2 ENVIRONMENTAL ASSESSMENT METHODS

2.1 Overview of Approach

EIA METHODS SUMMARY

The following provides a brief summary of the methods used in the EIA to assess potential environmental effects that may result from the Expansion Project.

The environmental assessment process has several key front-end steps that do not ascribe effects but, instead, focus the assessment on project activities with the potential for potential environmental interactions and significant residual effects.

In the Scoping of the Assessment, a table of potential interactions (common to all EIA sections and describing the main activities and physical works associated with the Expansion Project) is utilized to systematically assess the potential interactions of the Expansion Project against potential environmental effects to determine potential effects of the Expansion Project. The degree of potential effect is assigned for each project activity or interaction with numbers from zero (no discernible effect) to two (potential for significant effect). This step serves to focus the assessment on the issues that may have the potential for effects.

Once the scoping exercise has been completed, the environmental assessment commences to test the results of the literature assessment, field work and local knowledge against the potential interactions and environmental effects that have been identified. The assessment follows the components of the Terms of Reference that have been applied to the Expansion Project by Alberta Environment, as well as any other elements that may have been recommended by regulatory agencies.

Cumulative effects are assessed for all components of the EIA. Several screening questions are assessed for components of the EIA to determine the likelihood of a cumulative effect. Those that meet the criteria identified are subjected to a further cumulative effects assessment. In many cases, effects of the Expansion Project are localized and are considered to have negligible potential to interact with other effects; as such, further cumulative effects assessment may not be warranted.

Based on the results of the direct effects assessment and any cumulative effects assessment, the authors of the various relevant components of the EIA will provide a determination of significance, as appropriate, of any Expansion Project-related effects. The authors may use a combination of direct evidence, published literature, previous assessments in the area and professional judgment to make the determination of significance.

At the end of each section, as appropriate, the authors will include any follow-up and monitoring that may be recommended to verify predictions of environmental effects and assess the effectiveness of mitigation. Most of the follow-up and monitoring applied to any project tends to be the result of discussions with regulatory agencies (e.g. in AENV operating approval) and other affected stakeholders. As such, any monitoring described in the EIA should be considered tentative.

This environmental assessment has been completed using the standard corporate methodological framework developed by Stantec Ltd. to meet the requirements of the *Environmental Protection and Enhancement Act* (*EPEA*). This standard method also meets the needs of the *Canadian Environmental Assessment Act (CEAA)* as required. The environmental effects assessment method is based on a structured approach that considers:

- suggestions in the draft *Guide to Preparing Environmental Impact Assessment Reports in Alberta* (AENV 2009)
- Specific terms of reference (ToR) issued by Alberta Environment (AENV) for the Environmental Impact Assessment (EIA)
- provincial regulatory requirements for the assessment of environmental effects
- issues raised by the public, Aboriginal parties and public stakeholders
- engineering designs and programs for mitigation and monitoring within the context of a comprehensive environmental planning process

For the purpose of this environmental assessment, the term “environment” broadly refers to the combined biophysical and human environment, and includes:

a) land, water and air, including all layers of the atmosphere

b) all organic and inorganic matter and living organisms

c) the interacting natural systems

The environmental assessment focuses on valued environmental components (VECs), which are of particular interest to regulators and other stakeholders. Environmental components are typically selected based on regulatory issues and guidelines, consultation with regulators and stakeholders, field reconnaissance, and professional judgment.

The terms “impact” and “effect” refer to any given aspect of project infrastructure, action or activity that may result in an environmental response, including: responses of biophysical or human components

Environmental assessment methods address project-related and cumulative environmental effects. Project-related environmental effects are changes in the biophysical or human environment that are caused by a project or activity arising solely as a result of the proposed works and activities, as defined by the scope of the project. Cumulative environmental effects are changes in the biophysical or human environment that are caused by an action associated with the Expansion Project under review or in combination with other past, present and future projects and activities.

Project-related environmental effects and cumulative environmental effects are assessed sequentially. Project-specific environmental effects are discussed first, taking into account project design measures and mitigation that help to reduce or avoid project impacts that could result in this environmental effect. Residual project-related environmental effects are then characterized in light of planned mitigation. At minimum, all project environmental effects are characterized using specific criteria, which are defined for each VEC.

A cumulative environmental effects screening is conducted for any residual environmental effects to determine if there is potential for a cumulative environmental effect. The following questions are used to screen cumulative environmental effects:

- Is there is an environmental effect that can be measured or that can reasonably be expected to occur?
- Is there an overlap of project-related environmental effects of other past or future projects and activities that are likely to occur?
- Is there is a reasonable expectation that the Project's contribution to cumulative environmental effects will affect the viability or sustainability of the resource or value?

Based on these questions, if there is potential for cumulative environmental effects, it will be assessed to determine if they have the potential to shift a component of the biophysical or human environment to an unacceptable state.

The environmental effects assessment approach used in this assessment involves:

- scoping
- describing baseline conditions
- identifying and assessing project-related environmental effects
- identifying and evaluating cumulative environmental effects
- determining significance
- recommending follow-up

2.2 Scoping of the Assessment

Scoping of the overall assessment includes:

- Selection of valued environmental components
- identifying project Interactions with the environment
- defining spatial, temporal, administrative and technical boundaries
- defining the parameters that will be used to characterize the project-related environmental effects and cumulative environmental effects
- identifying the standards or thresholds that will be used to determine the significance of environmental effects

2.2.1 Selection of Valued Environmental Components

VECs are defined as broad components of the biophysical and human environments that, if altered by the project, would be of concern to regulators, Aboriginal people, resource managers, scientists and the general public.

VECs for the biophysical environment typically represent major components or aspects of the physical and biological environment (e.g., Atmospheric Environment, Aquatic and Terrestrial Ecosystems), which might be altered by the project, as required and are widely recognized as important for ecological reasons.

The following are key questions considered when selecting VECs:

- Are the potential VECs identified in the Final Terms of Reference (ToR) or by regulators?
- Do the potential VECs represent broad environmental, ecological or human environment components that might be affected by the project?
- Are the potential VECS vulnerable to the environmental effects of the project and other activities in the region?
- Have the potential VECs been identified as important issues or concerns by stakeholders or in other effects assessments in the region?

For each VEC, measurable parameters are selected to facilitate quantitative or qualitative measurement of potential project environmental effects and cumulative environmental effects. Measurable parameters provide a means to determine the amount of change to a VEC as a result of an environmental effect. For example, changes in the spatial extent of habitat availability may be measured for the VEC Wildlife. The degree of change in these measurable parameters is used to characterize project-related and cumulative environmental effects, and evaluate the significance of the potential environmental effects. Thresholds or standards are identified for each measurable parameter to assist, where possible, in determining the significance of a predicted environmental effect.

Sixteen VECs were identified: Air Quality, Noise, Hydrogeology, Hydrology, Surface Water Quality, Fish and Fish Habitat, Terrain and Soils, Vegetation and Wetlands, Wildlife, Biodiversity and Fragmentation, Land and Resource Use, Visual Aesthetics, Historical Resources, Traditional Ecological Knowledge and Land Use, Human and Ecological Health, and Socio-Economics.

2.2.2 Review of Available Information and Gap Analysis

A review of available information was conducted prior to characterization of environmental effects. Where the information available was not sufficient to assess the baseline state or potential environmental effects on each VEC, additional information was obtained. Additional sources of information included reviews of previous EIAs for other projects in the region, and targeted field work to supplement available information. Details on the sources for assessment information are provided in the assessment section for each VEC. An assessment of prediction confidence is provided for assessment datasets, including instances where the information cannot practicably be obtained to a level suitable to assess potential effects with a high degree of confidence (see Section 2.4.2). Modelling to predict baseline conditions and environmental effects has been conducted in accordance with codified guidelines. Where no guidelines exist, justification is provided for the selection of the models. Any potential limitations of models are identified. For more details on specific models used, refer to the methods section for each VEC.

2.2.3 Project Interactions with the Environment

Interactions between key Expansion Project activities and the environment are ranked according to the potential for a project activity to interact with one or more VEC. Ranking of each interaction is assigned as follows:

- 0 = No interaction takes place
- 1 = Interaction occurs; however, based on past experience and professional judgment the interaction would not result in a significant environmental effect, even without mitigation; or interaction would not be significant due to application of codified environmental protection practices that are known to effectively mitigate the predicted environmental effects
- 2 = Interaction could result in an environmental effect of concern; the potential environmental effects are considered further in environmental assessment. A precautionary approach has been taken, whereby interactions with a meaningful degree of uncertainty will be assigned a rank of 2, ensuring that a detailed environmental effects assessment will be conducted

Justification for assigning these ranks for each VEC is provided in the individual section of the environmental assessment for that VEC.

2.2.4 Temporal Boundaries

The temporal boundaries for the assessment are defined based on the timing and duration of Expansion Project environmental effects in relation to each VEC. The purpose of a temporal boundary is to identify when an environmental effect might occur in relation to specific project phases and activities.

The standard AENV assessment cases will be used:

- Baseline Case
- Application Case
- Planned Development Case (PDC)

The Expansion Project's life history will be partitioned by the standard project phases:

- Construction and Commissioning
- Operation
- Decommissioning (or Closure)

2.2.5 Spatial Boundaries

Spatial boundaries are established to assess potential project-related and cumulative environmental effects for each VEC. The primary consideration used in the establishment of spatial boundaries is the probable geographical extent of the environmental effects (i.e., the zone of influence) for the VEC. For example, in some instances, the boundaries are assessed to reflect the range of movement of a

migratory species, or to reflect administrative boundaries (e.g., wildlife management areas, provincial and municipal planning areas, census tracts). The spatial boundaries of the assessment areas are identified and justified in each section of the EIA.

The assessment area can be unique for the VEC or it can be derived from standardized areas defined for the EIA. Spatial boundaries vary according to the nature and distribution of the VEC and the type of environmental effect, but are generally defined in terms of a:

- **Project Area (PA):** this area contains the physical project footprint and is represented by the area that is subject to direct disturbance from the project and associated infrastructure (this is defined in the Project Description in Section 1.2).
- **Local Study Area (LSA)**: as the maximum area where project-specific environmental effects for the VEC can be predicted or measured with a reasonable degree of accuracy and confidence. Project environmental effects include direct effects such as habitat alteration within the project footprint (e.g., site-specific environmental effects), as well as indirect Project effects such as deposition of air emissions, sensory disturbances (sound transmission) and wildlife avoidance in the area around the project footprint.
- **Regional Study Area (RSA)**: the area within which cumulative environmental effects for the VEC are likely to occur, depending on physical and biological conditions (e.g., air sheds, watersheds, seasonal range of movements, population unit), and the type and location of other past, present or reasonably foreseeable projects or activities. For the human environment, the RSA may be based on planning areas, regions, etc.

For the assessment of cumulative environmental effects for the Planned Development Case, a project inclusion list was developed that identified all past, present and reasonably foreseeable projects or activities in the region (see Section 3.1.4, Table 3-1).

2.2.6 Characterizing Residual Environmental Effects

Where possible, the following characteristics for an environmental effect are described quantitatively to assist in the assessment of residual environmental effects. Where these residual environmental effects characteristics could not be expressed quantitatively, at minimum, they are described using qualitative terms. If qualitative descriptions are used, definitions for these qualitative terms are provided for each VEC, as appropriate, in the section of the environmental assessment for that VEC.

Direction: the ultimate long-term trend of the environmental effect (positive or adverse).

Magnitude: the amount of change in a measurable parameter or variable relative to baseline case (low, moderate, high).

Geographical Extent: the geographic area within which an environmental effect of a defined magnitude occurs (site-specific, local, regional, provincial, national, international).

Frequency: the number of times during a project or a specific project phase that an environmental effect may occur (once, sporadically, regular, continuous).

Duration: this is typically defined in terms of the period of time that is required until the VEC returns to its baseline condition or the environmental effect can no longer be measured or otherwise perceived (short term, medium term, long term, permanent).

Reversibility: the likelihood that a measurable parameter will recover from an environmental effect (reversible, irreversible).

Ecological or Socio-Economic Context: the general characteristics of the area in which the project is located (undisturbed, disturbed, urban setting). Additional details on the ecological and socio-economic context are provided in Section 3.

2.2.7 Standards or Thresholds for Determining the Significance of Environmental Effects

Under *EPEA*, the environmental assessment must include a determination of the significance of environmental effects. Where possible, standards or threshold criteria are identified specifically for each VEC and/or the measurable parameters used to assess the environmental effect, beyond which a residual environmental effect would be considered significant.

Standards reflect generally recognized government or industry regulations or objectives for physical aspects (e.g. standards for air quality, water quality, effluent release or in-stream flows). Thresholds reflect the limits of an acceptable state for an environmental component based on resource management objectives, community standards, scientific literature or ecological processes (e.g. desired states for fish or wildlife habitats or populations).

Potential changes in a measurable parameter or VEC resulting from project or cumulative environmental effects are evaluated against these standards or thresholds.

2.3 Assessment of Environmental Effects

2.3.1 Assessment of Project Environmental Effects

Project-related environmental effects are assessed, including:

- descriptions of how an environmental effect may occur
- the mitigation and environmental protection measures proposed to reduce or eliminate the environmental effect
- the evaluation and characterization of the residual environmental effects of the project (i.e., environmental effects remaining after application of mitigation measures) on the biophysical and human environment for each development phase

2.3.1.1 Description of Project Environmental Effects

The assessment of each Expansion Project environmental effect includes a description of the mechanisms whereby specific Expansion Project activities and actions could result in the environmental effect. Where possible, the spatial and temporal extent of these changes (i.e., where and when the environmental effect might occur) is also described. The environmental assessment focuses primarily on residual environmental effects, environmental effects before mitigation are not quantified or characterized. The significance of the environmental effect before mitigation is also not described.

2.3.1.2 Mitigation of Project Environmental Effects

Mitigation considers procedures or changes that can be incorporated in the temporal or spatial aspects of the Expansion Project and/or the means in which the Expansion Project will be constructed, operated or decommissioned, to limit or correct effects that may occur due to the Project. Mitigation measures that will help reduce or eliminate an environmental effect are described, with an emphasis on how these measures will help alter any identified environmental effect. Where possible, the effectiveness of the proposed mitigation measure(s) is expressed in terms of the expected change in the measurable parameter(s) for the environmental effect. For example, the water in runoff ponds may be released provided concentrations of water quality parameters meet quality objectives. The outlet of the perimeter berm and ditch system will be designed to prevent erosion and the formation of channels.

2.3.1.3 Characterization of Residual Project Environmental Effects

Residual environmental effects are described, taking into account how the proposed mitigation will alter or change the environmental effect. Where possible, the magnitude, geographic extent, and duration are quantified. In some cases, changes in an environmental effect could be described relative to each Project phase.

Environmental effects are characterized in terms of the direction, magnitude, geographic extent, frequency, duration, reversibility and ecological or socio-economic context. Where possible, these characteristics are described quantitatively for each residual environmental effect. Where these characteristics cannot be expressed quantitatively, at minimum, they are described using qualitative terms that are defined specifically for the VEC environmental effect.

2.3.2 Assessment of Cumulative Environmental Effects

Cumulative environmental effects of other projects and activities that overlap with Project-specific residual effects are identified. Cumulative effects are assessed for all components of the EIA. Several screening questions are assessed for all components of the EIA but only those that meet the criteria identified in Section 2.3.2.1 (below) are subjected to a more detailed cumulative effects assessment.

2.3.2.1 Screening for Cumulative Environmental Effects

Cumulative environmental effects are assessed if all three of the following conditions are met for the environmental effect under consideration:

- the Project will result in a measurable, demonstrable or reasonably-expected residual environmental effect on a component of the biophysical or human environment (i.e., there is an environmental effect that can be measured or that can reasonably be expected to occur)
- the project-specific residual environmental effect on that component does, or is likely to, act in a cumulative fashion with the environmental effects of other past or future projects and activities that are likely to occur (i.e., there is overlap or interaction of environmental effects leading to a cumulative environmental effect)
- there is a reasonable expectation that the Project's contribution to cumulative environmental effects will affect the viability or sustainability of the VEC

2.3.2.2 Project Inclusion List

The Project Inclusion List (PIL) includes all past, present and reasonably foreseeable projects, activities and actions with residual environmental effects that could overlap spatially and temporally with the residual environmental project effect being considered. Details on these projects, activities and actions are provided in Section 3.1.4. The PIL is provided by the EIA Project Management team to the discipline leads in the form of Table 3-1.

Where a cumulative environmental effects assessment is completed for a VEC, only those projects, activities and actions that could result in a similar environmental effect to that which is being considered are included in the cumulative environmental effects assessment. The specific projects, activities and actions considered for each environmental effect are described in the assessment for the VEC.

2.3.2.3 Description of Cumulative Environmental Effects

The assessment of each cumulative environmental effect begins with a description of the environmental effect and the mechanisms whereby the Project environmental effects may interact with other projects and activities in the Regional Study Area. Where possible, the cumulative environmental effect is quantified in terms of the degree of change in the appropriate measurable parameter(s) and the spatial and temporal extent of these changes (i.e., where and when might the interactions between the Project residual environmental effects and the residual environmental effects of other projects and activities occur). As the assessment focuses only on residual environmental effects, cumulative environmental effects before mitigation are not characterized. The significance of the environmental effect before mitigation is also not described.

2.3.2.4 Use of Temporal Cases

Cumulative environmental effects are described for three cases:

- Baseline Case: the current status of the measurable parameters for the environmental effect before the start of the project, including all appropriate past and present projects and activities. Present projects and activities include all projects or actions that currently exist, as well as projects that have been approved under some form of regulatory permitting. The Baseline Case is normally presented in the existing conditions of the VEC with explicit reference to the fact that the Baseline Case reflects the contributions of past and present projects and activities.
- Application Case: the status of the measurable parameters for the environmental effect with the project in place, over and above the Baseline Case. This is usually assessed using the peak environmental effect of the project or the maximum active footprint. The air quality assessment also includes a Project Case which is a subset of the Application Case but looks at the emissions from the project alone in order to better describe the project's contribution to the Application and Planned Development cases.
- Planned Development Case: the status of the measurable parameters for the environmental effect as a result of the Application Case in combination with all reasonably foreseeable projects, activities and actions. Reasonably foreseeable projects are defined as future projects, activities or actions that will occur with certainty, including projects that are in some form of regulatory approval process or have made a public announcement to seek regulatory approval (i.e., they are likely to occur).

The comparison of the Application Case with the Planned Development Case allows the project contribution to cumulative effects of all past, present and reasonably-foreseeable projects and activities (i.e., Planned Development Case) to be determined.

2.3.2.5 Mitigation of Cumulative Environmental Effects

Mitigation measures that can reduce the project residual cumulative environmental effects are described, with an emphasis on those measures that would help to minimize the interaction of the project environmental effect with similar environmental effects from other projects, activities and actions.

Mitigation measures that will assist in reducing potential cumulative environmental effects are identified for each environmental effect, including a discussion of how these measures may modify the characteristics of an environmental effect.

2.3.2.6 Characterization of Residual Cumulative Environmental Effects

Residual cumulative environmental effects are described, taking into account how the proposed mitigation will alter or change the environmental effect. Where possible, cumulative environmental effects are characterized in terms of the direction, magnitude, geographic extent, frequency, duration, reversibility and ecological or socio-economic context.

Two aspects of cumulative environmental effects to a VEC are characterized as:

- The overall cumulative environmental effect (i.e., the environmental effect of all past, present and reasonably foreseeable projects and activities in combination with the environmental effect of the Project)
- The contribution of the Project to overall cumulative effects

2.4 Determination of the Significance of Residual Environmental Effects

2.4.1 Determination of Significance of Residual Project Environmental Effects

The significance of project environmental effects is determined using standards or thresholds that are specific to the VEC or the measurable parameters used to assess the environmental effect.

Prediction confidence is made, based on scientific certainty relative to:

- quantifying or estimating the environmental effect, including the quality or quantity of data and the understanding of the effect mechanisms
- the effectiveness of the proposed mitigation measures

In cases where significant environmental effects are identified, the likelihood of their occurrence is determined.

2.4.2 Determination of Significance of Residual Cumulative Environmental Effects

The significance of cumulative environmental effects is made using standards or thresholds that are specific to the VEC or the measurable parameters used to assess the environmental effect. A determination of significance is made for the significance of the:

- overall cumulative environmental effect (i.e., the environmental effect of all past, present and reasonably foreseeable projects and activities in combination with the environmental effect of the project)
- contribution of the project to overall cumulative effects

Prediction confidence is discussed, based on scientific certainty relative to:

- quantifying or estimating the environmental effect, including the quality or quantity of data and the understanding of the effect mechanisms
- the effectiveness of the proposed mitigation measures

The likelihood of such effects occurring is identified.

2.5 Follow-up and Monitoring

Recommendations are made for follow-up and monitoring that may be required to verify environmental effects predictions and assess the effectiveness of mitigation measures.

Follow-up programs represent activities for:

a) verifying the accuracy of the environmental assessment of the project

b) determining the effectiveness of any measures taken to mitigate the adverse environmental effects of the project

Recommended follow-up and monitoring programs are described for each VEC or environmental effect, as appropriate.

Follow-up and monitoring may be developed in conjunction with regulatory agencies or regional monitoring organizations as part of the pre or post-approval process.