released to the environment	4.2.1 and Volume 3 Section 1
14.4	amount of the substances to be released to the environment	4.2.1 and Volume 3, Section 1
14.5	methods of release of substances to the environment	Volume 3, Sections 1 and 3
14.6	pollution prevention and control measures	3.3
14.7	runoff volume determination	3.3.6 and Volume 4, Section 5.2

Table 2 Alberta EPEA Guide to Content for Industrial Approval Applications (AENV 1999) (continued)

AEPEA Guide to Content 3(1)	Information Required for New Plants	Locations in Volume 1 unless otherwise noted
(i)	environmental monitoring information	Volume 2, Appendix 2-V
17.1	any baseline environmental data that may have been collected at the site (for air, water, soils, etc.)	Volumes 2 to 6
17.2	baseline hydrogeologic characteristics and groundwater monitoring data	Volume 4, Appendix 4-II
(j)	past use of substance release control systems (not applicable to new plants)	3.3
(k)	justification for substance releases	Volume 3, Section 1
23.1	application of process technology, management practices and current environmental control technology/control systems	Section 3.2 and 3.3
23.2	alternatives	2.4
(l)	waste minimization measures	3.3.6
26.1	waste management summary	3.3.6
26.2	waste minimization measures to be implemented	3.3.6
26.3	liquid effluent treatment and air emissions treatment	3.3 and Volume 4, Section 5.3
(m)	surface disturbance impacts	Volume 5
29.1	extent and nature of the surface disturbance	Volume 5, Section 5
(n)	Emergency Response Plans (ERP)	3.3.2
32.1	confirmation of filing of ERP with the EUB and other agencies	3.3.1
(o) 33.1	environmental contingency plans	3.3.1
(p)	conservation and reclamation	Section 6.0
34.1	soil assessments	Volume 5, Section 6.1; Volume 5, Appendix 5-I
34.2	procedures to return site to equivalent land capability	Section 6.0
(q)	public involvement process	5.0
37.1	proposed or conducted public involvement process	5.0
37.2	frequency, type and purpose for the public involvement and environmental concerns identified	5.0
(r) 40	information required under any other regulation under epea in support of the application	1.5.3

Table 3 ERCB Directive 023 Information Requirements (EUB 1991)

Directive 023 Section	Requirement (abridged)	Locations in Volume 1 unless otherwise noted
1.0 GENERAL INFORMATION		
1.5	**Project description**	
1.5.1	Applicable Acts and Sections under which the application is made	1.5.2
1.5.2	Name and address of the application and any partners involved and the details of company incorporation	1.1
1.5.3	Statement of need and project timing	1.2.8, 1.2.7
1.5.4	Overall project description and discussion of schedule Including: location, size and scope, schedule of preconstruction, construction, start up, duration of operations, and a discussion of the reasons for selecting the proposed schedule.	1.0
1.5.5	Regional setting and reference to existing and proposed land use	1.0
1.5.6	a. Maps showing freehold, leasehold, mineral and surface rights of the proposed scheme and surrounding area. b. Maps with legal descriptions showing the locations of landowners and their dwellings in relation to the proposed oil sands site	Figure 1.2-1 and Figure 1.2-2
1.5.7	Map showing topography, exiting areas of habitation, industry, the proposed site and any development in the project area	Figure 1.2-3 Figure 1.2-4
1.5.8	Aerial photomosaic at an appropriate scale to illustrate the locations of the project components including the mine area, wells, extraction plant, upgrader unit, tanks, discard storage sites including tailing ponds, access roads, railways, pipelines and utility corridors.	Figure 1.2-4
1.5.9	Description of storage and transportation facilities of the final hydrocarbon product, including detail of size and ownership of any pipeline which may be utilized	3.2.1.6 and 3.2.2.4
1.5.10	Proposed rate of production over the life of the Project	3.2
1.5.11	Description of the subject oil sands	2.3
1.5.12	Status of negotiations held or to be held with the freehold, leasehold, mineral surface rights owners	5.3
1.5.13	Proposed energy source, alternatives, resource use, sources and supply	2.4, 3.2
1.5.14	Description and results of public information program	5.0
1.5.15	The term of the approval sought, including expected project start and completion dates	1.5.2 and 1.2.7
1.5.16	Name of responsible person to contact	1.1

Table 3 ERCB Directive 023 Information Requirements (EUB 1991) (continued)

Directive 023 Section	Requirement (abridged)	Locations in Volume 1 unless otherwise noted
2.0 TECHNICAL INFORMATION		
2.1	Surface mining operations -	n/a
2.2	Underground access and development	n/a
2.3	In situ operations	Volume 1, Section 3
2.4	**Processing Plant**	
2.4.1	A separate description of the bitumen extraction, upgrading, utilities, refining and sulphur recovery facilities, including a discussion of the process process flow diagrams indicating major equipment, stream rates and composition, and the proposed production measurement devices, characteristics and locations chemical and physical characteristics and properties of feeds and product materials	3.2
2.4.2	Overall material and energy balances, including information with respect to hydrocarbon and sulphur recoveries, water use and energy efficiency	3.2.1.16
2.4.3	Quantity of products, by-products and waste and their disposition	3.2 and 3.3.6
2.4.4	Surface drainage within the areas of the processing plant, product storage and waste treatment and disposal	3.3.4 and Volume 4, Sections 5.2.3 and 7.2.1
2.4.5	Comparison of proposed process to alternatives considered on the basis of overall recovery, energy efficiency, cost, commercial availability and environmental considerations and the reasons for selecting the proposed process	1.2.8 and 2.6
2.4.6	This number has been omitted from Directive 023	
2.4.7	Example of production accounting reports	3.2.1.17
2.5	**Electrical Utilities and External Energy Sources**	
2.5.1	A description of any facilities to be provided for the generation of electricity to be used by the project.	1.4.1
2.5.2	Identification of the source, quantity and quality of any fuel, electricity or steam to be obtained from sources beyond the project site	3.2.1.7
2.5.3	Where energy resources from outside the project boundaries are to be supplied to the project, a detailed appraisal of the options available to eliminate the need for such resources, with consideration for overall recovery, energy balance, costs, technical limitations and environmental implications	3.2.1.7

Table 3 ERCB Directive 023 Information Requirements (EUB 1991) (continued)

Directive 023 Section	Requirement (abridged)	Locations in Volume 1 unless otherwise noted
2.6	**Environmental Control**	
2.6.1	A description of air and water pollution control and monitoring facilities, as well as a liquid spill contingency plan	3.3, Appendix 1-II and Volume 4, Section 7
2.6.2	A description of the water management program, including the proposed water source and expected withdrawal the source-water quality control the waste-water disposal program water balance for the proposed scheme the produced-water clean-up/recycle program	3.2, 3.3 and Volume 4, Sections 5.1.1 and 3.2
2.6.3	The manner in which surface water drainage within the Project area would be collected, treated and disposed	3.3.4 and Volume 4, Section 5.2.3; 7.2.1; and 3.2
2.6.4	A description of the air and water pollution control and monitoring facilities	3.3, Volume 3, Section 1 and Volume 4, Section 3.2 and 7.3
2.6.5	A description of the emission control system, including stack design criteria and process data any additions of residue gas or natural gas to the flare system to ensure combustion of hydrogen sulphide for both normal operating conditions and maximum emission conditions methods proposed for the control of all air pollutants from all potential or actual emission sources at the operation (including all vents, stacks, flares, product storage tanks, sulphur handling areas, ponds, wells and other fugitive emission sources) during normal, emergency and maximum operating conditions monitoring program for hydrogen sulphide, sulphur dioxide, total sulphation, hydrogen sulphide sulphation, soil pH, nitrogen oxides and hydrocarbons in the surrounding area	3.3.5
3.1	**Commercial Viability**	
3.1.1	An appraisal and projections, on an annual basis of revenues, capital and operating costs (including a breakdown of fuel costs and non-fuel operating costs), royalties and taxes, net cash flow, marketing arrangements, fuel and electric power arrangements	1.0 and Volume 5, Section 15

Table 3 ERCB Directive 023 Information Requirements (EUB 1991) (continued)

Directive 023 Section	Requirement (abridged)	Locations in Volume 1 unless otherwise noted
3.1.2	A description of project costs which include capital and operating cost, including a breakdown of capital and operating costs for each component of the project including site preparation, well drilling and completion, central processing facilities (including steam generation, waster treatment and recycling), satellite and surface facilities, production/injection distribution system, upgrading, utilities and off-sites depreciation	Volume 6, Section 6
3.2	**Benefit-Cost Analysis**	
3.2.1	A summary of quantifiable public benefits and costs incurred during the construction and operation of the Project	Volume 6, Section 6
3.2.2	A summary of non-quantifiable public benefits and costs incurred each year during construction and operation of the Project	Volume 6, Section 6
3.3	**Economic Impact**	
3.3.1	An appraisal of the economic impact of the Project on the region, province and nation	Volume 6, Section 6
3.3.2	A discussion of any initiatives undertaken to accommodate regional economic priorities and interests	Volume 6, Section 6
3.3.3	An assessment of direct and indirect employment opportunities for all groups associated with the Project including projected max and min workforce demand by skill categories in the construction and operating phases and an analysis of how these demands shall be met an analysis of the indirect and induced employment generated by the project due to employment multiplier effects a discussion of the employment and training arrangements provided by applicant that would enable residents of the region to participate in meeting the workforce demands	Volume 6, Section 6
4.0	Environmental Impact Assessment	Volumes 2 to 6
5.0	Biophysical Impact Assessment	Volumes 2 to 6
6.0	Social Impact Assessment	Volume 6, Section 6
7.0	Describe the environmental protection plan including mitigation measures, environmental monitoring and research	4.0 and Volumes 2 to 6; Volume 2, Appendix 2-V
8.0	Conceptual Development and Reclamation Plan	Volume 1, Section 6
9.0	Solid Waste Management Plan	3.3.6

APPENDIX 2-VIII

PHASE 2 BASELINES

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