

# Draft Directive 023: Oil Sands Project Applications

On June 17, 2013, the Energy Resources Conservation Board was succeeded by the Alberta Energy Regulator (AER). As part of this succession, the title page of this draft directive was changed to carry the AER logo. However, no changes were made to the main body of this draft directive.

---

## Application Requirements for Activities Within the Boundary of a Regional Plan

The AER is legally obligated to act in compliance with any approved regional plans under the *Alberta Land Stewardship Act*. To ensure this compliance, the AER is requiring any applicant seeking approval for an activity that would be located within the boundary of an approved regional plan to meet the requirements below. These requirements will be formally incorporated into the directive at a later date.

- A) For an activity to be located within the boundary of an approved regional plan, the applicant must assess
  - I) whether the activity would also be located within the boundaries of a designated conservation area, a provincial park, a provincial recreation area, or public land area for recreation and tourism and, if so, whether the mineral rights associated with the activity are subject to cancellation;
  - II) whether the activity is consistent with the land uses established in the applicable regional plan or with any of the outcomes, objectives, and strategies in that same plan; and
  - III) how the activity is consistent and complies with any regional trigger or limit established under the management frameworks detailed under the applicable regional plan or any notices issued in response to the exceedance of a regional trigger or limit.
- B) The applicant must retain the information for requirement A at all times and provide it on request unless otherwise indicated below. The information must be sufficient to allow the AER to assess an application under the applicable regional plan.
- C) The applicant must submit the information from requirement A if the proposed activity to be located within the boundary of an approved regional plan
  - I) is also within the boundaries of a designated conservation area, a provincial park, a provincial recreation area, or a public land area for recreation and tourism;
  - II) is inconsistent with the land uses established in the applicable regional plan or any of the outcomes, objectives, and strategies in that same plan; or

III) may result in the exceedance of a trigger or limit or contravene a notice issued in response to an exceedance of a trigger or limit.

D) The applicant must submit the information from requirement A if it believes that its proposed activity is permitted under the applicable regional plan because it is “incidental” to previously approved and existing activities. The applicant must also provide information to support its position.

The AER has no authority to waive compliance with or vary any restriction, limitation, or requirement regarding a land area or land use under a regional plan. Applicants that wish to seek this type of relief must apply directly to Alberta’s Land Use Secretariat established under the *Alberta Land Stewardship Act*. The stewardship minister may, on application and by order, vary the requirements of a regional plan. For more information, contact Alberta’s Land Use Secretariat by phone at 780-644-7972 or by e-mail to [LUF@gov.ab.ca](mailto:LUF@gov.ab.ca).

For more information on the requirements above, refer to *Bulletin 2014-28: Application Requirements for Activities within the Boundary of a Regional Plan* or e-mail [regional.plans@aer.ca](mailto:regional.plans@aer.ca). This bulletin rescinds and replaces *Bulletin 2012-22: Application Procedures for Approval of Activities Located In or Near the Boundaries of the Lower Athabasca Regional Plan*, which is an earlier bulletin that was issued regarding the AER’s compliance with approved regional plans under the *Alberta Land Stewardship Act*.

# Draft Directive 023

Release date: [Month day, year]

Effective date: [Month day, year]

Replaces previous edition issued September 1991.

## Oil Sands Project Applications

The Energy Resources Conservation Board (ERCB/Board) has approved this directive on [Month day, year].

[<original signed by>]

[Name]

[Title-Chair]

---

## Contents

1	Introduction.....	3
1.1	What This Directive Contains.....	3
1.2	<i>Directive 023</i> Help.....	4
2	Oil Sands Project Application Process.....	7
2.1	Introduction.....	7
2.2	Preapplication Considerations.....	7
2.3	Application for Multiple Project-Related Components.....	7
2.4	Incomplete Applications.....	8
2.5	Submission Method.....	8
2.6	Submission Formats.....	8
2.7	ERCB Application Review Process.....	8
2.8	<i>Directive 056</i> Well, Pipeline, and Facility Licences.....	9
2.9	Emergency Response Plans.....	11
3	General Application Requirements.....	13
3.1	Introduction.....	13
3.2	Applicant Eligibility.....	13
3.3	Project Description Requirements.....	13
4	Stakeholder Involvement.....	15
4.1	Introduction.....	15
4.2	Stakeholder Involvement Program.....	15
4.3	Information Package.....	16
4.4	Application Requirements.....	16
4.5	Other Related Processes and Guidance.....	17
5	Socioeconomic Requirements.....	19
6	Environmental Requirements.....	21

6.1	Introduction.....	21
6.2	Land Use .....	21
6.3	Soils.....	22
6.4	Vegetation and Wetlands .....	23
6.5	Wildlife .....	24
6.6	Hydrology .....	25
6.7	Surface Water Quality.....	26
6.8	Fisheries .....	27
6.9	Hydrogeology and Water Source .....	28
6.10	Air Quality and Emissions .....	29
6.11	Noise .....	31
6.12	Reclamation .....	31
7	In Situ Applications .....	33
7.1	Regional Geology .....	33
7.2	Project Geology.....	33
7.3	Regional Hydrogeology .....	34
7.4	Reservoir Characterization.....	34
7.5	Resource Recovery Process .....	35
7.6	Reserves .....	36
7.7	Reservoir Simulation.....	37
7.8	Existing Wells in the Project Area .....	38
7.9	Well Operation, Design, and Drilling Practices.....	38
7.10	Reservoir Containment and Maximum Operating Pressure.....	39
7.11	Disposal Schemes .....	40
7.12	Cavern Storage or Cavern Disposal Schemes.....	40
7.13	Facilities.....	41
8	Mining Applications .....	45
8.1	Geology and Resource Evaluation .....	45
8.2	Mine Design.....	47
8.3	Geotechnical Design .....	49
8.3.1	Pit-Wall Design.....	49
8.3.2	Storage or Disposal Structure Design .....	50
8.3.3	Tailings Dike Design .....	51
8.4	Mine Plan .....	52
8.5	Extraction Plant.....	52
8.6	Tailings Management.....	54
8.7	Dedicated Disposal Area Plan.....	55
8.8	Project Water Management.....	56
9	Processing Plant Applications.....	59
10	Amendment Applications .....	61
10.1	Introduction.....	61
10.2	Category 1 Amendments.....	61
10.3	Category 2 Amendments.....	62
10.4	Category 3 Amendments.....	63
10.5	Transfer of Approval.....	63
Appendices		
A	Definitions for the Purposes of <i>Directive 023</i> .....	65
B	Schedule 1—Applicant General Information .....	67
C	Spatial Information Submission Requirements.....	69
D	Modelling Submission Specifications.....	77

E Geological Units .....	79
G Table of Thermal Compatibility of Existing Wells .....	83
H Generic Energy Balance .....	85
I Drillhole Inventory Table—Example .....	87
J Transfer of Approval .....	89
Figures	
2.1 A simplified application review process for oil sands projects.....	10
7.1 Reserve intervals.....	37

## 1 Introduction

The Energy Resources Conservation Board (ERCB) is an independent, quasi-judicial agency of the Government of Alberta that regulates the safe, responsible, and efficient development of Alberta’s energy resources. In support of this mandate, one of the ERCB’s roles is to consider whether a project is in the public interest, which includes having a regard for the social and economic effects of the project and the effects of the project on the environment (*Energy Resources Conservation Act*, section 3).

*Directive 023: Oil Sands Project Applications* sets out the requirements and procedures for filing an application with the ERCB under sections 10 and 11 of the *Oil Sands Conservation Act (OSCA)*. Section 10 governs the approval of a scheme or operation to recover oil sands or crude bitumen and covers in situ and surface or underground mining operations. Section 11 governs the approval of oil sands processing plants and covers bitumen extraction facilities, refineries and upgraders, and certain gas processing facilities. *Directive 023* also sets out the requirements and procedures for filing an application under section 13 of the *OSCA* to amend a previously approved scheme or processing plant.

This directive does not address the application requirements for primary, enhanced recovery or experimental schemes for the recovery of oil sands or crude bitumen or the requirements to suspend or abandon a scheme or a processing plant.

A scheme or operation for the recovery of oil sands or crude bitumen, any processing plant, or any combination of the previous two will be referred to as an oil sands project throughout this directive. (See Appendix A for further definitions.)

This directive is designed to apply to all oil sands projects and therefore, the level of detail required may vary from project to project. Applicants are expected to use professional judgement when determining the level of detail necessary to support the application.

This edition of the directive replaces and rescinds the September 1991 edition of *Directive 023* and the December 2010 edition of *Directive 078: Regulatory Application Process for Modifications to Commercial In Situ Oil Sands Projects*.

### 1.1 What This Directive Contains

ERCB requirements that are common to all oil sands project applications are contained in Sections 2 to 6. Additional application requirements specific to the type of oil sands project are contained in Sections 7 to 9. Section 10 contains the application requirements for amending an oil sands project.

## Section 2: Oil Sands Project Application Process

- Describes the process for filing an oil sands project application, including considerations before filing an application, filing an application containing multiple project-related components, the consequences of filing a deficient application, the format of application submissions, and the application review and disposition process.

## Section 3: General Application Requirements

- Describes the general information that must be provided in every oil sands project application.

## Section 4: Stakeholder Involvement

- Describes the stakeholder involvement requirements that must be met as part of every oil sands project application, including what parties must be engaged, what information must be provided to these parties, and what information regarding an applicant's stakeholder involvement program must be included in the application.

## Section 5: Socioeconomic Requirements

- Describes the socioeconomic information that must be provided in every oil sands project application. The information provided by the applicant must articulate the benefits of the project and planned measures to mitigate the negative social and economic effects arising from the project.

## Section 6: Environmental Requirements

- Describes the environmental information that must be provided in every oil sands project application. The information provided by the applicant must identify a project's effects on air, land, water, and biotic resources; planned measures to mitigate effects; and any residual effects.

## Section 7: In Situ Applications

- Describes the information that must be provided as part of an application for an approval to construct and operate an in situ operation.

## Section 8: Mining Applications

- Describes the information that must be provided as part of an application for an approval to construct and operate an oil sands mining operation, including an extraction plant.

## Section 9: Processing Plant Applications

- Describes the information that must be provided as part of an application for an approval to construct and operate a processing plant.

## Section 10: Amendment Applications

- Describes the different amendment categories and the information that must be provided as part of an application to amend a previously approved oil sands project.

### 1.2 **Directive 023 Help**

For additional information, including frequently asked questions (FAQs), visit the ERCB website [www.ercb.ca](http://www.ercb.ca).

If you have a specific question that has not been covered in this directive or addressed as an FAQ, contact the ERCB Oil Sands and Coal Branch at

Phone: 403-XXX-XXXX

Fax: 403-XXX-XXXX

E-mail: [Directive023.help@ercb.ca](mailto:Directive023.help@ercb.ca)





## 2 Oil Sands Project Application Process

### 2.1 Introduction

This section describes the process for filing an oil sands project application, including considerations before filing an application, filing an application containing multiple project-related components, the consequences of filing a deficient application, the format of application submissions, and the application review and disposition process.

### 2.2 Preapplication Considerations

This directive describes the information that must be provided as part of an application to the ERCB for an oil sands project. However, other government agencies, such as Alberta Environment and Sustainable Resource Development (ESRD) and Alberta Energy, may also issue licences or approvals for an oil sands project. The applicant is responsible for ensuring that it also meets all of the requirements and information needs of these agencies.

Applicants may be required to complete an environmental impact assessment report (EIA) under the *Water Act*, *Environment Protection and Enhancement Act*, and related regulations. Applicants may also be required to conduct an environmental assessment (EA) as required by the *Canadian Environmental Assessment Act*. Applicants are responsible for ensuring that applications submitted under this directive are consistent with any associated EIA or EA.

If an EIA or EA is required for a project, it must be submitted as part of the application package to the ERCB. The information included in an application submitted under this directive must be consistent with any associated EIA or EA.

An applicant must carry out a stakeholder involvement program that complies with Section 4 of this directive before filing an application with the ERCB. Making *bona fide* efforts to address and resolve concerns raised about the proposed project as early as possible can greatly facilitate the application review process and may help avoid the need for a hearing.

Applicants are expected to discuss any uncertainties regarding the content or structure of an application with the ERCB. Applicants are encouraged to meet with the ERCB before filing an oil sands project application as an opportunity to

- notify the ERCB of its intent to file an application;
- give the ERCB an overview of the type and complexity of the application that will be forthcoming; and
- ask any questions, identify issues, and receive clarification so that a complete application may be submitted and subsequently reviewed in a timely and efficient manner.

### 2.3 Application for Multiple Project-Related Components

An oil sands project may contain a number of project-related components (e.g., an oil sands mine, a bitumen extraction plant, an upgrader). The applicant may submit a single application for all project-related components described in this directive provided that the application contains all of the information that would be required if the project-related components were applied for separately.

## 2.4 Incomplete Applications

In its sole discretion, the ERCB may decide to close and/or deny any application submitted that is deficient or omits any of the information required in this directive. The failure of an applicant to provide the required information or information requested by the ERCB may cause delays or complications in the processing of the application or may result in a decision by the ERCB to close or deny the application in its entirety.

If the ERCB exercises its discretion to close or deny a deficient or incomplete application, it will notify the applicant in writing that the application is being closed and the reason for the closure. The applicant may reapply by submitting a new, complete application.

## 2.5 Submission Method

*Directive 023* applications must be submitted in electronic format and include a completed Schedule 1 (see Appendix B).

While the ERCB prefers to manage application documents electronically, the ERCB may require an applicant to provide hard copies of the application and associated submissions to the ERCB or other parties.

## 2.6 Submission Formats

An applicant must submit its application documents to the ERCB in the file formats listed below. An application will not be registered until the documents have been submitted in the required formats.

The application documents must be submitted as unlocked, searchable, and indexed Adobe PDF files. Supporting attachments and appendices must be included as separate Adobe PDF files. Individual file size must not exceed 200 megabytes (MB).

All figures submitted in the PDF documents must be at a scale that enables technical analysis. Maps must include legal subdivision (LSD) coordinates where scale allows.

Spatial information must be submitted in both of the following formats:

- 1) As maps in the PDF application document.
- 2) As shapefiles that are supported by the Environmental Systems Research Institute (ESRI) ArcView products.

Refer to Appendix C for further information on how to submit spatial files.

Where modelling data are required, refer to Appendix D for instructions on how to submit the data as part of the application.

## 2.7 ERCB Application Review Process

When an application is filed with the ERCB, it is registered, placed on the ERCB's Integrated Application Registry (IAR), and given an application number. All subsequent application-related submissions to the ERCB and correspondence from the ERCB to the applicant or any party will also be placed on the IAR. The applicant or any party may access the application documents or may review the status of an application by accessing the IAR on the ERCB's website.

The application will undergo a preliminary review to ensure it is administratively complete before the ERCB proceeds with a detailed review. If necessary, the ERCB will send the applicant one or more supplemental information requests (SIRs) to obtain the necessary application requirements.

After a complete review of the application and satisfaction from the ERCB that the application requirements have been met, the ERCB may issue a Notice of Application to announce to interested parties that an application is before the ERCB and that the ERCB may issue a decision on the application without further notice if no party objects to the application.

If the ERCB receives any objections to an application, it will determine whether the objecting party has standing under section 26(2) of the *Energy Resources Conservation Act*. This determination ensures that if a party has legal rights or interests that may be directly and adversely affected by a decision on the project by the Board, the party will be given an opportunity to present its concerns at a hearing before a panel appointed by the Board. The Board decides whether a party has standing under section 26(2) on a case-by-case basis, taking into account the specific facts and circumstances of each application. If an objection is not resolved, the application may be set down for a hearing by the ERCB.

The ERCB will disposition the application either through the application approval process or following a hearing. The ERCB may approve the application with or without approval conditions or deny the application.

Figure 2.1 illustrates a simplified review process for oil sands project applications.

## **2.8 Directive 056 Well, Pipeline, and Facility Licences**

### **General**

Stakeholder involvement programs followed by an applicant in connection with any oil sands project application or amendment submitted under this directive will satisfy the participant involvement requirements for any related subsequent *Directive 056* licences for wells, pipelines, and facilities.

### **In Situ**

Wells, pipelines, and surface facilities associated with in situ oil sands projects must also be licensed in accordance with *Directive 056: Energy Development Applications and Schedules*.

- Approval of a new in situ oil sands project or an amendment to an existing project under *Directive 023* must be obtained before filing any associated *Directive 056* applications, except as indicated in the next bullet for oil sands evaluation wells.
- *Directive 056* well licence applications for oil sands evaluation wells may be made at any time. *Directive 056* participant involvement requirements must be satisfied for licences of oil sands evaluation wells that have not been addressed within an ERCB-approved in situ oil sands project application.

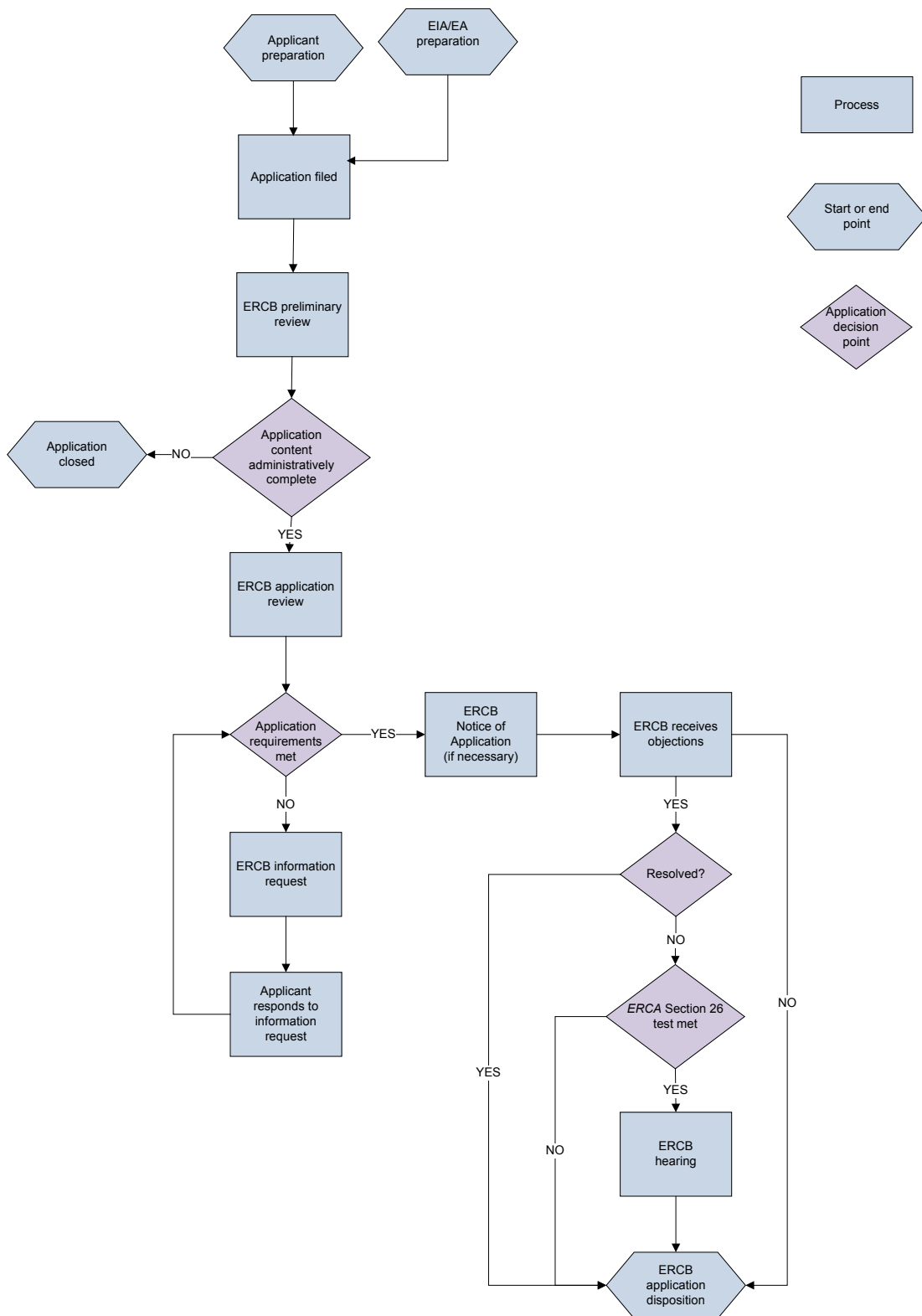


Figure 2.1 A simplified application review process for oil sands projects

- *Directive 056* licences must be obtained for all production, injection, evaluation, and observation wells; pipelines; and surface facilities before any preparatory or incidental field operations may commence.

### **Mining**

*Directive 056* well licence applications for oil sands evaluation wells may be made at any time. *Directive 056* participant involvement requirements must be satisfied for oil sands evaluation wells that are not within an ERCB-approved oil sands mining project area.

Well licences are not required for oil sands evaluation wells drilled within an approved mining project area, in accordance with Part 2, section 4(5) of the *Oil Sands Conservation Regulation (OSCR)*.

Facility licences for surface facilities associated with oil sands mine approvals are not issued under *Directive 056*.

### **Processing Plants**

Facility licences for surface facilities associated with oil sands processing plant approvals are not issued under *Directive 056*.

## **2.9 Emergency Response Plans**

Applicants seeking approval for oil sands projects must comply with *Directive 071: Emergency Preparedness and Response Requirements for the Petroleum Industry*.

In unique circumstances, the ERCB may require an applicant to submit the emergency response plan (ERP) required under *Directive 071* as part of the oil sands project application filed in accordance with *Directive 023*. The ERCB will determine the need to submit the ERP as part of the application on a case-by-case basis.



### 3 General Application Requirements

#### 3.1 Introduction

This section describes the general information that must be provided in every oil sands project application. This information identifies the applicant and provides the context of the oil sands project.

#### 3.2 Applicant Eligibility

In order to apply, the applicant must hold a business associate (BA) code and be an eligible ERCB approval holder according to *Directive 067: Applying for Approval to Hold EUB Licences*.<sup>1</sup> The applicant must be the intended approval holder and legally responsible for the project.

The project operator must be identified if different from the applicant and the relationship between the applicant and the operator made clear.

#### 3.3 Project Description Requirements

- 1) Identify the applicant and the project name.
- 2) Describe any partners involved in the project. State their roles and responsibilities.
- 3) State the section of the *OSCA* under which the application is being made.

For example:

ABC Company is applying for an approval to construct and operate an in situ oil sands project under section 10 of the *OSCA*.

- 4) Provide an overview of the project. Include the following information, where applicable:
  - a) the location of the project and its proximity to the nearest communities (LSD coordinates are to be provided for plant/facility locations),
  - b) target resource,
  - c) project components,
  - d) recovery technology,
  - e) annual production capacity over the life of project,
  - f) project development phases,
  - g) energy sources used for recovery and processing,
  - h) intended transportation of product and by-products to market, and
  - i) water source(s) and estimated volume of annual use.
- 5) Provide a map of the project that includes the following information, where applicable:
  - a) project area (for in situ only, include the target development area);
  - b) lease boundaries;

---

<sup>1</sup> The Energy Resources and Conservation Board was previously the Alberta Energy and Utilities Board (EUB).

- c) water bodies;
  - d) mine sites;
  - e) processing plants;
  - f) pad locations, central processing facilities (CPFs), and drainage patterns;
  - g) storage or disposal structures; and
  - h) roads, pipelines, and other significant infrastructure.
- 6) Provide a regional map of the project that shows
- a) urban centres;
  - b) major industrial operations;
  - c) water bodies;
  - d) road, rail, pipeline, power and utility corridors, and other significant infrastructure; and
  - e) public works.

The regional map is expected to provide a broader context of the project location and development surrounding and within the project area.

- 7) Provide a project schedule that includes the following milestones:
- a) regulatory application submissions and anticipated approvals,
  - b) construction, and
  - c) operations.
- 8) Identify associated applications and any additional approvals obtained or required from other regulatory agencies. For example, applications to ESRD seeking approval under the *Environmental Protection and Enhancement Act* or the *Water Act*.
- 9) Provide a statement regarding the ownership of mineral rights for the oil sands project.
- The ERCB will not issue an approval unless the applicant is a mineral rights holder.
- 10) Provide a summary of surface rights access and ownership within the project area.
- Include existing surface rights holdings and Crown land.
- 11) Provide a table showing the LSD coordinates of the oil sands project. For each LSD, identify the owner of the surface rights, as well as the owner of the rights to any other surface or subsurface resources.
- 12) List all waivers or variances of all applicable ERCB requirements requested as part of the application, including the reasons for the requests.



## 4 Stakeholder Involvement

### 4.1 Introduction

An applicant must carry out a stakeholder involvement program to inform parties about the proposed oil sands project and to, where feasible, make *bona fide* efforts to address and resolve concerns raised about the proposed project. The extent of stakeholder involvement efforts required by an applicant will depend on the nature, size, and scope of the oil sands project and may range from the publication of a notice in a local newspaper to meeting directly with persons who raise concerns about and file objections to the proposed activities.

An applicant should tailor its stakeholder involvement program to fit the unique circumstances of its project. An applicant should consider that oil sands projects often involve multiple authorizations issued by different agencies for which the stakeholder requirements may vary. Where practical, the ERCB prefers that applicants conduct a single stakeholder involvement program that encompasses information sharing and communication with all stakeholders.

To ensure that a project-specific stakeholder involvement program addresses the relevant requirements, applicants are advised to review the appropriate regulatory guidance documents and contact the relevant government authorities directly to answer any outstanding questions before commencing any engagement activities.

### 4.2 Stakeholder Involvement Program

The applicant must determine who to include and tailor its stakeholder involvement program accordingly. The ERCB encourages applicants to provide project-related information and notification to a range of potential stakeholders and to make *bona fide* efforts to address and resolve concerns and objections raised in connection with the proposed activities. Applicants must document their efforts to address and resolve concerns and be prepared to provide detailed information about those efforts to the ERCB on request.

Generally a stakeholder involvement program for applications filed under this directive should include, persons or groups who have legal rights to conduct activity on the land (including landowners, occupants, residents, local First Nations and Métis groups, and local authorities) and those who have rights to the underlying mineral, energy, or other natural resources (including freehold and Crown mineral owners and lessees).

At a minimum, stakeholder involvement activities must include

- landowners in the project area and the off-setting sections,
- oil sands leaseholders in off-setting quarter sections, and
- petroleum and natural gas leaseholders and freehold mineral owners of any unleased lands in the project area and the off-setting sections.

The applicant should provide the name of someone who represents the company and may be contacted about the collection of personal information in connection with the application, as well as the applicant's privacy policy.

Stakeholder involvement efforts are intended to

- inform parties of the nature of the oil sands project and its effects,
- respond to questions and concerns, and

- facilitate discussion on the proposed option, alternatives, and mitigation measures.

An applicant must begin its stakeholder involvement program before filing an application with the ERCB. Applicants are expected to continue their stakeholder involvement activities throughout the life of the oil sands project.

The ERCB expects applicants to respond and engage in a meaningful way with any party that has raised a concern or has questions regarding the oil sands project and to make reasonable efforts to address concerns raised before filing an application. The ERCB does not expect complete consultation and comprehensive resolution of all concerns before the applicant files an application. Applicants should be aware that incomplete or deficient stakeholder involvement activities may result in delays in processing an application, the closure of an application, or a hearing on the application.

### 4.3 Information Package

An information package must be developed and distributed to all parties that are part of the applicant's stakeholder involvement program and to any other party that requests it. The information package must be written in plain language and must contain sufficient information so that parties understand the oil sands project clearly and can determine whether it has any effects on them. Information packages relating to amendment applications should provide a description of the changes to the approved project.

The information package must contain the following:

- The applicant's name, postal address, phone number, fax number, and e-mail address.
- The location of the oil sands project. Include a map at a scale that sufficiently encompasses the stakeholder involvement area. Multiple maps may be included if necessary given the scale. Provide the LSD coordinates for the oil sands project.
- A description of the oil sands project, including utilities and infrastructure.
- A high-level summary of the environmental effects of the oil sands project and the mitigation measures. The summary must be in plain language and include effects on
  - land use,
  - air quality,
  - groundwater, and
  - water bodies.
- A high-level summary of the socioeconomic effects of the oil sands project and the mitigation measures.
- A high-level discussion of the potential implications to developing lands adjacent to the oil sands project.
- A schedule that shows regulatory, construction, and operating milestones.
- ERCB *EnerFAQs 15: Objecting to an Energy Resource Project*.

### 4.4 Application Requirements

- 1) Discuss the stakeholder involvement area and the criteria that were used to determine it. Include a map of the stakeholder involvement area that shows
  - a) the project area,

- b) existing land uses,
  - c) the locations of persons included within the stakeholder involvement area (including landowners, mineral leaseholders, and owners of any unleased lands in the project area and the off-setting sections and oil sands leaseholders in the project area and off-setting quarter sections).
- 2) Describe the stakeholder involvement program.
- a) Discuss activities completed to date and any future planned activities. Include a table identifying the date of the activity, location, participating parties, and issues raised. Identification of parties should be at a high level (i.e., by organization or by occupation or activity [e.g., trappers, landowners]).
  - b) Discuss the results of the engagement activities, including how feedback (any concerns or issues raised) was responded to or incorporated into the project and the efforts undertaken to address outstanding concerns or objections.
- 3) Provide a copy of the information package. Copies of any ERCB documents provided to a party do not need to be included but must be identified.

An applicant must not submit personal information about the parties contacted as part of its stakeholder involvement program. However, an applicant must retain and make available to the ERCB upon request

- a list of notifications issued,
- a list of parties consulted,
- all communication records with parties (e.g., letters, notifications, e-mails),
- all party contact information, and
- all registered mail or courier tracking records.

#### 4.5 Other Related Processes and Guidance

Applicants are reminded of their obligations under the *Personal Information Protection Act (PIPA)*. This includes disclosing the need and purpose for collecting any personal information; the circumstances under which the information will be disclosed; and any details on the security, retention, and the ultimate destruction of this information. The name of the person to be contacted regarding personal information collection and the company's privacy policy should also be provided, with all details consistent with the applicant's established privacy policy.

In its attempt to address concerns and objections, an applicant may wish to use the ERCB's appropriate dispute resolution (ADR) process. ADR includes a variety of options to manage disputes, such as direct negotiation between the parties, ERCB facilitation, and third-party mediation or arbitration.

More information on ADR can be found on the ERCB website [www.ercb.ca](http://www.ercb.ca).



## 5 Socioeconomic Requirements

In assessing the socioeconomic effects of the project, the applicant must identify the area in which the project-related effects are expected to occur. The socioeconomic information provided by the applicant must articulate the effects of the project (both positive and negative) in the area and any measures planned to mitigate negative effects arising from the project.

- 1) Describe the assessment area and the criteria that were used to determine it. Include a map of the assessment area overlaid with the project area boundary.
- 2) Describe the existing socioeconomic conditions within the assessment area. Include the following:
  - a) Population
    - Permanent and transient population
  - b) Housing
    - Available housing
  - c) Employment and training
    - Potential employable population
  - d) Economic activity
  - e) Transportation
    - Existing traffic patterns
  - f) Infrastructure and services (e.g., recreational services and public services such as sewage, housing, law enforcement, fire, schools, and health services)
- 3) Discuss the overall economic effects of the project.
  - a) Provide a table showing the taxes, royalties, gross domestic product, and labour income (i.e., direct, indirect, and induced) to be generated by the oil sands project.
  - b) Provide a table showing the capital costs and annual operating expenditures. Include a breakdown of expenditures in percentage amounts in relation to the local region, Alberta, Canada, and outside of Canada.
- 4) Describe the resulting project effects within the assessment area on the items in the following list. Include both potential positive and negative social effects, in quantitative terms where possible, taking into consideration any relevant local, regional, or national development plans.
  - a) Population
    - Direct, indirect, and induced population changes
  - b) Housing
    - Available housing
  - c) Employment and training
    - Policies and programs to enhance skill development of the community to participate in the project

- d) Economic activity
  - e) Transportation
    - Project traffic effects
  - f) Infrastructure and services (e.g., recreational services and public services such as sewage, housing, law enforcement, fire, schools, and health services)
  - g) Other social effects of the project on the people and communities within the assessment area
- 5) Discuss the measures to mitigate the socioeconomic effects of the oil sands project. Discuss any residual effects following mitigation.

The discussion should address how mitigation measures aim to reduce or eliminate the effects for each of the items identified in (4).

- 6) Provide information on the project's workforce, including
- a) the number of direct jobs;
  - b) the timing of peak periods;
  - c) the transportation of workers and equipment to and from the site, including type, quantity, and frequency; and
  - d) worker accommodation. If on-site accommodations are needed, provide
    - rationale;
    - capacity, including the number of workers to be housed;
    - the length of time the accommodations will be in service; and
    - the on-site services to be provided.

## 6 Environmental Requirements

### 6.1 Introduction

In assessing the environmental effects of a project, the applicant must identify the area within which the project-related effects are expected to occur. For each environmental component (e.g., land use, soils, wildlife), the applicant is expected to address the effects within the project area at a minimum. However, the assessment area may differ for each component. If the applicant identifies that the effects can reasonably be expected to extend beyond the project area (e.g., broader watersheds, airsheds, or within additional associated footprints such as well pads or CPFs outside of the project area) the assessment area must be expanded accordingly. The application must include a project-wide evaluation of effects and the measures planned to mitigate them. Applicants must demonstrate how planned mitigations will be followed using the initial development phase.

The ERCB recognizes that more detail will be available within the initial development phase where specific footprint placements are known. The application must contain information specific to known footprints that evaluates the effects and demonstrates how planned mitigations are followed. The evaluation of known footprints must be consistent with the strategies and practices to be implemented throughout the life of the project.

### 6.2 Land Use

- 1) Describe the assessment area and the criteria that were used to determine it.
- 2) Identify existing land uses within and directly adjacent to the assessment area.

Quantify land use in hectares.

Include a map illustrating the land uses overlaid with the project area boundary and, if applicable, the development area boundary, and footprints.

Land uses may include Crown and private land holdings (including dwellings), surface rights dispositions (e.g., agriculture, forestry, oil and gas, mineral, nonmetallic development), fur management areas, existing and designated access routes, traditional land uses (including First Nations and Métis land uses), provincial recreation or conservation area designations within an Alberta regional planning document, and recreation and tourism uses.

- 3) Identify local and regional land-use plans, policies, and approvals that affect the project area, such as Alberta regional planning documents (e.g., Lower Athabasca Regional Plan), integrated resource plans, and management plans. Discuss project compliance with any applicable plans, policies, and approvals.
- 4) Describe the assessments undertaken pursuant to the *Historical Resources Act*, and identify any authorizations issued under the act.
- 5) Identify and discuss project effects on the identified land uses.
- 6) Summarize planned measures to mitigate effects and any anticipated residual effects.

For the initial development-phase footprints, describe how the mitigations will be applied and identify anticipated residual effects.

Mitigations may include managing access, avoiding a sensitive area, and managing the timing of development and operations.

- 7) Identify and discuss the potential for using existing footprints (including infrastructure).

Include a map illustrating the overlap between existing footprints and the project's infrastructure.

The discussion must cover any coordination of shared or third-party infrastructure as it relates to the orderly development of the project.

- 8) Provide a table of the project footprint in hectares, differentiating between the new and existing disturbance as well as the type of disturbance. Identify the total footprint for each of the following major project components where applicable:

- a) CPFs,
- b) processing plants,
- c) exploration programs (e.g., wells, seismic),
- d) tailings ponds,
- e) storage or disposal structures,
- f) pads,
- g) access roads,
- h) pipelines,
- i) borrow pits,
- j) camps, and
- k) any other related footprints.

- 9) Describe how the project's footprints are going to be managed and monitored over the life of the project.

- 10) Summarize the monitoring and follow-up activities necessary to assess the effectiveness of mitigations.

Include the monitoring scope, objectives, and approach, as well as the process for reporting to the appropriate jurisdictions.

- 11) Summarize additional approved or applied for project-related developments.

Induced developments may include seismic lines, exploration wells, pipelines, utilities, borrow pits, camps, sumps, disposal and water wells, and access roads.

### **6.3 Soils**

- 1) Describe the assessment area and the criteria that were used to determine it.
- 2) Identify any sensitive soil types within the assessment area.

Include a map of the sensitive soil types overlaid with the project area boundary and, if applicable, the development area boundary, and footprints. Also include a table of disturbance by mineral and organic soil type in hectares.



Sensitive soils may include those sensitive to acid input, sandy soils that are easily eroded and could result in sedimentation of water bodies, and soils that may present reclamation challenges.

- 3) Summarize the soils information gathered in the assessment area and the collection methods.

Sources of information may include baseline surveys and existing reports and assessments. Collection methods may include field or desktop surveys.

Identify how collection methods are appropriate for the scale of the project, site conditions, and the timing of development.

- 4) Identify and discuss the effects of the project on the sensitive soils, including the effect of potential acid input, where applicable.
- 5) Summarize planned measures to mitigate effects and any anticipated residual effects.

For the initial development-phase footprints, describe how the mitigations will be applied and identify anticipated residual effects, noting changes in soil quantity and quality.

#### **6.4 Vegetation and Wetlands**

- 1) Describe the assessment area and the criteria that were used to determine it.
- 2) Identify vegetation and wetland types within the assessment area, specifying those that are locally or regionally rare or sensitive.

Vegetation types should be identified at the ecosite phase level or equivalent, using the Alberta Ecosystem Classification System, the Alberta Wetland Inventory, or other similar standard.

Include a map illustrating the vegetation and wetland types overlaid with the project area boundary and, if applicable, the development area boundary, and footprints. Also include a table of the overall project footprint in hectares by ecosite type.

For the initial development-phase footprints, identify in a map the locations of known rare plants and locations with high potential to support rare plants. Include a table of disturbance in hectares by ecosite type.

- 3) For the assessment area, identify species of management concern and culturally important species. Describe sites with the potential to support these species.

Include species listed as “At Risk,” “May Be At Risk,” and “Sensitive” under the ESRD General Status of Alberta Wild Species, listed in Schedule 1: List of Wildlife Species at Risk of Canada’s *Species at Risk Act*, listed as “At Risk” by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and traditionally used species.

Also identify species that support rare or culturally important wildlife species.

- 4) Summarize the vegetation information gathered in the assessment area and the collection methods.

Sources of information may include baseline surveys, and existing reports and assessments. Collection methods may include field or desktop surveys.

Identify how collection methods are appropriate for the scale of the project, site conditions, and the timing of development.

- 5) Identify and discuss project effects on the vegetation and wetlands.

Include effects of potential acid input on vegetation and wetlands, where applicable.

- 6) Summarize planned measures to mitigate effects and any anticipated residual effects.

For the initial development-phase footprints, describe how the mitigations will be applied and identify anticipated residual effects, noting changes in habitat quality and availability of suitable habitat for plants of management concern (e.g., rare plants) and culturally important plant species (e.g., used in traditional foods and medicines). Include riparian areas.

- 7) Summarize the monitoring and follow-up activities necessary to assess the effectiveness of mitigations.

Include the monitoring scope, objectives, and approach, as well as the process for reporting to the appropriate jurisdictions.

## 6.5 Wildlife

- 1) Describe the assessment area and the criteria that were used to determine it.

- 2) Identify the presence or potential overlap of rare, sensitive, or culturally important wildlife species' habitat or ranges within the assessment area.

Include a map illustrating known and potential locations of identified wildlife species overlaid with the project area boundary and, if applicable, the development area boundary, and footprints, as well as any provincially or federally determined boundaries (e.g., caribou zones).

Also include a map of high-quality habitats of identified wildlife species overlaid with the project area boundary and, if applicable, the development area boundary, and footprints.

Specify the criteria used to identify affected wildlife species and their habitat.

Include species listed as “At Risk,” “May Be At Risk,” and “Sensitive” under the ESRD General Status of Alberta Wild Species, listed in Schedule 1: List of Wildlife Species at Risk of the Canada’s *Species at Risk Act*, listed as “At Risk” by the COSEWIC, and traditionally used species.

- 3) Summarize the wildlife information gathered in the assessment area and the collection methods.

Sources of information may include baseline surveys, and existing reports and assessments. Collection methods may include field or desktop surveys.

Identify how collection methods are appropriate for the scale of the project, site conditions, and the timing of development.

- 4) Identify and discuss effects of the project on the identified wildlife species.

Effects may include mortality, sensory loss, habitat loss, and changes to habitat quality.

- 5) Summarize planned measures to mitigate effects and any anticipated residual effects.

For the initial development-phase footprints, describe how the mitigations will be applied and identify anticipated residual effects, noting changes in habitat quality and availability for rare, sensitive, or culturally important species.

- 6) Summarize the monitoring and follow-up activities necessary to assess the effectiveness of mitigations.

Include the monitoring scope, objectives, and approach, as well as the process for reporting to the appropriate jurisdictions.

## 6.6 Hydrology

- 1) Identify and describe the watershed(s) in the region of the project.

Include a watershed- or subwatershed-scale map with topographic contours that shows the hydrologic setting overlaid with the project area boundary and, if applicable, the development area boundary and footprints.

- 2) Describe the assessment area and the criteria that were used to determine it.

- 3) Identify water bodies within the assessment area.

Include a water body map overlaid with the project area boundary and, if applicable, the development area boundary, and footprints. Illustrate topographic contours and crossing structures.

- 4) Summarize the hydrological information collected in the assessment area and the collection methods.

Sources of information may include baseline surveys, and existing reports and assessments. Collection methods may include field or desktop surveys.

Identify how collection methods are appropriate for the scale of the project, site conditions, and the timing of development.

- 5) Identify and discuss the effects of the project on the identified water bodies.

Effects may include the alteration of stream channels or natural drainage pathways, changes in water levels, changes in magnitude and frequency of peak and low flow discharges, and changes to erosion and sedimentation.

For mining applications only, provide a summary of modelling results, assumptions, and accuracy.

- 6) Summarize planned measures to mitigate effects and any anticipated residual effects. For the initial development-phase footprints, describe how the mitigations will be applied and identify anticipated residual effects.
- 7) Identify locations where the project's footprints are near a water body. For any footprint within 100 m of a water body, provide the following:
  - a) a description of the equipment that will be located less than 100 m from the water body and the fluids involved; and
  - b) a discussion of the preventative measures that will be employed at the facility to minimize the risk of a spill occurring, and in the event of a spill, the preventive measures for ensuring that the spill does not reach the water body.
- 8) Identify the effects on surface water as a result of groundwater use in areas of groundwater-surface water interaction. Summarize associated planned measures to mitigate effects.
- 9) Summarize the monitoring and follow-up activities necessary to assess the effectiveness of mitigations. Include the monitoring scope, objectives, and approach, as well as the process for reporting to the appropriate jurisdictions.

## 6.7 Surface Water Quality

- 1) Describe the assessment area and the criteria that were used to determine it.
- 2) Identify water bodies within the assessment area sensitive to changes in water chemistry (e.g., acid sensitive, salinity, nutrients) or with atypical water chemistry. Specify the criteria used to identify these surface water bodies.

Include a map illustrating the water bodies overlaid with the project area boundary and, if applicable, the development area boundary, and footprints.

Atypical features may include saline surface water and naturally occurring exceedances of the *Alberta Surface Water Quality Guidelines*.

- 3) Discuss the extent of any identified atypical features and factors contributing to the atypical result.
- 4) Provide baseline physical, inorganic, and organic water chemistry measurements for a representative water body, all water bodies sensitive to changes in chemistry, and those with atypical chemistry.
- 5) Summarize the water quality information gathered in the assessment area and the collection methods.

Sources of information may include baseline surveys, and existing reports and assessments. Collection methods may include field or desktop surveys.

Identify how collection methods are appropriate for the scale of the project, site conditions, and the timing of development.

Include a map showing the location of any field measurements obtained (i.e., flowing or standing water bodies).

- 6) Identify and discuss the effects of the project on the water quality of the identified water bodies.

Effects may include increased sedimentation, potential acid input, and eutrophication.

- 7) Summarize planned measures to mitigate effects and any anticipated residual effects.

For the initial development-phase footprints, describe how the mitigations will be applied and identify anticipated residual effects.

For mining applications only, provide a summary of modelling results and modelling assumptions and accuracy.

- 8) Summarize the monitoring and follow-up activities necessary to assess the effectiveness of mitigations.

Include the monitoring scope, objectives, and approach, as well as the process for reporting to the appropriate jurisdictions.

## 6.8 Fisheries

- 1) Describe the assessment area and the criteria that were used to determine it.
- 2) Identify fish-bearing and potentially fish-bearing water bodies (i.e., fish habitats) in the assessment area. Specify the criteria used to identify these water bodies.
- 3) Describe any rare, sensitive, or culturally important fish, and their habitats within the assessment area.

Include a map labelled with fish species and a map of rare and sensitive fish species' habitats (with the fish species labelled). Both maps are to be overlaid with the project area boundary and, if applicable, the development area boundary and footprints.

Include species listed as "At Risk," "May Be At Risk," and "Sensitive" under the ESRD General Status of Alberta Wild Species, listed in Schedule 1: List of Wildlife Species at Risk of Canada's *Species at Risk Act*, listed as "At Risk" by the COSEWIC, and traditionally used species.

- 4) Summarize the fisheries information gathered in the assessment area and the collection methods.

Sources of information may include baseline surveys, existing reports, and assessments. Collection methods may include field or desktop surveys.

Identify how collection methods are appropriate for the scale of the project, site conditions, and timing of development.

- 5) Identify and discuss the effects of the project on the identified fisheries' resources.

The discussion of effects may include changes in quantity or availability of fish habitat, effects of water crossings (provide a reference to Section 6.6 of this directive, including the page number, if applicable), and effects on fish abundance and health.

- 6) Summarize planned measures to mitigate effects and any anticipated residual effects.

For the footprints of the initial development phase, describe how the mitigations will be applied and identify any anticipated residual effects.

- 7) Summarize the monitoring and follow-up activities necessary to assess the effectiveness of mitigations.

Include the monitoring scope, objectives, and approach, as well as the process for reporting to the appropriate jurisdictions.

## **6.9 Hydrogeology and Water Source**

- 1) Describe the assessment area and the criteria that were used to determine it. Include a map of the assessment area overlaid with the project area boundary.
- 2) Provide the base of groundwater protection (BGWP) across the hydrogeological assessment area. Discuss which water bearing units within the assessment area are considered to be domestic use aquifers (DUA) as defined by ESRD, identify these units on a geologic column.
- 3) Identify the hydrogeological settings for the assessment area. For each water-bearing unit potentially impacted by operations, provide
  - a) hydraulic conductivities;
  - b) vertical and horizontal gradients and flow directions with a contour map showing hydraulic head elevation across each unit and identify horizontal flow directions;
  - c) interaquifer and surface water connectivity;
  - d) recharge and discharge points;
  - e) baseline water chemistry, including major ions, total dissolved solids (TDS), and any other parameters (e.g., dissolved metals, hydrocarbon content) that could be affected by project activities;
  - f) lateral extent, depth, and thickness; and
  - g) composition of material and hydraulic connection between disposal facility (e.g., dedicated disposal area [DDA], tailings ponds) and water-bearing units.
- 4) Summarize the hydrogeological information gathered in the assessment area and the collection methods.

Sources of information may include baseline surveys, existing reports, and assessments. Collection methods may include field or desktop surveys.

Identify how methods are appropriate for the scale of the project, site conditions, and the timing of development.

- 5) Identify aquifer users in the assessment area and provide a map indicating locations of use, including source and disposal activities.

- 6) Indicate whether the use of a nonsaline groundwater source is being proposed. If so, provide
  - a) the planned location of the water source well(s); and
  - b) the zone, including the formation name and baseline water chemistry, covering all parameters that could be affected by the project's activities.
- 7) Indicate whether the use of a saline groundwater source is being proposed. If so, provide
  - a) the planned location of the water source well(s);
  - b) the zone, including the formation name and baseline water chemistry.
- 8) Discuss the challenges to water sourcing, such as impacts on surface water, aquifer deliverability, and groundwater quality changes through time. Specify the criteria used to evaluate challenges.
- 9) Identify and discuss effects on groundwater receptors resulting from the project, including thermal effects, drawdown resulting from dewatering, and alterations to natural flow conditions.

Include an evaluation of changes to groundwater quality (e.g., arsenic liberation) and quantity (e.g., available drawdown).

Receptors may include domestic water wells and surface water bodies.

The discussion of effects may include interaquifer connectivity and surface water interactions.

- 10) Summarize planned measures to mitigate effects and any anticipated residual effects.
- 11) Summarize the monitoring and follow-up activities necessary to assess the effectiveness of mitigations.

Include the monitoring scope, objectives, and approach, as well as the process for reporting to the appropriate jurisdictions.

## **6.10 Air Quality and Emissions**

- 1) Describe the assessment area and the criteria that were used to determine it.

Include a map of the assessment area overlaid with the project area boundary and, if applicable, the development area boundary, and footprints.
- 2) Describe the air dispersion modelling that was conducted in accordance with the Alberta *Air Quality Model Guideline* published by ESRD and how it is appropriate for the project. Include the following:
  - a) A summary of the baseline climatic and meteorological information relevant to the project as well as the frequency (noticeable trends) of relevant conditions in the project area.

Include temperature, precipitation, humidity, wind speed and direction, and inversions.

- b) A summary of the potential for site specific meteorological conditions (e.g., thermal inversions).
- c) A summary of the baseline air quality information.

Highlight possible trends in air quality, including past ground-level concentration exceedances of relevant air quality parameters (e.g., hydrogen sulphide [H<sub>2</sub>S], nitrogen dioxide [NO<sub>2</sub>], ozone [O<sub>3</sub>], sulphur dioxide [SO<sub>2</sub>]), as well as any other relevant measured parameters.

Baseline air quality data sources may include monitoring data collected by the applicant or other industrial operators or through regional airshed monitoring.

- d) A plot plan of the sources of air emissions within the project area.
- e) A summary of the air modelling input data for the sources identified in (d).  
Include stack heights and diameters, exit velocities, temperatures, and emission rates.
- f) A summary of the range of predicted ground-level concentrations of appropriate air quality parameters from normal operating conditions to expected upset conditions.

- 3) If regional acid deposition modelling was conducted to support the project, provide a summary of the amount and nature of acidifying emissions and an analysis of the potential acid input deposition levels consistent with the *Alberta Acid Deposition Management Framework*.

- 4) Discuss any modelling results not in compliance with the *Alberta Ambient Air Quality Objectives*.

The discussion of modelling results must be supported by maps of terrain, land-use features, sensitive receptors, such as soils or vegetation, and concentration isopleths, as appropriate. Map effects where they are likely to occur.

- 5) Summarize planned measures to mitigate effects and any anticipated residual effects.

The summary of mitigations should address relevant provincial and federal requirements and/or guidelines, which may include codes of practice and frameworks from the Government of Alberta or organizations such as the Canadian Council of Ministers of the Environment (CCME).

- 6) Discuss the potential for odours both inside and outside the project's footprints, possible causes, and mitigation strategies.

- 7) Summarize the air emission control technologies to be used.

Include control technologies (e.g., sulphur and vapour recovery facilities and burners) applied to point, area, and fugitive sources.

- 8) Summarize the monitoring and follow-up activities needed to assess the effectiveness of mitigations.
- 9) Summarize the project's greenhouse gas management plan.



Include a discussion on CO<sub>2</sub> capture and storage technology and energy efficiency projects, mentioning the predicted effects on greenhouse gas emissions.

10) Describe the flare stacks and identify the units they are associated with. The description must address the number and types of flares and expected flare rates (in thousand cubic metres per calendar day [ $10^3$  m<sup>3</sup>/cd] at standard temperature and pressure [STP]) for both continuous flaring and during emergency conditions.

11) Discuss the mitigation strategies to prevent or minimize flaring events.

The ERCB expects gas to be recovered during normal operations or flared during emergency conditions.

12) Provide the anticipated gas venting rates (in  $10^3$  m<sup>3</sup>/cd at STP) and expected emission sources.

If gas volumes are sufficient to sustain combustion, the gas must be burned (or conserved).

Further flaring and venting requirements for in situ operations can be found in *Directive 060: Upstream Petroleum Industry Flaring, Incinerating, and Venting*.

## **6.11 Noise**

Applicants seeking approval for oil sands projects must comply with *Directive 038: Noise Control*, which include undertaking a noise impact assessment before a facility is constructed or in operation.

In unique circumstances the ERCB may require an applicant to submit the noise impact assessment required under *Directive 038* as part of the oil sands project application filed in accordance with *Directive 023*. The ERCB will determine the need to submit the noise impact assessment as part of the application on a case-by-case basis.

## **6.12 Reclamation**

1) Summarize the reclamation plan for the life of the project.

2) Discuss management of the project footprints during the life of the project, including the use of progressive reclamation.

3) Identify and discuss any areas affected by the project that may be difficult to reclaim. Specify the criteria used to identify these areas and discuss the reclamation measures that will be applied. Provide a map of these areas, which may include geotechnically unstable areas, saline-sodic disposal areas, watercourses, end pit lakes containing tailings, disposal areas with potential for mineral oxidation, peat lands, and areas with coarse-textured soils.

4) Discuss the end land-use objectives at project closure. End land-use objectives used in reclamation planning may include traditional land uses, recreation, forested ecosystem, and municipal or industrial development.

5) Summarize the monitoring and follow-up activities necessary to assess the effectiveness of reclamation throughout the life of the project.



## 7 In Situ Applications

All geological maps must incorporate available well information and seismic data and be annotated with posted well data values.

### 7.1 Regional Geology

A minimum of three sections beyond the project area boundary must be used to characterize the regional geology, and all maps in this section must display the area accordingly.

- 1) Provide a geological description of the stratigraphic units identified in Appendix E for the applicable oil sands area and target deposit, including
  - a) a stratigraphic column with all units displayed,
  - b) well log cross-sections that illustrate all units,
  - c) a seismic cross-section tied to well logs,
  - d) isopach maps for all units, and
  - e) structure maps for all units.

### 7.2 Project Geology

- 1) Describe the delineation of the bitumen resource in the project area, supported by
  - a) a discussion of the resource delineation for the project and development areas and its alignment with the guidelines listed in Appendix F;
  - b) a map of the project and development areas showing the locations of the evaluation wells and cored wells;
  - c) a map of the project and development areas showing the 3-D seismic area and 2-D seismic lines;
  - d) a discussion of the seismic acquisition parameters and the processing methods; and
  - e) an annotated depth-converted seismic section tied to well logs.
- 2) If geological modelling was conducted to support the project, describe
  - a) the modelling software used,
  - b) the data used to generate the model and any data conditioning that occurred,
  - c) the cell size and how the cells were populated, and
  - d) the anisotropy assumptions of reservoir parameters (e.g., porosity, permeability) used in generating the model.

Additional modelling information may be required in unique circumstances including the entire geological model.

- 3) Discuss structural events, supported by mapping, that are in the project area. Include the timing of these events in relation to reservoir deposition (pre-Cambrian basement and pre-, syn-, and post-reservoir deposition).

### 7.3 Regional Hydrogeology

A minimum of six sections beyond the project area boundary must be used to characterize the regional hydrogeology. All maps required in this section must display the area accordingly.

- 1) Discuss the hydrostratigraphy to the deepest nonsaline aquifer in the area. Include general lithology and TDS for each.
- 2) Discuss all Quaternary channels and river valleys that are connected to bedrock aquifers within the project area. Provide
  - a) a map showing the Quaternary channels and river valleys in relation to the trajectories of injection and production wells, water source wells, and disposal wells;
  - b) cross-sections of channels and river valleys;
  - c) incision elevation(s);
  - d) lithology of Quaternary channels; and
  - e) all subcropping formations along the talweg.

### 7.4 Reservoir Characterization

- 1) Discuss each target reservoir, including
  - a) the depositional environment;
  - b) mineralogy, grain size, and clay content;
  - c) porosity;
  - d) vertical and horizontal permeability;
  - e) facies association;
  - f) water, gas, and lean zones associated with the bitumen;
  - g) permeability barriers and baffles (e.g., tight streaks and shales); and
  - h) for a carbonate reservoir, the fracture analysis that includes the distribution, size, orientation, and density of the fractures.
- 2) For each target reservoir, provide the following maps and discuss the criteria used to generate each map:
  - a) gross bitumen pay isopach;
  - b) net bitumen pay isopach;
  - c) net/gross bitumen pay ratio;
  - d) structure map of top and base of net bitumen pay;
  - e) pool isopach for all associated and nonassociated gas within the target reservoir, including an identification of the gas associated with the target reservoir (summarize the data and analysis used to determine pooling [e.g., pressure and fluid contacts]);
  - f) top-water isopach (include identification of top water in contact with the target reservoir);
  - g) bottom-water isopach (include identification of bottom water in contact with the target reservoir); and

- h) lean zone isopachs associated with the target reservoir.
- 3) For each target reservoir, provide
  - a) average bitumen viscosity,
  - b) initial gas-oil ratio,
  - c) initial pressure, and
  - d) initial temperature.

## 7.5 Resource Recovery Process

- 1) Describe the bitumen recovery process, including a description of any injection fluids and their composition.
- 2) Discuss the expected drainage pattern recovery performance and how it was determined. Provide the steam-oil ratio if applicable.
- 3) Discuss subsurface and surface constraints that have influenced the layout for the drainage patterns. Justify the reasoning for any unexploited bitumen resources.

Include a bitumen net pay map overlaid with the drainage pattern boundaries and well trajectories.

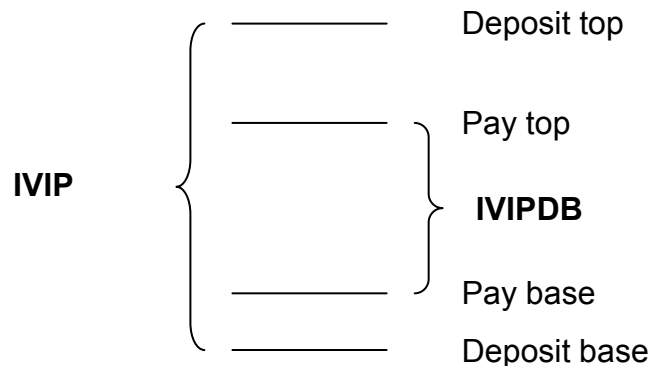
- 4) Describe the criteria used to determine the drainage pattern design (i.e., vertical placement of horizontal wells or the perforation interval of vertical wells, interwell spacing, horizontal well length, pattern buffers and project boundary setbacks). Provide the technical information and analysis used to support these criteria.
- 5) Based on the above drainage pattern design criteria, provide the below parameters for the development area. Include the expected variation for each parameter and the basis for this variation.
  - a) vertical placement of horizontal wells or the perforation interval of vertical wells,
  - b) interwell spacing,
  - c) horizontal well length,
  - d) buffers between drainage patterns, and
  - e) setbacks from project boundaries.
- 6) Provide an annotated well log cross-section for each drainage pattern including logs, within and off-setting the pattern, that illustrates
  - a) the pay top and pay base,
  - b) facies distribution,
  - c) fluid contacts, and
  - d) the vertical placement of horizontal wells or the perforation interval of vertical wells.
- 7) Describe the operating strategy for the project. Include injection rates, volumes, injection and production durations, bottomhole pressures, and temperatures on a typical well or well pair and drainage pattern.

- a) For steam-assisted gravity drainage (SAGD) projects, provide the above for start-up operations, normal operations, and wind-down operations.
  - b) For cyclic steam stimulation (CSS) projects, provide the above on a cycle-by-cycle basis specifying injection, soaking, and production operations.
- 8) Discuss how geological factors (e.g., thief zones, bottom water, fractures, faults, karsting, incising channels, structural collapse) affect the operating strategy.
- 9) Discuss how the operating strategy may affect associated gas reserves, where applicable. Include
- a) identification of any associated gas pools that will or may have to be repressured in order to recover the bitumen,
  - b) the fluid(s) that are planned for the repressurization, and
  - c) any resource conservation or operational impacts associated with the fluid to be injected and how these could be mitigated.
- 10) Discuss the effects of the project on other energy resource recovery operations in the project area. Include
- a) a summary of other operations in the area that could impact the project or could be impacted by the project,
  - b) identification of any surface or subsurface conflicts that may have implications on the development of the project or on the development of other operations,
  - c) a summary of protocols and agreements in place to ensure the safe drilling and operation of wells,
  - d) how the integrity of the caprock within the project area with the development of other reservoirs will be addressed,
  - e) how the coordination of surface development to minimize overall disturbance will be addressed, and
  - f) how any future conflicts will be addressed.
- 11) Discuss plans for artificial lift.
- 12) Discuss the reservoir monitoring program. Include
- a) the strategy in the placement of observation wells and the planned number of observation wells per drainage pattern,
  - b) the type of monitoring data to be collected,
  - c) the approximate interval depths at which monitoring data will be collected,
  - d) the frequency of monitoring data collection,
  - e) plans for 4-D seismic data collection, and
  - f) plans for surface-heave data collection.

## 7.6 Reserves

- 1) For both the project and development area provide the following and include all inputs used in the calculations:

- a) the initial volume in place of bitumen (IVIP) (see Figure 7.1)
- b) the initial volume in place of developable bitumen (IVIPDB) (see Figure 7.1)
- c) the initial established reserves of bitumen, and
- d) the recovery factor.



**Figure 7.1 Reserve intervals**

- 2) Demonstrate that the IVIPDB in the project area can support the applied-for production capacity for the duration of the project.
- 3) Discuss the methods used to determine the recovery factor (e.g., model study, a comparison of analogous projects).
- 4) Discuss how thief zones (i.e., transition zones, top gas, lean zones) may impact bitumen recovery in the development area.
- 5) Provide an annual production forecast for the life of the project, including assumptions and parameters used to determine the forecast.
- 6) Provide a table with the following information for each drainage pattern within the development area:
  - a) drainage area (hectares),
  - b) average net bitumen pay,
  - c) average porosity,
  - d) average water saturation,
  - e) volume of IVIPDB,
  - f) recovery factor,
  - g) initial established reserves of bitumen, and
  - h) number of production wells.

## 7.7 Reservoir Simulation

- 1) If reservoir simulation modelling is used to support the application,

- a) describe the modelling software used,
  - b) discuss the modelling conducted,
  - c) summarize the relevant results of the modelling and how they support the reservoir development strategy,
  - d) discuss the assumptions (e.g., homogenous reservoir, dead oil) used in the reservoir simulation model, and
  - e) provide the reservoir simulation model input files.
- 2) If a geostatistical geological model is used, discuss how it was upscaled to the reservoir simulation model.

## 7.8 Existing Wells in the Project Area

The ERCB expects that all wells penetrating the target formation or deposit in the project area be completed or abandoned in a manner that is compatible with proposed in situ operations; cement and casing must be designed to withstand anticipated operating temperatures and pressures to ensure reservoir fluid containment.

- 1) Discuss the criteria used to assess the thermal compatibility of existing wells in the project area.
- 2) Complete a table in accordance with Appendix G of the thermal compatibility of existing wells, listing all wells in the project area penetrating the target deposit. For each well that is not thermally compatible, specify why it did not meet the criteria provided in (1).
- 3) Provide a map of the project and development areas showing the drainage pattern boundaries and the locations of wells that are not thermally compatible.
- 4) Discuss the planned mitigation measures (e.g., remediation, monitoring, buffer distances) for the wells that are not thermally compatible to ensure fluid containment.

## 7.9 Well Operation, Design, and Drilling Practices

Wells that are part of recovery operations for an in situ project must comply with the requirements set out in *Directive 051: Wellbore Injection Requirements* and *Directive 050: Drilling Waste Management*.

- 1) Provide a wellbore schematic illustrating the completion design for all well types associated with the project. Include production, injection, observation, disposal, and water source wells that penetrate the caprock of the target reservoir within the project area.
- 2) Identify any site-specific issues that may lead to challenges in obtaining adequate cement bonds during the drilling and completion of the project wells. Provide the mitigations that will be incorporated into the drilling practices to ensure that cement bonds are compatible with thermal operations.
- 3) Provide a discussion on the operational monitoring systems proposed (e.g., passive seismic, thermal fibre, pressure monitoring in overlying zones) to assist in monitoring wellbore integrity.



## 7.10 Reservoir Containment and Maximum Operating Pressure

The ERCB expects in situ operations to be conducted in a manner that ensures reservoir fluid containment.

In certain circumstances (e.g., shallow SAGD operations or CSS operations above reservoir fracture pressure), the ERCB may require an applicant to support its caprock integrity study with a 3-D seismic evaluation. The 3-D seismic information may identify faults and structural anomalies associated with karsting and salt dissolution impacts that can be missed by evaluation wells.

The ERCB's ongoing reservoir containment project is intended to provide appropriate caprock integrity and maximum operating pressure (MOP) requirements for in situ schemes.

- 1) Identify the caprock of the target reservoir in the project area and provide the basis for this determination.
- 2) Provide the geological interpretation of the caprock, including
  - a) the lithology and mineralogy of the caprock supported with available particle size and mineralogical analysis;
  - b) structure maps of the top and base of the caprock in the project area that incorporate data from logs, core, and any seismic programs run;
  - c) a map showing the depth of the base of the caprock in true vertical depth for the project area; and
  - d) an isopach map of the caprock in the project area.
- 3) Discuss the presence of water and gas bearing intervals between the caprock and the bitumen pay zone within the target reservoir. Include an isopach map of these intervals.
- 4) Discuss any fractures, faults, karsts, incising channels, and structural collapse in the caprock or target reservoir in the area used to assess the regional geology (see Section 7.1) and how these features may affect reservoir containment. Provide the following items in support of the discussion:
  - a) core photos and results from any wellbore image logs run, and
  - b) a map illustrating where these features are located.
- 5) Provide a summary of results from all mini-frac tests conducted in the project area. The testing summary must include
  - a) the criteria used to determine the location of mini-frac test(s),
  - b) the intervals and zones tested,
  - c) a discussion of any geological features that could impact the test results,
  - d) the estimated fracture pressures of the reservoir and caprock determined by each test location, and
  - e) justification for excluding any test results.
- 6) Provide all geomechanical laboratory tests conducted to determine caprock properties within the project area (e.g., cohesion, friction angle, Young's modulus).

- 7) Specify the requested MOP for the project and discuss how it was determined and why it is appropriate.
- 8) If geomechanical modelling is used to support the application,
  - a) identify the modelling software used,
  - b) discuss the modelling conducted,
  - c) summarize the modelling results and show how they support the requested MOP,
  - d) discuss the assumptions of the model (e.g., boundary conditions, material failure criteria, soil constitutive models, material properties), and
  - e) provide the model's input files.
- 9) Discuss how operations will be monitored to ensure that the MOP is not exceeded. Include the field operating protocols to deal with an exceedance of the MOP should it occur.
- 10) Discuss how operations will be monitored to ensure that the integrity of the caprock has not been compromised. Include the criteria used to characterize events that may compromise caprock integrity and the field operating protocols for responding to such an event.

#### **7.11 Disposal Schemes**

Disposal schemes require approval under *Directive 065: Resources Applications for Oil and Gas Reservoirs*.

The ERCB may require that disposal scheme applications directly related to an oil sands project be processed in parallel with the *Directive 023* application.

- 1) Describe plans for any disposal schemes. Include a summary of the assessment conducted to support the plans.
- 2) Identify the disposal zone(s) and provide
  - a) the formation name and depth;
  - b) the disposal location;
  - c) a characterization of the disposal zone(s), as well as a regional isopach map of the zone(s) and confining strata; and
  - d) the average and maximum injection rates in m<sup>3</sup>/day.

#### **7.12 Cavern Storage or Cavern Disposal Schemes**

Cavern storage or cavern disposal schemes require approval under the *Oil and Gas Conservation Act (OGCA)*, section 39.

Cavern disposal schemes must comply with the requirements set out in *Directive 058: Oilfield Waste Management Requirements for the Upstream Petroleum Industry*.

The ERCB may require that cavern storage or cavern disposal scheme applications directly related to an oil sands project be processed in parallel with the *Directive 023* application.

- 1) Describe plans for any cavern storage and schemes. Include a summary of the assessment conducted to support the plans.
- 2) Identify the cavern storage or disposal zone(s) and provide
  - a) the formation name and depth,
  - b) the number and location of the cavern(s),
  - c) the type of fluid(s) to be stored,
  - d) a characterization of the storage or disposal zone(s),
  - e) the average and maximum injection rates in m<sup>3</sup>/day, and
  - f) a discussion of the construction and operation of the cavern(s) and its integration with the project.

### 7.13 Facilities

- 1) Describe the CPF and pad facilities.
- 2) Discuss the criteria for selecting the process technology.
- 3) Discuss the selected CPF location and its potential for resource sterilization.
- 4) Provide a plot plan of the CPF and each pad that includes
  - a) process equipment,
  - b) storage areas,
  - c) emergency relief stacks,
  - d) buildings, and
  - e) pipelines.
- 5) For each major process unit, describe the unit, its components, and its capacity and provide the associated simplified process flow diagram (PFD). PFDs must include enough detail so that all unit components can be easily identified.
- 6) For the project as a whole and for each phase of the project, provide a material balance for water, sulphur, and hydrocarbons (i.e., gas, bitumen, and diluent). The material balances are to be shown on a block flow diagram using both mass and volumetric flow rates. All flow rates must be expressed on a calendar-day basis at standard temperature and pressure. Include the assumed facility service factor.
- 7) Provide a table listing each storage tank, including its
  - a) capacity,
  - b) contents,
  - c) roof type (e.g., floating, fixed), and
  - d) fugitive emissions control.

In situ oil sands projects must comply with *Directive 055: Storage Requirements for the Upstream Petroleum Industry*.

- 8) Provide an energy balance for the CPF. Include the lower heating value (LHV) and energy content of each stream.

Appendix H provides a generic energy balance. Adapt the energy balance as necessary to reflect the project.

- 9) Discuss the steps to be taken to maximize produced water recycling and minimize disposal.
- 10) Provide
  - a) a discussion of the disposal for the project and how it complies with the associated maximum disposal limit for the project;
  - b) the approximate duration, from start-up, to achieve the maximum disposal limit; and
  - c) a detailed water balance for the project as a whole and for each phase of the project.

Applicants seeking approval for in situ oil sands projects must comply with the requirements of *Directive 081: Water Disposal Limits and Reporting Requirements for Thermal In Situ Oil Sands Schemes*.

The detailed water balance must allow for determining key water use indicators, such as blowdown recycle and regeneration losses.

- 11) Describe the storage, handling, and disposal of waste. Include
  - a) a list of the oilfield wastes that will be generated by the project (see *Directive 058* for general oilfield waste types),
  - b) the volumes to be generated,
  - c) the volumes to be stored on site,
  - d) the final disposition of the waste, and
  - e) any environmental controls.

Waste and storage management for in situ projects must comply with the requirements of *Directive 055* and *Directive 058*.

- 12) Provide a simplified PFD showing the significant measurement points and the type of measurement device (e.g., meter, sampler) in the CPF to be used for mass balancing, assessing regulatory compliance, and fulfilling the reporting requirements of the ERCB.

Measurement, accounting, and reporting plans (MARPs) are required for all thermal in situ projects, as described in *Directive 042: Measurement, Accounting, and Reporting Plan (MARP) Requirement for Thermal Bitumen Schemes*. MARP approval must be obtained before submitting a *Directive 056* licensing application for the associated surface facilities unless, upon request, an exemption is obtained from the ERCB.

When modifications are made to an existing thermal in situ project with an approved MARP, an application to amend the approved MARP

- is required if the modifications include a new CPF or if they involve significant modifications to the existing CPF, and
- is not required if the modifications involve additional wells, pad facilities, or

modifications to an existing CPF that are not significant; however, these additions or modifications must be included in the annual updates to the approved MARP.

- 13) Describe the technology and methods that will be used to estimate well production. Include a simplified PFD of a typical well pad indicating proposed meter and sample point locations.

Measurement requirements for in situ projects are stipulated in *Directive 017: Measurement Requirements for Oil and Gas Operations*.

- 14) Describe the gathering and distribution pipelines between the CPF and well pad facilities.



## 8 Mining Applications

This section describes the information that must be provided as part of an application for an approval to construct and operate an oil sands mining operation, including an extraction plant. The ERCB acknowledges that the level of detail and site-specific data to support the analyses for some requirements may not be available for new projects at the time of application. In these cases, which are identified within the section, information available at the time of application submission and expected design must be provided. The necessary detail must be submitted with an amendment application as per Section 10 of this directive and in accordance with the dates outlined in the *OSCR*.

### 8.1 Geology and Resource Evaluation

- 1) Provide an overview of the geology in the surface mineable area, including
  - a) the stratigraphy,
  - b) the depositional setting, and
  - c) any regional geological structures or features.
  
- 2) Provide a geological description of the project area with a 500 m offset for the Quaternary, Cretaceous, and Devonian periods. Include the following information for each formation, member, or unit identified:
  - a) a stratigraphic column,
  - b) structural cross-sections,
  - c) isopach and structure maps,
  - d) its lithology, and
  - e) a map and cross-sections of water-bearing units.

Provide the data sources used (e.g., seismic, electromagnetic).
  
- 3) Describe the drilling activities conducted. Include
  - a) the drilling history and well abandonment practices; and
  - b) a map of drillhole locations with an overlay of the lease boundaries, pit limit outlines, and surface facilities.
  
- 4) Provide a drillhole inventory table similar to Appendix I, indicating
  - a) the number of drillholes,
  - b) drilling dates,
  - c) the quality of the drillhole data,
  - d) which laboratory analyses were completed,
  - e) types of logs run, and
  - f) facies described.

Corehole data to be submitted electronically as stated in Appendix D.

- 5) Discuss the core sampling and lab analysis methods for
  - a) bitumen, water, and solids;
  - b) particle-size distribution; and
  - c) clay characterization.
  
- 6) Summarize how the geological model was developed. Include
  - a) a description of the data and the data conditioning that was applied,
  - b) the block size and method of population,
  - c) anisotropic assumptions,
  - d) model constraints (e.g., surfaces, facies, water sands, interburden) and constraint assumptions,
  - e) compositing logic,
  - f) the validation process, and
  - g) the block model input files.
  
- 7) Summarize how modelling parameters were defined. Include
  - a) the cut-off for weight per cent bitumen, minimum thickness, and dilution; and
  - b) the calculation and methodology for total volume to bitumen-in-place ratio (TV:BIP).
  
- 8) Provide representative cross-sections that show the variability and distribution both vertically and laterally across the project area for
  - a) the mineable resource,
  - b) interburden, and
  - c) resource–water sands contacts.
  
- 9) Provide maps for
  - a) TV:BIP for values up to 18:1 overlain with drillhole locations,
  - b) total mineable resource thickness,
  - c) weight per cent bitumen starting at 5 per cent,
  - d) total interburden thickness,
  - e) total overburden thickness, and
  - f) average fines.
  
- 10) Provide a table of mineable resources, including
  - a) tonnage of resource, fines, interburden, and overburden;
  - b) per cent average fines;
  - c) weight per cent bitumen; and
  - d) total bitumen volume.



## 8.2 Mine Design

While *Directive 082: Operating Criteria: Resource Recovery Requirements for Oil Sands Mine and Processing Plant Operations* sets out the minimum requirements for resource recovery, the applicant must describe the design of the mine as it will be operated.

- 1) Summarize the objectives of the mine's design and the mining method. Include which mining technologies will be used (e.g., truck and shovel, slurry at face) and the rationale for the mining method selected.
- 2) Discuss the assumptions of the mine's design. Include
  - a) the production rate;
  - b) bitumen recovery;
  - c) per cent material suitability for construction; and
  - d) densities used in the mine's material balance for mineable resource and waste, bitumen, waste storage structures, and tailings dikes.
- 3) Discuss the slopes for the pit, storage or disposal structure, and tailings dike used in the mine's design.
- 4) Discuss the design criteria and constraints for setbacks from water bodies, infrastructure, and lease boundaries.
- 5) Provide a map of the project area that includes the final footprints of the ultimate pit limits, plant sites, tailings, storage and disposal structures, sedimentation and emergency ponds; and watercourses, stream diversions, compensation lakes, or any other relevant feature.
- 6) Describe how the lease boundary will be developed and discuss cooperative efforts with adjacent operators. Include plans for integrating the project with adjacent operations specific to each lease boundary.
- 7) Describe the mine pit limit analyses. Include
  - a) the methods used;
  - b) analysis factors, such as waste island evaluation and pushbacks, as well as operational and economic considerations;
  - c) maps showing stages of analysis for each pit; and
  - d) a table of waste volume, mineable resource volume, weight per cent bitumen, recoverable mineable resource volume, and TV:BIP for each pit and stage of analysis.
- 8) Discuss how the mine design meets or exceeds the requirements of *Directive 082*.
- 9) Justify the sterilization of mineable resources or disposal of recovered resources. Include
  - a) a map that identifies the location of the resources proposed for sterilization or disposal and shows the unmined areas, storage locations, and plant site footprints; and

- b) a description of options for minimizing or eliminating sterilization or disposal of resources, such as moving infrastructure, revising project scheduling, modifying project setbacks, and blending feed.
- 10) Provide the mass and weight per cent bitumen of the mineable resources to be sterilized or disposed of.
- If a stockpile is being considered for sterilization, include the original characteristics of the stockpile and describe the original plan for its use.
- 11) Provide an economic evaluation for each area containing mineable resources that will be sterilized or disposed of. Include data on an incremental basis, detailing any simplifying assumptions used.
- For the economic evaluation, use
- a sensitivity analysis to assess risk or error;
  - a discount rate equal to the current Bank of Canada 10-year bond rate; and
  - the lesser of 25 years or remaining project life as the time span of study, with the sterilized resource valued in the period in which it would have been recovered (in the case of an amendment, according to the previously approved mine plan).
- 12) Provide a table of the mineable recoverable resources for the project area, including
- a) tonnage of recoverable resources, fines, interburden, and overburden;
  - b) per cent average fines;
  - c) weight per cent bitumen;
  - d) and recoverable bitumen volume.
- 13) Describe how the location of the opening cut was determined.
- 14) Discuss the design of the shovel bench, including the criteria used to determine
- a) the bench width,
  - b) the bench height, and
  - c) the need for and design of double or triple benches.
- 15) Discuss operational practices needed to maintain a safe-working mine face.
- 16) Discuss the design of haul roads and ramps. Include
- a) road gradients,
  - b) surface running width for single- and double-lane traffic,
  - c) berms, and
  - d) emergency escape routes.
- 17) Provide a map(s) showing hydrologic and hydrogeologic interventions. Include well locations, dewatering ditches, and diversion routes.

- 18) Discuss depressurization, dewatering, and seepage control plans for the mine and the impact implementation of these plans will have on the stability of adjacent structures.
- 19) Provide a table of water withdrawal rates for each depressurization well.
- 20) Discuss the release of water into each mine pit from water-bearing units around the pit. Include the stability of water-bearing units below the pit, identification of confining units, the ability of the confining units to prevent upward movement of water-bearing units into the pit, and potential weaknesses in the confining units.

### **8.3 Geotechnical Design**

This section sets out the required geotechnical information for each pit wall, in-pit dike, external dike, and disposal and storage structure with an overall height of 5 m or greater. The ERCB acknowledges that the level of detail and site-specific data available to support the analyses may not be available for new projects. In these cases, provide information available at the time of application submission with detail to be provided at a later date in accordance with section 24 of the *OSCR*.

#### **8.3.1 Pit-Wall Design**

- 1) Provide a predevelopment topographic map of the pit-wall location showing pit limits, drainage systems, surrounding infrastructure, and hydrological features.
- 2) Discuss the characteristics of the pit-wall area. Include surface topography, surficial and bedrock geology, geological formation history, and representative geological profiles or models.
- 3) Provide geological profiles for the pit-wall area showing bench widths and elevations, toe, crest, interbench angles, and overall slope angle.
- 4) Provide a table and graph(s) of soil and rock properties and groundwater elevation. Discuss field methods and laboratory tests used to collect the data.
- 5) Provide a summary of the strength and geometric design parameters for the pit wall. Discuss the basis for parameter selection.
- 6) Provide the design criteria for the pit wall. Discuss the failure mechanisms that are addressed using these design criteria.
- 7) Describe the stability analyses of the pit wall at selected critical locations. Include
  - a) assumptions;
  - b) risks or uncertainties associated with the design, such as bench-slope failure and shallow- or deep-seated failure;
  - c) consequences of high-wall failure for different failure mechanisms;
  - d) remediation options, such as supporting berms, aggressive dewatering, and panel mining; and
  - e) representative cross-sections, maps, and graphs of stability model results.

- 8) Provide an assessment, including assumptions, of the interaction between the pit wall and adjacent structures.
- 9) Discuss dewatering, depressurization, and surface runoff diversion activities specific to maintaining the stability of the pit walls.
- 10) Provide the configuration for the final pit wall, including toe and crest positions, planned face slopes, average overall wall slopes, bench widths, bench intervals, and barricade construction.
- 11) Discuss the method and rate of excavation of the final pit walls.
- 12) Describe the monitoring plans for groundwater, settlement, and lateral movement in the vicinity of the pit wall. Include
  - a) a map of the monitoring locations,
  - b) geological cross-sections showing target depths,
  - c) monitoring types and purposes,
  - d) method and timing for installing monitoring equipment, and
  - e) monitoring frequencies and schedules.

### **8.3.2 Storage or Disposal Structure Design**

- 1) Describe each storage or disposal structure. Include
  - a) a topographic map that shows the footprint, surrounding infrastructure, and drainage systems (e.g., ditches, adjacent water bodies) associated with the structure;
  - b) a table of construction start and completion dates and depletion dates, if applicable;
  - c) timelines for placement of different materials within each structure; and
  - d) representative cross-sections showing bench widths and elevations, toe, crest, interbench angles, and overall slope angle.
- 2) Discuss conditions before initial material placement. Include
  - a) surface topography,
  - b) surficial and bedrock geology,
  - c) soil and rock properties,
  - d) groundwater elevations, and
  - e) geological profiles or models.

Provide representative cross-sections, tables, and graphs of the data collected.

- 3) Discuss the foundation preparation required for each storage or disposal structure. Include clearing, drainage, and ground preparation.
- 4) Discuss field methods and laboratory tests used to collect data on the conditions of the structure's location.

- 5) Provide a summary of the strength and geometric design parameters for the storage or disposal structure. Discuss the basis for selecting the parameters.
- 6) Provide the design criteria for the storage or disposal structure. Discuss the failure mechanisms that are addressed using the specified design criteria.
- 7) Discuss construction material specifications and lift placement procedures for each storage or disposal structure, including the density and thickness of the lift and seasonal considerations for operations.
- 8) Discuss the stability analysis, based on measured conditions, for the foundation and fill in each storage or disposal structure. Include
  - a) assumptions,
  - b) risks or uncertainties,
  - c) failure consequences, and
  - d) remediation options.

Support the discussion with stability models, graphs, and maps.

- 9) Provide an assessment of the interaction between each storage or disposal structure and existing or future adjacent structures. Include the assumptions made and any associated risks or uncertainties.
- 10) Discuss the final geometric and drainage design for each disposal or storage structure. Include
  - a) overall dimensions;
  - b) representative cross-sections;
  - c) a figure illustrating the drainage areas;
  - d) a table showing the size, slope, and maximum overland flow path lengths for each drainage area; and
  - e) construction activities needed to define the drainage areas.
- 11) Describe the monitoring plans for groundwater, settlement, and lateral movement in the vicinity of the storage or disposal structure. Include
  - a) a map of monitoring locations,
  - b) geological cross-sections showing target depths,
  - c) monitoring types and purposes,
  - d) method and timing for installing monitoring equipment, and
  - e) monitoring frequencies and schedules.

### **8.3.3 Tailings Dike Design**

The following information is required for new projects only.

- 1) Provide a stability analysis for representative in-pit and external dikes.

- 2) Discuss the seepage analysis for each in-pit dike, external dike, and tailings pond foundation. Include
  - a) seepage parameters (e.g., pressure head, permeability, geometry),
  - b) seepage criteria (e.g., exit gradient, filter design, drain pipe integrity),
  - c) expected seepage rates, and
  - d) seepage mitigation measures for each structure.

#### **8.4 Mine Plan**

- 1) Provide a table showing mineable recoverable resources, stockpiled resources, weight per cent bitumen, and bitumen production for each of the mine's first 10 years and for 5-year mining intervals thereafter.
- 2) Describe the mine development. Include all of the following information:
  - a) A mine sequence map showing the mining area for each year of the mine's life.
  - b) A mine development map(s) showing for each of the mine's first 10 years and for 5-year mining intervals thereafter
    - the preparation, mining advance, disposal and storage structures and locations, tailings structures, and reclamation activity; and
    - any surface facilities, water bodies, utilities, and project area boundaries.
  - c) A description of activities for each of the first 10 years and for 5-year intervals thereafter.
- 3) Provide a material balance for each of the mine's first 10 years and for 5-year intervals thereafter for reclamation, overburden, interburden, and crusher rejects. Include source, material type, and destination.

Reclamation material definitions must be consistent with soil salvage requirements.

- 4) Provide a table of overburden and interburden classified by
  - a) geologic formation with associated volume and weight,
  - b) per cent of material suitable for construction, and
  - c) the amount for use in dike construction.
- 5) Discuss the circumstances under which blasting will be required and the operating procedures to ensure safe blasting. Include
  - a) the criteria used to define the need for blasting,
  - b) which material types will require blasting, and
  - c) when in the mine plan sequence blasting will occur.
- 6) List the mine equipment for each project development phase.

#### **8.5 Extraction Plant**

- 1) Describe the extraction plant.

- 2) Discuss the criteria for selecting the process technology.
- 3) Provide a plot plan of the extraction plant that includes
  - a) process equipment,
  - b) storage areas,
  - c) emergency relief stacks,
  - d) buildings, and
  - e) pipelines.
- 4) For each major process unit, describe the unit, its components, and its capacity and provide the associated simplified PFD. PFDs must include enough detail so that all unit components can be easily identified.
- 5) Describe the utilities and infrastructure associated with the extraction plant. These may include water, cogeneration, steam, electricity, and pipelines.
- 6) For the project as a whole, and for each phase of the project, provide a material balance for solids, water, and hydrocarbons (i.e., bitumen, solvent, and diluent). The material balances are to be shown on a block flow diagram using both mass and volumetric flow rates. All flow rates must be expressed on a calendar-day basis at standard temperature and pressure. Include the assumed facility service factor.
- 7) Provide a table listing each storage tank, including its
  - a) capacity,
  - b) contents,
  - c) roof type (e.g., floating, fixed), and
  - d) fugitive emissions control.
- 8) Provide an energy balance for the extraction plant and mine operations. Include the LHV and energy content of each stream.

Appendix H provides a generic energy balance. Adapt the energy balance as necessary to reflect the project.
- 9) Provide a simplified PFD showing the measurement points and the measurement device (e.g., meter, sampler) within the extraction plant to be used for mass balancing, assessing regulatory compliance, and fulfilling the reporting requirements of the ERCB.
- 10) Describe the actions that will be taken to minimize feed and product losses during commissioning and start-up.
- 11) Describe how the extraction plant's design can accommodate the expected range in ore quality. Provide and justify the quality of the ore that the design was based on. Parameters used to determine the quality of the ore include bitumen, connate water quality, fines content, and d50 sand grain size.

## 8.6 Tailings Management

- 1) Discuss the selection of tailings technologies. Include
  - a) which tailings technologies were examined,
  - b) the advantages and disadvantages of these technologies,
  - c) which technologies were selected for implementation, and
  - d) the reasons why the technologies were selected.
- 2) Discuss the planning assumptions and criteria used in the development of the tailings management plan. Include
  - a) integration with the mine plan,
  - b) fines distribution,
  - c) tailings characteristics, including the percentage of oil, water, and solids; particle-size distribution; shear strength; tailings type-specific gravities; the angle of tailings deposition; and consolidation curves for each tailings type, and
  - d) tailings structure and DDA design.
- 3) Provide a map that shows the locations of all elements of the tailings management plan, such as the DDAs, tailings structures, and tailings treatment facilities.
- 4) For each element of the tailings management plan, provide a table of planned key construction, operating, abandonment, and closure activity dates.
- 5) Provide a description of each tailings treatment facility and its capacity. Include a simplified PFD for each treatment facility with sufficient detail to discern the equipment being proposed.
- 6) Describe each tailings structure. Provide its capacity and baseline elevation, and describe how it will be managed during each phase of the tailings plan.
- 7) Describe each tailings type before treatment, entering the tailings structures and DDAs following treatment, and exiting the system.
- 8) Provide the components (i.e., percentage of water, fines, sand, and bitumen) and density of each tailings type.
- 9) Provide the water chemistry for fluid tailings.
- 10) Discuss the expected variability of fluid tailings composition as the fines in the mineable resource change.
- 11) Provide a tailings material balance using block flow diagrams.

If the project is to be phased, provide balances for each phase, as well as for the overall project. Both mass and volumetric flow rates must be provided on a calendar-day basis.
- 12) Provide a description of how the plan meets the requirements of *Directive 074: Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes*.



- 13) Discuss the integration of the tailings management plan with the mine plan.
- 14) Describe the construction and operation of each tailings structure. Include
  - a) a table that shows the volume placed and corresponding elevation for each tailings structure for each of the mine's first 10 years and for 5-year intervals thereafter,
  - b) a description of the types of material used for construction, and
  - c) a list of tailings types entering the structure.
- 15) Provide a table showing for each year of the mine's first 10 years and for 5-year intervals thereafter,
  - a) the total tonnes and cumulative totals of fines in feed; and
  - b) the total tonnes of fines captured by DDAs, dikes, and beaches.

Also express the fines captured in DDAs as per cent of total fines in the feed.
- 16) Provide a measurement plan that describes the sampling protocol and the methods used to determine the fines in
  - a) oil sands feed,
  - b) tailings types,
  - c) dikes and beaches, and
  - d) DDAs.

Discuss how the methods used to determine fines are validated.
- 17) Provide a table showing total fluid tailings volume accumulating in tailings structures for each of the mine's first 10 years and for 5-year intervals thereafter. Provide a graph that illustrates the adequacy of tailings containment.

## **8.7 Dedicated Disposal Area Plan**

This section sets out the information required for each DDA.

The ERCB acknowledges that the level of detail and site-specific data available to support the analyses may not be available for new projects. In these cases, provide information available at the time of application submission with the detail to be provided at a later date in accordance with section 28.1 of the *OSCR*.

- 1) Describe the DDA containment and deposit design. Include
  - a) design assumptions,
  - b) geometry (e.g., height, slope of base), and
  - c) capacity.
- 2) Provide a topographical map of each DDA showing the location, surrounding infrastructure, and undisturbed areas.

- 3) Describe the construction and operation of each DDA. Include
  - a) dates of construction, use, formation of trafficable deposit, capping, abandonment, start of reclamation, and closure;
  - b) operating procedures associated with the containment structure and deposit; and
  - c) plans for preparing for abandonment and closure.
- 4) Describe the deposit growth for each DDA. Include
  - a) tailings types deposited,
  - b) deposition sequence and timing, and
  - c) annual and final height of the deposit.

Illustrate the deposit growth in comparison to capacity over time.
- 5) Describe the plan for removing water from each DDA.
- 6) Provide a strength measurement plan for each DDA, including
  - a) sampling and testing methodology (e.g., American Society for Testing and Materials [ASTM] standards),
  - b) lateral and vertical spacing, and
  - c) measurement frequency.
- 7) Discuss remedial activities for off-specification tailings. Include mechanism of removal and treatment.
- 8) Describe the final geometry and drainage design. Include
  - a) the dimensions of the final DDA and representative cross-sections,
  - b) a figure illustrating the drainage areas,
  - c) a table showing size, slope and maximum overland flow path lengths for each drainage area in the DDA,
  - d) a discussion of the construction activities needed to define the drainage areas, and
  - e) a description of how the final DDA design will interact with surrounding infrastructure.

## 8.8 Project Water Management

- 1) Describe the storage, handling, use, recycling, treatment, and disposal of water for the project. Include
  - a) a topographic map showing
    - i) water sources (e.g., fresh surface water, fresh groundwater, saline groundwater, precipitation),
    - ii) water diversions,
    - iii) water intake points,

- iv) water storage areas (distinguish between areas containing process-affected and nonprocess-affected water),
  - v) depressurization sources, and
  - vi) compensation lakes where applicable;
- b) a summary of water management strategies to minimize the use of fresh make-up water and increase the recycling of process-affected water; and
  - c) a schedule for implementing each water management strategy identified.
- 2) Provide a table showing the projected water use on an annual basis for each of the project's first five years and for each subsequent phase of development. Include
- a) the volume of water from sources entering the project (e.g., dewatering, surface drainage, surface diversion, groundwater diversion),
  - b) the volume of water entering each storage area,
  - c) the volume of water exiting each storage area, and
  - d) the volume of water exiting the project (e.g., disposal, release).



## 9 Processing Plant Applications

- 1) Describe the processing plant.
- 2) Discuss the criteria for selecting the process technology.
- 3) Discuss the selected processing plant location and its impact on resource sterilization.
- 4) Provide a plot plan of the processing plant that includes
  - a) process equipment,
  - b) storage areas,
  - c) emergency relief stacks,
  - d) buildings, and
  - e) pipelines.
- 5) For each major process unit, describe the unit, its components, and its capacity. Provide the associated simplified PFDs for each unit. PFDs must include enough detail so that all unit components can be easily identified.
- 6) Describe the utilities and infrastructure associated with the processing plant. These may include water, cogeneration, steam, electricity, and pipelines.
- 7) For the project as a whole, and for each phase of the project, provide a material balance for solids, water, sulphur, and hydrocarbons (i.e., process gas, bitumen, and diluent). The material balances are to be shown on a block flow diagram using both mass and volumetric flow rates. All flow rates must be expressed on a calendar-day basis at standard temperature and pressure. Include the assumed facility service factor.
- 8) Provide a table listing each storage tank, including its
  - a) capacity,
  - b) contents,
  - c) roof type (e.g., floating, fixed), and
  - d) fugitive emissions control.
- 9) Provide an energy balance for the processing plant. Include the LHV and energy content of each stream.

Appendix H provides a generic energy balance. Adapt the energy balance as necessary to reflect the project.
- 10) Describe the storage, handling, use, and disposal of water. Include the
  - a) location of water intakes;
  - b) water treatment, recycle, and disposal systems;
  - c) oily water sewer systems; and
  - d) cooling water systems.

- 11) Describe the storage, handling, and disposal of waste (excluding tailings), including
  - a) the volumes to be generated,
  - b) the volumes to be stored on site, and
  - c) any environmental controls.
  
- 12) Describe the storage, handling, and disposal of by-products. Include
  - a) the mass of by-products to be stored on site, either temporarily as running inventory or as a result of emergency situations;
  - b) the transportation of by-products off site; and
  - c) any environmental controls.
  
- 13) Provide a simplified PFD showing the measurement points and the type of measurement device (e.g., meter, sampler) within the processing plant to be used for mass balancing, assessing regulatory compliance, and fulfilling the reporting requirements of the ERCB.

## 10 Amendment Applications

### 10.1 Introduction

All amendment applications should consider the information requirements outlined in this directive. If the modification to the project results in changes or additions to information previously considered by the Board, the relevant information should be included to support the amendment application. In cases where there are no changes or additions to information previously considered by the Board, that previously considered information need not be provided.

Submit all amendment applications in accordance with Section 2 of this directive.

Amendment applications submitted to the ERCB fall under one of three categories depending on the nature of the modification. These three categories are described below.

### 10.2 Category 1 Amendments

Category 1 project amendments are applications submitted to modify an oil sands project that is not expected to adversely and materially affect resource conservation or alter the environmental and socioeconomic impacts assessed in the original and/or any approved amendment applications. Category 1 project amendments are also not expected to directly and adversely affect the rights of stakeholders, including other mineral rights owners. They do, however, involve modifications that require ERCB review to ensure compliance with ERCB requirements and to ensure that operational improvements and efficiencies are optimized.

Some examples of modifications to a project that typically fall under this category are listed below. This is not an exhaustive list and these examples must be considered in the context of the description provided in the previous paragraph.

- Adding portable and/or temporary equipment
- Modifying the mining sequence or timing
- Modifying the construction schedule of a facility or plant component

Submissions must contain a detailed description of the modifications, provide the reasons for the modifications, and include enough technical information to demonstrate that the modifications will neither adversely and materially affect resource conservation, nor alter the environmental and socioeconomic impacts assessed in the original and/or any approved amendment applications. Technical information must also demonstrate that the modifications will not directly and adversely affect stakeholders, including other mineral rights owners.

At its discretion, the ERCB may request additional information from the applicant and may reclassify the modifications as it deems appropriate. If reclassified, consideration of the request would then follow the process associated with the amendment category designated by the ERCB.

Category 1 project amendments do not require applicants to conduct a stakeholder involvement program that complies with Section 4, since such modifications, by definition, do not introduce any adverse effects that were not previously considered by the ERCB.

Under normal circumstances, applicants can expect the ERCB to render a decision usually within a month of the date on which the submission was received. The operator will be

notified of the ERCB's decision by letter. An amendment of the ERCB project approval is not required in the case of Category 1 project amendments.

### 10.3 Category 2 Amendments

Category 2 project amendments are applications submitted to modify an oil sands project that may adversely or beneficially affect resource conservation and/or involve significant process modifications. Category 2 project amendments are not, however, expected to directly and adversely affect the rights of stakeholders, including other mineral rights owners, or adversely and materially alter the environmental and socioeconomic impacts assessed in the original and/or any approved amendment applications. Note that an application is required even if the modifications are expected to improve resource conservation since the mandate of the ERCB requires it to be fully aware of, understand, and maintain a record of all modifications to resource recovery.

Some examples of modifications to a development that typically fall under this category are listed below. This is not an exhaustive list and these examples must be considered in the context of the description provided in the previous paragraph.

- Expanding the development area within the project area
- Changing trajectories of wells that could alter subsurface drainage patterns
- Debottlenecking facility or plant to increase production or optimize performance
- Injecting solvent with steam to improve recovery
- Adding new mine material storage areas within the approved project area
- Wasting a previously stored, lower quality resource that was planned for recovery
- Expanding a planned waste disposal structure (geotechnical)

Applications must contain a detailed description of the modifications, provide the reasons for the modifications, and include enough technical information to assess their effect on resource conservation. The application must provide enough information to demonstrate that the modifications will not adversely and materially alter the environmental and socioeconomic impacts assessed in the original and/or any approved amendment applications. The information must also demonstrate that the modifications will not directly and adversely affect stakeholders, including other mineral rights owners.

At its discretion, the ERCB may request additional information from the applicant and may reclassify the modifications as it deems appropriate. If reclassified, consideration of the application would then follow the process associated with the amendment category designated by the ERCB.

Category 2 project amendments do not require applicants to conduct a stakeholder involvement program that complies with Section 4, since such modifications, by definition, do not introduce any adverse effects that were not previously considered by the ERCB.

The timeline for processing a Category 2 project amendment is influenced by a number of factors, including the nature and complexity of the modifications. An amendment of the ERCB project approval is required in the case of Category 2 project amendments.



## 10.4 Category 3 Amendments

Category 3 project amendments are applications submitted to modify an oil sands project that may adversely or beneficially affect resource conservation, directly and adversely affect other mineral rights owners, and/or result in an adverse and material change to the environmental and socioeconomic impacts assessed in the original and/or any approved amendment applications and therefore, may directly and adversely affect other stakeholders. As with Category 2 project amendments, an application is required even if the modifications are expected to improve resource conservation.

Some examples of modifications to a development that typically fall under this category are listed below. As with the other categories, this is not an exhaustive list and these examples must be considered in the context of the description provided in the previous paragraph.

- Expanding the project area
- Significantly increasing overall surface disturbance
- Significantly increasing the approved bitumen production or processing capacity
- Developing additional and/or different geological zones
- Repressurizing any associated gas or water zones
- Adding a major process unit to the plant or facility
- Adding satellite steam generation facilities
- Modifying tailings technology that will result in significant changes to material balances or reclamation plans

Submissions must contain a detailed description of the modifications, provide reasons for the modifications, and include enough technical information to understand and assess

- the effect on resource conservation,
- impacts on other mineral rights owners, and
- environmental and socioeconomic impacts.

At its discretion, the ERCB may request additional information from the applicant and may reclassify the modifications as it deems appropriate. If reclassified, consideration of the application would then follow the process associated with the amendment category designated by the ERCB.

Category 3 project amendments require applicants to develop and conduct an effective stakeholder involvement program that complies with Section 4 of this directive before filing an application with the ERCB since such modifications, by definition, may directly and adversely affect the rights of stakeholders.

The timeline for processing a Category 3 project amendment application is influenced by a number of factors, including the nature and complexity of the modifications, whether any objections are received, and whether a public hearing is required. An amendment of the ERCB project approval is required for a Category 3 project amendment.

## 10.5 Transfer of Approval

All ERCB approvals must be kept current and must reflect the approval holder that is responsible for the project. No change in the approval holder has force or effect until the

approval has been amended to reflect the change. In order to transfer the approval, the ERCB requires the following information:

- 1) The ERCB project approval number.
- 2) For a change to the approval holder's name, provide evidence of the change or details on when such evidence was filed with the ERCB. For a change in name of approval holder for multiple projects, attach a list of the approval numbers.
- 3) For an approval holder change, complete and submit the Transfer of Approval agreement in Appendix J.

If the present holder no longer exists, provide evidence that the new holder is the correct person or company that will assume responsibility for the project and provide evidence that the present approval holder no longer exists.

## Appendix A Definitions for the Purposes of *Directive 023*

<b>Caprock</b>	To be determined.
<b>Central processing facility</b>	See the <i>OSCR</i> .
<b>Drainage pattern</b>	A configuration of production and/or injection wells placed within the reservoir that will be operated in a unified manner to recover bitumen from a localized area.
<b>Initial volume in place of bitumen</b>	The volume of crude bitumen calculated or interpreted to exist in the ground before any quantity has been produced.
<b>Initial volume in place of developable bitumen</b>	The volume of crude bitumen calculated or interpreted to exist in the target reservoir before any quantity of bitumen has been produced.
<b>Initial established reserves of bitumen</b>	Established reserves prior to the deduction of any production. See <i>ST98: Alberta's Energy Reserves &amp; Supply/Demand Outlook</i> for further information on the ERCB's approach of reporting reserves.
<b>Initial development phase</b>	The components of the project associated with the initial planned stage of construction, commissioning, and operation.
<b>In situ development area</b>	The boundaries, within the project area, approved for the specific placement of drainage patterns for the recovery of bitumen.
<b>In situ gross bitumen pay</b>	A target interval with no cutoffs applied.
<b>In situ net bitumen pay</b>	A target interval with specified cutoffs applied.
<b>In situ operation</b>	See the <i>OSCA</i> .
<b>In situ project area</b>	The boundaries within which bitumen recovery may occur over the life of the project.
<b>Lean zone</b>	A zone associated with the target reservoir that has different reservoir properties and normally higher level of water saturation than the target reservoir.
<b>Major process units</b>	A combination of process equipment designed to support the recovery or conversion of, oil sands or oil sands products (e.g., oil treatment, water treatment, gas treatment, steam generation, distillation, coking, cracking, sulphur recovery).

<b>Mineable recoverable resources</b>	Those resources that are discovered and potentially recoverable after applying mining constraints.
<b>Mineable resources</b>	Those resources that are discovered and potentially recoverable before applying mining constraints.
<b>Mine site</b>	See the <i>OSCA</i> .
<b>Mining constraints</b>	Factors that prevent the recovery of oil sands, which may include environmental setbacks, small isolated ore bodies, and the locations of surface facilities (e.g., plant sites, tailings ponds, storage or disposal structures).
<b>Mining operation</b>	See the <i>OSCA</i> .
<b>Mining project area</b>	The project area represents the boundaries within which surface development may occur over the life of the project.
<b>Oil sands</b>	See the <i>OSCA</i> .
<b>Oil sands project</b>	An in situ operation, a mining operation or a processing plant, or any one or more of them.
<b>Processing plant</b>	See the <i>OSCA</i> .
<b>Processing plant project area</b>	The project area represents the boundaries within which surface development may occur over the life of the project.
<b>Water body</b>	See <i>Directive 056: Energy Development Applications and Schedules</i> .

**Appendix B Schedule 1—Applicant General Information**

**1. Applicant Information**

(Provide information on the person responsible for the application and to whom correspondence should be addressed.)

Company name: \_\_\_\_\_ BA code: \_\_\_\_\_  
 Contact name: \_\_\_\_\_  
 Telephone: \_\_\_\_\_  
 E-mail: \_\_\_\_\_  
 Mailing address: \_\_\_\_\_  
 Project name: \_\_\_\_\_  
 Application type: \_\_\_\_\_  
 Application description: (Maximum three sentences. Include the ERCB approval number to be amended, if applicable.)  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**2. Project Information**

(Identify the project's central processing facility (CPF), processing plant, or mine site location[s].)

Project location(s)	Location exception (LE)	Legal subdivision (LSD)	Section (SC)	Township (TWP)	Range (RG)	W	Meridian (M)
_____						W	
_____						W	
_____						W	
_____						W	
_____						W	

**3. Target Oil Sands Deposit / Oil Sands Area**

(See Appendix E for a list of deposits within the oil sands areas)

\_\_\_\_\_  
 \_\_\_\_\_



## Appendix C Spatial Information Submission Requirements

The ERCB will use spatial data to assist with the application review process. Below are the spatial submission requirements.

Submitted spatial information that does not meet the outlined submission requirements will be returned to the applicant. Failure of an applicant to provide the required information in the proper format may cause delays or complications in the processing of the application or may result in a decision by the ERCB to close the application.

### Standards

The ERCB requires spatial data in the form of shapefiles that are supported by the Environmental Systems Research Institute (ESRI) ArcView Products. Shapefiles will adhere to the following standards:

Shapefile format	Extension	Example
Main file (shape records)	.shp	example.shp
dBase table (attribute records)	.dbf	example.dbf
Index file	.shx	example.shx
*Project file (map project and datum information)	.prj	example.prj

**Note:** A naming convention isn't required as long as the file name is supported by the ESRI shapefile standard. These spatial standards are outlined in the ESRI White Paper, [ESRI Shapefile Technical Description](#).

### Geodatum and Map Projections

All shapefiles must be in 10TM\_AEP\_FOREST projection. The following .prj file parameters must be adhered to:

```
PROJCS["NAD_1983_10TM_AEP_Forest",GEOGCS["GCS_North_American_1983",DATUM["D_North_American_1983",SPHEROID["GRS_1980",6378137.0,298.257222101]],PRIMEM["Greenwich",0.0],UNIT["Degree",0.0174532925199433\\],PROJECTION["Transverse_Mercator"],PARAMETER["False_Easting",500000.0],PARAMETER["False_Northing",0.0],PARAMETER["Central_Meridian",115.0],PARAMETER["Scale_Factor",0.9992],PARAMETER["Latitude_of_origin",0.0],UNIT["Meter",1.0]]
```

### Geo-referencing

Where applicable, applicants must use the Alberta Township Survey (ATS) system, version 4.1 to geo-reference their data and submissions to optimize spatial accuracy.

## Attributes

The following details must be submitted as attributes with every spatial information file, including vector information. Spatial information submitted in relation to a single application, must have consistent information provided for all features (i.e., submitted for each file).

Field name	Type (maximum field size)	Permitted value(s)	Validation	Notes
Company BA code	String (6)	Any	Mandatory	Must include the BA code of primary applicant.
Company name	String (40)	Any	Mandatory	Must include the company name of the primary applicant.
Project name	String (40)	Any	Mandatory	
Scheme type	String (40)	<ul style="list-style-type: none"><li>• MOS</li><li>• INSITU</li><li>• Processing plants</li></ul>	Mandatory	
Positional accuracy	Integer	Any	Mandatory	M (indicates plus/minus meters for the position on the ground)
Depth/height accuracy	Integer	Any	Mandatory	M (indicates plus/minus meters for the position above or below the ground)



### Spatial Submission Details

Spatial information has been grouped into the following three feature types:

- 1) Administration boundary
- 2) Resource boundary
- 3) Project footprints

Applicants will submit one shapefile per feature type with multiple polygons (as applicable). The following data requirements apply to each feature.

#### 1. Administration Boundary

Description: Physical limits on the surface of the earth that establish boundaries of an oil sands project.

Geometry: Polygon

Field name	Type (maximum field size)	Permitted value(s)	Validation	Notes
Name	String (40)	Any	Mandatory	The name of the scheme.
Type	String (40)	<ul style="list-style-type: none"> <li>• Project area boundary</li> <li>• Development area boundary</li> </ul>	Mandatory	The type of boundary.
Admin boundary status	String (40)	<ul style="list-style-type: none"> <li>• Proposed admin boundary</li> </ul>	Mandatory	
Deposit (geologic pool or deposit name)	String (40)	Refer to deposit section in Appendix E for valid deposit values.	Mandatory	
Submission date	Date	<ul style="list-style-type: none"> <li>• YYYYMMDD</li> </ul>	Mandatory	

## 2. Resource Boundary

Description: Physical limits on the surface of the earth that establish boundaries of where resource recovery is expected to take place.

Geometry: Polygon

### a) In Situ Resource Boundary (Drainage Patterns)

Field name	Type (maximum field size)	Permitted value(s)	Validation	Notes
Name	String (40)	Any	Mandatory	The name of the resource recovery location (e.g., A drainage pattern ID).
In situ resource boundary status	String (40)	<ul style="list-style-type: none"> <li>Proposed resource boundary</li> </ul>	Mandatory	
Deposit (geologic pool or deposit name)	String (40)	<ul style="list-style-type: none"> <li>Refer to deposit section in Appendix E for valid deposit values.</li> </ul>	Mandatory	
Average water saturation	Decimal (4,3)	Any	Mandatory	Must be measured in percent (%).
Average porosity	Decimal (4, 3)	Any	Mandatory	Must be measured in percent (%).
Average net bitumen pay	Decimal (4, 1)	Any	Mandatory	Must be measured in meters (m).
Initial volume in place of developable bitumen (IVIPDB)	Decimal (10, 2)	Any	Mandatory	Must be measured in meters cubed (m <sup>3</sup> ).
Recovery factor	Decimal (10, 2)	Any	Mandatory	Must be measured in percent (%).
Initial established reserves of bitumen	Decimal (10, 2)	Any	Mandatory	Must be measured in meters cubed (m <sup>3</sup> ).

**b) Mineable Oil Sands (MOS) Resource Boundary**

Field name	Type (maximum field size)	Permitted value(s)	Validation	Notes
Name	String (40)	Any	Mandatory	The proposed resource area name (e.g., a pit name or number).
MOS resource boundary status	String (40)	<ul style="list-style-type: none"> <li>Proposed resource boundary</li> </ul>	Mandatory	
Deposit (geologic pool or deposit name)	String (40)	Refer to Appendix E for valid deposit values.	Mandatory	

### 3. Project Footprint

Description: Existing or proposed physical footprints related to an oil sands project.

Geometry: Polygon

#### a) In Situ Project Footprint

Field name	Type (maximum field size)	Permitted value(s)	Validation	Notes
Name	String (40)	Any	Mandatory	Structure, facility, or footprint name.
In situ project footprint status	String (40)	<ul style="list-style-type: none"> <li>Proposed footprint boundary</li> </ul>	Mandatory	
Scheme footprint type	String (40)	<ul style="list-style-type: none"> <li>Oil sands processing plant</li> <li>Central processing facility</li> <li>Surface pad</li> <li>Pipelines</li> <li>Known permanent structures</li> <li>Other</li> </ul>	Mandatory	If applying the value "Other," please specify (e.g., Other-Camp).

#### b) MOS Project Footprint

Field name	Type (maximum field size)	Permitted value(s)	Validation	Notes
Name	String (40)	Any	Mandatory	Structure, facility, or footprint name
MOS project footprint status	String (40)	<ul style="list-style-type: none"> <li>Proposed footprint boundary</li> </ul>	Mandatory	
Scheme footprint type	String (40)	<ul style="list-style-type: none"> <li>Ultimate pit limit</li> <li>Oil sands processing plant</li> <li>Pipelines</li> <li>Tailings area</li> <li>Storage area</li> <li>Compensation area</li> <li>Water intake infrastructure</li> </ul>	Mandatory	If applying the value "Other," please specify (e.g., Other-Camp)

Field name	Type (maximum field size)	Permitted value(s)	Validation	Notes
		<ul style="list-style-type: none"> <li>• Landfill</li> <li>• Dyke</li> <li>• Project drainage system</li> <li>• End pit lakes</li> <li>• Known permanent structures</li> <li>• Other</li> </ul>		
<p>Scheme footprint subtype</p> <p>Note: Do not repeat scheme footprint type in brackets.</p>	String (40)	<ul style="list-style-type: none"> <li>• (Ultimate pit limit) <ul style="list-style-type: none"> <li>- Toe</li> <li>- Crest</li> </ul> </li> <li>• (Tailings area) <ul style="list-style-type: none"> <li>- Fluid</li> <li>- DDA</li> <li>- Sand/beach</li> </ul> </li> <li>• (Storage area) <ul style="list-style-type: none"> <li>- Overburden/interburden</li> <li>- Reclamation material stockpiles (RMSs)</li> <li>- Coke stockpile</li> <li>- Sulphur stockpile</li> </ul> </li> <li>• (Compensation areas) <ul style="list-style-type: none"> <li>- Lake</li> <li>- Wetland</li> </ul> </li> <li>• (Water intake infrastructure) <ul style="list-style-type: none"> <li>- Water intake area</li> <li>- Water intake pipeline</li> <li>- Off stream storage ponds (OSP)</li> </ul> </li> <li>• (Project drainage area) <ul style="list-style-type: none"> <li>- Stream diversion</li> </ul> </li> <li>• Other</li> </ul>	Mandatory	If applying the value “Other,” please specify (e.g., Other–Camp)

Field name	Type (maximum field size)	Permitted value(s)	Validation	Notes
Maximum potential volume (total capacity)	Integer (10)	Any	Mandatory for scheme footprint types: tailings area and storage areas	Must be measured in metres cubed (m <sup>3</sup> ).  For proposed overburden, RMS, and tailings areas.
Maximum proposed elevation	Integer (10)	Any	Mandatory for scheme footprint types: tailings area and storage areas	Must be measured in metres above sea level.  For proposed overburden, RMS, and tailings areas

### c) Processing Plant

Field name	Type (maximum field size)	Permitted value(s)	Validation	Definition
Name	String (40)	Any	Mandatory	Structure, facility, or footprint name
Processing plant status	String (40)	<ul style="list-style-type: none"> <li>Proposed processing plant</li> </ul>	Mandatory	
Processing plant type	String (40)	<ul style="list-style-type: none"> <li>Oil sands processing plant</li> <li>Pipelines</li> <li>Known permanent structures</li> <li>Other</li> </ul>	Mandatory	If applying the value "Other," please specify (e.g., Other–Camp)

## Appendix D Modelling Submission Specifications

The ERCB will use modelling data to assist with the application review process. Below are the modelling submission requirements that will enable the ERCB to receive, store, and analyze the modelling data.

### Submission Requirements

If your application meets the model submission requirements, model data/files must be submitted in the following formats:

Model type	Accepted formats
Reservoir	.dat
Geomechanical	.txt
Mining	.dm, .csv, .dxf and DXF

Model files must be zipped in a zip file.

The ERCB will consider any modelling completed in support of an application even if it is not in an accepted format.

Note that the requirements in Section 2.6 limit file size to 200 MB. If modelling files exceed 200 MB, or are not in an accepted format, the file(s) should be submitted on CD or portable hard drive. These can be provided at

Energy Resources Conservation Board  
 Suite 1000, 250 – 5 Street SW  
 Calgary, Alberta T2P 0R4

### Mine modelling requirements

Directive 023 requirement(s)	Model data submission requirement(s)
8.1, 4	<p>The following electronic core hole data is required to be submitted in four separate .csv files, projected in NAD 83 coordinates:</p> <ul style="list-style-type: none"> <li>Collars file including               <ul style="list-style-type: none"> <li>- unique well identifier (UWI),</li> <li>- hole name, X, Y, Z (ground elevation above sea level) coordinates,</li> <li>- TD (total hole depth),</li> <li>- Top_McM (elevation of top of McMurray formation),</li> <li>- Top_Dev (elevation of top of Devonian), and</li> <li>- RR_Date (date of rig release);</li> </ul> </li> <li>Assays file (including the hole name, UWI, From [distance from sample top to ground elevation], To [distance to sample bottom from ground elevation], bitumen [wt%], water [wt%], solids [wt%], fines [particle size of 44 microns or smaller] as a percentage of total solids [wt%], and any other analyzed contents);</li> <li>Facies file (including the hole name, UWI, From, To, facies name);</li> <li>Lithology file (including the hole name, UWI, From, To, and lithology name).</li> </ul>
8.1, 5	<p>Digital spatial data is required for each of the following project features:</p> <ul style="list-style-type: none"> <li>Project area boundary</li> </ul>

Directive 023 requirement(s)	Model data submission requirement(s)
	<ul style="list-style-type: none"> <li>• Ultimate pit limits and final pit shells</li> <li>• Storage and disposal structures</li> <li>• Plant sites</li> <li>• Tailings structures</li> <li>• Watercourses</li> <li>• Stream diversions</li> <li>• Compensation lakes</li> <li>• Sedimentation and emergency ponds</li> <li>• Utility corridors</li> <li>• Any other known permanent facilities</li> </ul>
8.2, 9	Digital spatial data for each area or structure proposed for sterilization and/or waste.



## **Appendix E Geological Units**

The ERCB expects that for the target oil sands deposit (listed in bold font under each oil sands area), applicants provide mapping and a geological discussion for each of the stratigraphic units listed. In situations where the stratigraphic unit listed is not within the project area due to erosion or subcropping, provide a discussion and mapping for the location of the subcrop and erosion edge.

### **Athabasca Oil Sands Area**

**Wabiskaw–McMurray:** Quaternary, Grand Rapids, Clearwater Valley (sand), Clearwater Shale, Wabiskaw, McMurray, Subcretaceous Unconformity, and Prairie Evaporite

**Nisku:** Grand Rapids, Clearwater, Wabiskaw–McMurray, Calmar, Nisku, Upper Ireton, Grosmont, and Ireton

**Grosmont:** Grand Rapids, Clearwater, Wabiskaw–McMurray, Nisku, Upper Ireton, Grosmont D, Grosmont CD Marl, Grosmont C, Grosmont C/B Mud, Grosmont B, Grosmont B/A Mud, Grosmont A, and Lower Ireton

**Leduc:** Clearwater, Wabiskaw–McMurray, Ireton, Leduc, Cooking Lake, Beaverhill Lake

**Grand Rapids:** Quaternary, Colorado, Viking, Joli Fou, Grand Rapids (Upper, Middle Lower), Clearwater, Wabiskaw-McMurray, Subcretaceous Unconformity

### **Cold Lake Oil Sands Area**

**Clearwater:** Colorado, Viking, Joli Fou, Grand Rapids, Clearwater Shale, Clearwater Sand, Wabiskaw–McMurray, Subcretaceous Unconformity, and Prairie Evaporite

**Grand Rapids:** Colorado, Viking, Joli Fou, Upper Grand Rapids, Lower Grand Rapids, Cummings-Dina, Subcretaceous Unconformity, and Prairie Evaporite

### **Peace River Oil Sands Area**

**Bluesky–Gething:** Base of Fish, Paddy–Cadotte, Harmon, Notikewin, Falher, Wilrich, Bluesky, Gething, and Subcretaceous Unconformity

**Pekisko:** Wilrich, Bluesky-Gething, Shunda, and Pekisko

**Shunda:** Wilrich, Bluesky-Gething, Debolt, Shunda, and Pekisko

**Debolt:** Wilrich, Bluesky-Gething, Triassic Strata, Debolt, and Shunda

**Belloy:** Wilrich, Bluesky-Gething, Triassic Strata, Belloy, and Debolt



## Appendix F In Situ Resource Delineation Guidelines

The ERCB expects applicants to have obtained an adequate amount of resource delineation to support their application. This section details guidelines for the minimum amount of resource delineation necessary for the ERCB to conduct a review of an application.

The project area must be delineated adequately so that the applicant can demonstrate that there is potentially recoverable bitumen within each section. To achieve this, applicants are to have drilled at least one well per section in each of the sections in the project area.

Table G1 indicates by deposit/formation the minimum number of wells per section needed to properly evaluate the resource in order to finalize the pad, well, and facility locations in the development area before the application is submitted. The minimum number of wells to be cored per section is four wells or 50 per cent of the wells listed in the table, whichever is greater.

The ERCB will consider requests by applicants to reduce the number of delineation wells per section as indicated in Table G1 if the applicant can demonstrate that there is enough information to adequately delineate the resource. For example, 3-D seismic information obtained specifically for in situ bitumen recovery may qualify the project for reduced delineation well density.

The ERCB will also consider requests for a lower level of resource delineation where significant environmental constraints prevent attaining the required level.

It is the applicant's responsibility to meet with the ERCB well in advance of filing an application if the applicant intends to vary from the ERCB resource delineation guidelines. This will minimize the risk of the application being considered incomplete due to inadequate information.

**Table G1. ERCB in situ delineation well guidelines**

<b>Deposit / Formation</b>	<b>Delineation wells per section</b>
Athabasca Grand Rapids	8
Athabasca Wabiskaw-McMurray	16
Peace River Bluesky-Gething	8
Cold Lake Grand Rapids	8
Cold Lake Clearwater	6
Cold Lake Wabiskaw-McMurray	16
Carbonate deposits (e.g., Grosmont and Leduc)	8



**Appendix G Table of Thermal Compatibility of Existing Wells**

<b>Well Parameters</b>	<b>Well 1—Unique well identifier and licence number</b>	<b>Well 2—Unique well identifier and licence number</b>
<b>Well status</b>		
<b>Target formation</b>		
<b>Spud date and final drill date</b>		
<b>Well licensee</b>		
<b>Cement type</b>		
<b>Cement tops</b>		
<b>Cement returns</b>		
<b>Surface casing vent flows/Gas migration status</b>		
<b>Completion status and details</b>		
<b>Directive 020 compliance</b>		
<b>Thermal compatibility</b>		
<b>Criteria failed</b>		



## Appendix H Generic Energy Balance

### Energy In

Stream	Units	Year		
		Input	Lower heating value (LHV)	Total energy (GJ)
Product receipts	m <sup>3</sup>			
Gas receipts	10 <sup>3</sup> m <sup>3</sup>			
Electricity imports	MWh			
<b>Total energy in</b>				

### Energy Out

Stream	Units	Year		
		Input	Lower heating value (LHV)	Total energy (GJ)
Product sales	m <sup>3</sup>			
Gas dispositions	10 <sup>3</sup> m <sup>3</sup>			
Electricity exports	MWh			
<b>Site use and losses</b>				
Losses	m <sup>3</sup>			
Fuel use	10 <sup>3</sup> m <sup>3</sup>			
Flared or wasted	m <sup>3</sup>			
Other	-			
<b>Total energy out</b>				
<b>Energy out (product streams)</b>				
<b>Energy efficiency (total energy out [product stream] / total energy in)</b>	%			
<b>Energy intensity (per saleable products/ bitumen produced/oil sands mined)</b>				





**Appendix I Drillhole Inventory Table—Example**

<b>Drilling date</b>	<b>Number of drill holes</b>	<b>Drillhole data quality</b>	<b>Facies description (yes/no)</b>	<b>Type of laboratory analysis</b>	<b>Type of logs run</b>
1950s	35	poor to good	no	bitumen, mineral	none
1960s	0				
1970s	167	poor to good	no	bitumen, fines, some water, mineral	gamma ray, caliper, resistivity, neutron density
1980s	0				
1990–1999	0				
2000	210	excellent	yes	bitumen, mineral, water, particle size distribution	gamma ray, caliper, resistivity, neutron density,
2001	123	excellent	yes	bitumen, mineral, water, particle size distribution	gamma ray, caliper, resistivity, neutron density,



**Appendix J Transfer of Approval**

**AGREEMENT TO TRANSFER APPROVAL(S) BETWEEN**

[Company name] of the City of [Name of city] in the Province of Alberta, referred to as the **Transferor**, and [Company name] of the City of [Name of city] in the Province of Alberta, referred to as the **Transferee**.

The **Transferor**, who is the holder of ERCB Approval No. [#####] , dated the [Calendar day] day of [Month] [Year] (or of the attached list of ERCB approvals) for a [Type of project] project, for good and valuable consideration, transfers to the **Transferee** the approval(s) and all the **Transferor**'s right and title in the approval(s).

The **Transferee** agrees to the transfer of the ERCB approval (or attached list of ERCB approvals), acknowledges that it is aware of the details and conditions of the approved [Type of project] project, and agrees to carry out the project as approved.

The address of the **Transferee** in Alberta is [Company address].

Dated at [Name of city] , on [Month day, year].

Signature: \_\_\_\_\_  
Authorized Representative of Transferor

Signature: \_\_\_\_\_  
Authorized Representative of Transferee