

**TERMS OF REFERENCE  
ENVIRONMENTAL IMPACT ASSESSMENT REPORT  
FOR THE PROPOSED  
LARICINA ENERGY LTD.  
GERMAIN PROJECT EXPANSION**

**Approximately 46 km from Wabasca-Desmarais, Alberta**

**ISSUED BY: Alberta Environment**

**DATE: MAY 13, 2011**

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## **PURPOSE OF THE TERMS OF REFERENCE**

The purpose of this document is to identify for Laricina Energy Ltd. (Laricina), aboriginal communities and appropriate stakeholders the information required by government agencies for an Environmental Impact Assessment (EIA) report prepared under the *Environmental Protection and Enhancement Act* (EPEA) for the Germain Project Expansion (the Project).

In March 2006, Laricina acquired its first six sections of land in the Germain area, located within the west Athabasca Oil Sands region approximately 46 km northeast of the community of Wabasca-Desmarais. Subsequent lease acquisitions brought Laricina's total land base in the Germain area to 71 sections of land within Townships 83-85, Ranges 21-23 west of the 4th Meridian.

The primary zone of interest at Germain is the Grand Rapids Formation. Laricina has Grand Rapids oil sands rights in 63 (gross) of these sections which offer significant resource potential, containing estimates of approximately 2.3 billion barrels of bitumen in place within the lease area. Laricina's current plan includes a staged approach to expand bitumen production beyond 155,000 gross barrels per day (bbls/d). Current and future innovations of in situ technology will be utilized to develop Laricina's oil sands assets at Germain.

In October 2010, Laricina received regulatory approval of the Germain Commercial Demonstration Project (Phase 1), which will have a capacity of 5,000 bbls/d of bitumen. The Germain Project (the Project) will integrate the Phase 1 Project and the Germain Project Expansion (Phases 2-4). The proposed production capacity for the Project is 155,000 bbls/d of bitumen over a 30 year period. The thermal recovery techniques being utilized for the development of the Project are Steam Assisted Gravity Drainage (SAGD) and Solvent-Cyclic Steam Assisted Gravity Drainage (SC-SAGD).

SC-SAGD is an improvement to SAGD technology in that it involves the co-injection of solvents and steam into the reservoir in a series of phases. The steam injection rate will decline as solvent is injected into the steam chamber. The solvents being contemplated are combinations of heavier hydrocarbon (>C<sub>5</sub>, diluent, or condensate blend) with a lighter hydrocarbon such as propane. By combining solvent injection with steam, Laricina expects to realize a material reduction in the cumulative steam oil ratio (CSOR), improved overall recovery, improved bitumen flow rates, and reduction in water use and carbon emission intensity.

Laricina proposes to develop the Germain Project Expansion in three phases in addition to the Phase 1 - Commercial Demonstration Project. Phase 2 will consist of a 30,000 bbls/d facility that will be integrated with the 5,000 bbls/d Phase 1 Project; Phase 3 and 4 will consist of 60,000 bbls/d facilities each. The Germain Project is expected to sustain production volumes of 155,000 bbls/d over a 30 year reserve life.

## **SCOPE OF THE EIA REPORT**

Laricina shall prepare and submit an EIA report that examines the environmental and socio-economic effects of the Project.

The EIA report shall be prepared considering all applicable provincial and federal legislation, codes of practice, guidelines, standards, policies and directives.

The EIA report shall be prepared in accordance with these Terms of Reference and the environmental information requirements prescribed under EPEA and associated regulations, and the *Canadian Environmental Assessment Act* if applicable. The EIA report will form part of Laricina's application to the Energy Resources Conservation Board (ERCB). An EIA report summary will also be included as part of the ERCB Application.

Laricina shall refer to the *Guide to Preparing Environmental Impact Assessment Reports in Alberta* published by Alberta Environment and these Terms of Reference when preparing the Environmental Impact Assessment report. In any case where there is a difference in requirements between the Guide and these Terms of Reference, the Terms of Reference shall take precedence.

## **CONTENT OF THE EIA REPORT**

### **1 PUBLIC ENGAGEMENT AND ABORIGINAL CONSULTATION**

- [A] Describe the concerns and issues expressed by the public and the actions taken to address those concerns and issues, including how public input was incorporated into the Project development, impact mitigation and monitoring.
- [B] Describe the concerns and issues expressed by aboriginal communities and the actions taken to address those concerns and issues, including how aboriginal community input was incorporated into the Project development, impact mitigation and monitoring. Describe consultation undertaken with aboriginal communities and groups with respect to traditional ecological knowledge and traditional use of land.
- [C] Describe plans to maintain the public engagement and aboriginal consultation process following completion of the EIA report to ensure that the public and aboriginal peoples will have an appropriate forum for expressing their views on the ongoing development, operation and reclamation of the Project.

### **2 PROJECT DESCRIPTION**

#### **2.1 Overview**

- [A] Provide a brief project description in sufficient detail to provide context for the EIA, including:
  - a) Laricina information;
  - b) proposed extraction and bitumen processing technology;
  - c) amount and source of energy required for the Project;
  - d) water supply and disposal requirements, including process water and potable water requirements;
  - e) proposed method to transport product to markets; and
  - f) development plan and schedule.
- [B] Provide maps and/or drawings of the Project components and activities including:
  - a) existing infrastructure, leases and clearings, including exploration clearings;
  - b) proposed central processing/treatment and field facilities;
  - c) other buildings and infrastructure (pipelines and utilities);
  - d) temporary structures;
  - e) transportation and access routes;

- f) on-site hydrocarbon storage;
  - g) containment structures such as retention ponds and storage ponds (e.g., lime sludge, stormwater runoff, boiler blow-down);
  - h) water wells/intakes, pipelines, and storage structures;
  - i) sources of aggregate resources, borrow material and other construction material and locations of any stockpiles that will be developed; and
  - j) waste storage area and disposal sites.
- [C] Discuss the potential for a delay in proceeding with the Project, or any phase of the Project, or not going ahead with the Project.
- [D] Describe the benefits of the project, including jobs created, local training, employment and business opportunities, and royalties and taxes generated that accrue to:
- a) Laricina;
  - b) local and regional communities, including Aboriginal communities;
  - c) the local authority;
  - d) Alberta; and
  - e) Canada.
- [E] Provide the adaptive management approach that will be implemented throughout the life of the Project. Include how monitoring, mitigation and evaluation were incorporated.

## 2.2 Constraints

- [A] Discuss the process and criteria used to identify constraints to development, and how the Project has been designed to accommodate those constraints. Include the following:
- a) any applicable *Alberta Land Stewardship Act* Regional Plan;
  - b) land use policies and resource management initiatives that pertain to the Project;
  - c) aboriginal traditional land use;
  - d) all known traplines;
  - e) the environmental setting;
  - f) cumulative environmental impacts in the region;
  - g) cumulative social impacts in the region;
  - h) results of Project-specific or regional monitoring;
  - i) potential for new or additional technology to increase resource recovery at later times; and
  - j) potential for changes in the regulatory regime.
- [B] Discuss the selection criteria used, options considered, and rationale for selecting:
- a) location of facilities and infrastructure;
  - b) thermal energy and electric power required for the Project;
  - c) water supply sources;
  - d) wastewater treatment, management and disposal;
  - e) air emission and air quality management; and
  - f) waste disposal.
- [C] Provide a list of facilities for which locations will be determined later. Discuss the selection criteria that will be used to determine the specific location of these facilities.

## **2.3 Regional and Cooperative Efforts**

- [A] Discuss Laricina's involvement in regional and cooperative efforts to address environmental and socio-economic issues associated with regional development.
- [B] Describe opportunities for sharing infrastructure (e.g., access roads, utility corridors, water infrastructure) with other resource development stakeholders, and the rationale for not implementing any of these opportunities.

## **2.4 Transportation Infrastructure**

- [A] Provide a traffic impact assessment and discuss improvements needed to access the provincial highways. Where traffic impact assessments have been prepared for other existing and planned projects in the area, provide a summary of those studies and incorporate their recommendations into the traffic assessment for the Project.
- [B] Describe the anticipated changes to traffic (e.g., type, volume) on highways during all stages of the Project and assess their impacts, considering the cumulative effects of other existing and planned uses of the same highways.

## **2.5 Air Emissions Management**

- [A] Provide emission profiles (type, rate and source) for the Project's operating and construction emissions including point and non-point sources and fugitive emissions. Consider both normal and upset conditions. Discuss:
  - a) odorous or visible emissions from the proposed facilities;
  - b) annual and total greenhouse gas emissions during all stages of the Project. Identify the primary sources and provide detailed calculations;
  - c) the intensity of greenhouse gas emissions per unit of bitumen produced;
  - d) the Project's contribution to total provincial and national greenhouse gas emissions on an annual basis;
  - e) Laricina's overall greenhouse gas management plans;
  - f) amount and nature of Criteria Air Contaminants emissions;
  - g) the amount and nature of acidifying emissions, probable deposition patterns and rates;
  - h) control technologies used to minimize air emissions;
  - i) emergency flaring scenarios (e.g., frequency and duration) and proposed measures to ensure flaring events are minimized;
  - j) upset condition scenarios (e.g., frequency and duration) and proposed measures to ensure upset conditions are minimized;
  - k) gas collection and conservation, and the applicability of vapour recovery technology;
  - l) applicability of sulphur recovery, acid gas re-injection or flue gas desulphurization to reduce sulphur emissions; and
  - m) fugitive emissions control technology to detect, measure and control emissions and odours from equipment leaks.

## **2.6 Water Management**

### **2.6.1 Water Supply**

- [A] Describe the water supply requirements for the Project, including:

- a) the expected water balance during all stages of the Project. Discuss assumptions made or methods chosen to arrive at the water balances;
- b) the process water, potable water, and non-potable water requirements and sources for construction (including but not limited to road construction, winter road construction, lease construction, production well drilling and dust suppression), camp(s) and plant site, start-up, normal and emergency operating situations, decommissioning and reclamation. Identify the volume of water to be withdrawn from each source, considering plans for wastewater reuse;
- c) the location of sources/intakes and associated infrastructure (e.g., pipelines for water supply);
- d) the variability in the amount of water required on an annual and seasonal basis as the Project is implemented;
- e) the expected cumulative effects on water losses/gains resulting from the Project operations;
- f) potable water treatment systems for all stages of the Project;
- g) type and quantity of potable water treatment chemicals used; and
- h) measures for ensuring efficient use of water including alternatives to reduce the consumption of non-saline water such as water use minimization, recycling, conservation, and technological improvements.

### **2.6.2 Surface Water**

- [A] Describe the surface water management strategy for all stages of the Project, including:
  - a) design factors considered; and
  - b) permanent or temporary alterations or realignments of watercourses, wetlands and other waterbodies.
- [B] Describe crossings of watercourses or waterbodies (including bridges, culverts and pipelines) required.

### **2.6.3 Wastewater Management**

- [A] Describe the wastewater management strategy, including:
  - a) the source, quantity and composition of each wastewater stream from each component of the proposed operation (e.g., bitumen extraction and associated facilities) for all Project conditions, including normal, start-up, worst-case and upset conditions;
  - b) the proposed disposal locations and methods for each wastewater stream;
  - c) formations for the disposal of wastewaters;
  - d) design of facilities that will collect, treat, store and release wastewater streams;
  - e) type and quantity of chemicals used in wastewater treatment; and
  - f) sewage treatment and disposal.

### **2.7 Waste Management**

- [A] Characterize and quantify the anticipated dangerous goods, and hazardous, non-hazardous, and recyclable wastes generated by the Project, and:
  - a) describe the composition and volume of specific waste streams and discuss how each stream will be managed;
  - b) describe how the disposal sites and sumps will be constructed; and

- c) describe plans for pollution prevention, waste minimization, recycling, and management to reduce waste quantities for all stages of the Project.

## **2.8 Conservation and Reclamation**

- [A] Provide a conceptual conservation and reclamation plan for the Project. Describe and map as applicable:
  - a) current land use and capability and proposed post-development land use and capability;
  - b) anticipated timeframes for completion of reclamation stages and release of lands back to the Crown including an outline of the key milestone dates for reclamation and how progress to achieve these targets will be measured;
  - c) constraints to reclamation such as timing of activities, availability of reclamation materials and influence of natural processes and cycles including natural disturbance regimes;
  - d) a revegetation plan for the disturbed terrestrial and aquatic areas;
  - e) reclamation material salvage, storage areas and handling procedures; and
  - f) existing and final reclaimed site drainage plans.
- [B] Discuss, from an ecological perspective, the expected timelines for establishment and recovery of vegetative communities and wildlife habitat, the expected success of establishment and recovery, and the expected differences in the resulting communities.
- [C] Discuss uncertainties related to the conceptual reclamation plan.

## **3 ENVIRONMENTAL ASSESSMENT**

### **3.1 Air Quality, Climate and Noise**

#### **3.1.1 Baseline Information**

- [A] Discuss the baseline climatic and air quality conditions including:
  - a) the type and frequency of meteorological conditions that may result in poor air quality; and
  - b) appropriate ambient air quality parameters.

#### **3.1.2 Impact Assessment**

- [A] Identify components of the Project that will affect air quality, and:
  - a) describe the potential for reduced air quality (including odours and visibility) resulting from the Project and discuss any implications of the expected air quality for environmental protection and public health;
  - b) estimate ground-level concentrations of appropriate air quality parameters;
  - c) discuss any expected changes to particulate deposition, nitrogen deposition or acidic deposition patterns;
  - d) identify areas that are predicted to exceed Potential Acid Input (PAI) critical loading criteria; and
  - e) discuss interactive effects that may occur resulting from co-exposure of a receptor to all emissions.
- [B] Identify stages or elements of the Project that are sensitive to changes or variability in climate parameters, including frequency and severity of extreme weather events. Discuss

what impacts the projected change to climate parameters over the life of the Project may have on elements of the Project that are sensitive to climate parameters.

- [C] Summarize the results of the noise assessment conducted for the ERCB, and:
  - a) identify the nearest receptor used in the assessment; and
  - b) discuss the design, construction and operational factors to be incorporated into the Project to comply with the ERCB's Directive 38: Noise Control.
- [D] Discuss mitigation strategies to minimize the potential impact of the Project on air quality and noise.

## **3.2 Hydrogeology**

### **3.2.1 Baseline Information**

- [A] Provide an overview of the existing geologic and hydrogeologic setting from the ground surface down to, and including, the oil producing zones and disposal zones, and:
  - a) present regional and Project Area geology to illustrate depth, thickness and spatial extent of lithology, stratigraphic units and structural features; and
  - b) present regional and Project Area hydrogeology describing:
    - i) the major aquifers, aquitards and aquicludes (Quaternary and bedrock), their spatial distribution, properties, hydraulic connections between aquifers, hydraulic heads, gradients, groundwater flow directions and velocities. Include maps and cross sections,
    - ii) the chemistry of groundwater aquifers including baseline concentrations of major ions, metals and hydrocarbon indicators,
    - iii) the potential discharge zones, potential recharge zones and sources, areas of groundwater-surface water interaction and areas of Quaternary aquifer-bedrock groundwater interaction,
    - iv) water well development and groundwater use, including an inventory of groundwater users,
    - v) the recharge potential for Quaternary aquifers,
    - vi) potential hydraulic connection between bitumen production zones, deep disposal formations and other aquifers resulting from Project operations,
    - vii) the characterization of formations chosen for deep well disposal, including chemical compatibility and containment potential, injection capacity, hydrodynamic flow regime, and water quality assessments, and
    - viii) the locations of major facilities associated with the Project including facilities for waste storage, treatment and disposal (e.g., deep well disposal) and describe site-specific aquifer and shallow groundwater conditions beneath these proposed facilities. Provide supporting geological information.

### **3.2.2 Impact Assessment**

- [A] Describe Project components and activities that have the potential to affect groundwater resource quantity and quality at all stages of the Project.

- [B] Describe the nature and significance of the potential Project impacts on groundwater with respect to:
- a) inter-relationship between groundwater and surface water in terms of surface water quantity and quality;
  - b) implications for terrestrial or riparian vegetation, wildlife and aquatic resources including wetlands;
  - c) changes in groundwater quality, quantity and flow;
  - d) conflicts with other groundwater users, and proposed resolutions to these conflicts;
  - e) potential implications of seasonal variations; and
  - f) groundwater withdrawal for Project operations, including any expected alterations in the groundwater flow regime during and following Project operations.
- [C] Discuss mitigation strategies to minimize the potential impact of the Project on hydrogeology.

### **3.3 Hydrology**

#### **3.3.1 Baseline Information**

- [A] Describe and map the surface hydrology in the Project Area.
- [B] Identify any surface water users who have existing approvals, permits or licenses.

#### **3.3.2 Impact Assessment**

- [A] Describe the extent of hydrological changes that will result from disturbances to groundwater and surface water movement:
- a) include changes to the quantity of surface flow, water levels and channel regime in watercourses (during minimum, average and peak flows) and water levels in waterbodies;
  - b) assess the potential impact of any alterations in flow on the hydrology and identify all temporary and permanent alterations, channel realignments, disturbances or surface water withdrawals;
  - c) discuss the effect of these changes on hydrology (e.g., timing, volume, peak and minimum flow rates, river regime and lake levels), including the significance of effects for downstream watercourses; and
  - d) identify any potential erosion problems in watercourses resulting from the Project.
- [B] Describe impacts on other surface water users resulting from the Project. Identify any potential water use conflicts.
- [C] Discuss the impact of low flow conditions and in-stream flow needs on water supply and water and wastewater management strategies.
- [D] Discuss mitigation strategies to minimize the potential impact of the Project on hydrology.

### **3.4 Surface Water Quality**

#### **3.4.1 Baseline Information**

- [A] Describe the baseline water quality of the watercourses and waterbodies.

### **3.4.2 Impact Assessment**

- [A] Describe the potential impacts of the Project on surface water quality and proposed mitigation measures to maintain surface water quality at all stages of the Project.

## **3.5 Aquatic Ecology**

### **3.5.1 Baseline Information**

- [A] Describe and map the fish, fish habitat and aquatic resources (e.g., aquatic and benthic invertebrates) of the lakes, rivers, ephemeral water bodies and other waters. Describe the species composition, distribution, relative abundance, movements and general life history parameters of fish resources. Also identify any species that are:
- listed as “at Risk, May be at Risk and Sensitive” in The Status of Alberta Species (Alberta Sustainable Resource Development);
  - listed in Schedule 1 of the federal *Species at Risk Act*; and
  - listed as “at risk” by COSEWIC
- [B] Describe and map existing critical or sensitive areas such as spawning, rearing, and overwintering habitats, seasonal habitat use including migration and spawning routes.
- [C] Describe the current and potential use of the fish resources by aboriginal, sport or commercial fisheries.
- [D] Identify the key aquatic indicators that Laricina used to assess project impacts. Discuss the rationale for their selection.

### **3.5.2 Impact Assessment**

- [A] Describe and assess the potential impacts of the Project to fish, fish habitat, and other aquatic resources, considering:
- potential habitat loss and alteration;
  - potential increased fishing pressures in the region that could arise from the increased workforce and improved access from the Project;
  - potential increased habitat fragmentation;
  - potential acidification; and
  - potential groundwater surface water interactions.
- [B] Discuss mitigation measures to minimize potential impacts of the Project on fish, fish habitat and other aquatic resources. Clearly identify those mitigation measures that will be implemented and provide the rationale for their selection.
- [C] Identify plans proposed to offset any loss in the productivity of fish habitat. Indicate how environmental protection plans address applicable provincial and federal policies on fish habitat including the development of a “No Net Loss” fish habitat objective.

## **3.6 Vegetation**

### **3.6.1 Baseline Information**

- [A] Describe and map the vegetation communities, wetlands, rare plants, old growth forests, and communities of limited distribution. Identify the occurrence, relative abundance and distribution, and identify any species that are:

- a) listed as “at Risk, May be at Risk and Sensitive” in The Status of Alberta Species (Alberta Sustainable Resource Development);
  - b) listed in Schedule 1 of the federal *Species at Risk Act*; and
  - c) listed as “at risk” by COSEWIC
- [B] Describe the current extent of habitat fragmentation.
- [C] Identify key vegetation indicators used to assess the Project impacts. Discuss the rationale for their selection.

### **3.6.2 Impact Assessment**

- [A] Describe and assess the potential impacts of the Project on vegetation communities, wetlands, rare plants, old growth forests and communities of limited distribution considering:
- a) both temporary (include timeframe) and permanent impacts;
  - b) the potential for introduction and colonization of weeds and non-native invasive species.
  - c) potential increased fragmentation and loss of upland, riparian and wetland habitats; and
  - d) implications of vegetation changes for other environmental resources (e.g., terrestrial and aquatic habitat diversity and quantity, water quality and quantity, erosion potential).
- [B] Discuss the mitigation measures to avoid or minimize impacts on vegetation communities, wetlands, rare plants, old growth forests and communities of limited distribution. Clearly identify those mitigation measures that will be implemented and provide the rationale for their selection.

## **3.7 Wildlife**

### **3.7.1 Baseline Information**

- [A] Describe and map the wildlife resources (amphibians, reptiles, birds and terrestrial and aquatic mammals). Describe species relative abundance, distribution and their use and potential use of habitats. Also identify any species that are:
- a) listed as “at Risk, May be at Risk and Sensitive” in The Status of Alberta Species (Alberta Sustainable Resource Development);
  - b) listed in Schedule 1 of the federal *Species at Risk Act*; and
  - c) listed as “at risk” by COSEWIC.
- [B] Describe and map existing wildlife habitat and habitat disturbance (including exploration activities). Identify those habitat disturbances that are related to existing and approved Project operations.
- [C] Identify the key wildlife and habitat indicators used to assess Project impacts. Discuss the rationale for their selection.

### **3.7.2 Impact Assessment**

- [A] Describe and assess the potential impacts of the Project to wildlife and wildlife habitats, considering:

- a) how the Project will affect wildlife relative abundance, habitat availability, mortality, movement patterns and distribution for all stages of the Project;
  - b) how improved or altered access may affect wildlife;
  - c) how increased habitat fragmentation may affect wildlife, considering edge effects and the influence of linear features and infrastructure on wildlife movements and predator-prey relationships;
  - d) potential effects on wildlife resulting from changes to air and water quality, including both acute and chronic effects to animal health; and
  - e) potential effects on wildlife from Laricina's proposed and planned exploration, seismic and core hole activities, including monitoring/4D seismic.
- [B] Discuss mitigation measures to avoid or minimize the potential impact of the Project on wildlife and wildlife habitat. Clearly identify those mitigation measures that will be implemented and provide the rationale for their selection.

### **3.8 Biodiversity**

#### **3.8.1 Baseline Information**

- [A] Describe and map the existing biodiversity.
- [B] Identify the biodiversity metrics, biotic and abiotic indicators that are used to characterize the baseline biodiversity and to assess project impacts. Discuss the rationale for their selection.

#### **3.8.2 Impact Assessment**

- [A] Describe and assess the potential impacts of the Project to biodiversity considering:
- a) the effects of fragmentation on biodiversity potential
  - b) the contribution of the Project to any anticipated changes in regional biodiversity and the potential impact to local and regional ecosystems.
  - c) effects during construction, operations and post-reclamation and the significance of these changes in a local and regional context
- [B] Discuss mitigation measures to avoid or minimize the potential impact of the Project on biodiversity. Clearly identify those mitigation measures that will be implemented and provide the rationale for their selection.

### **3.9 Terrain and Soils**

#### **3.9.1 Baseline Information**

- [A] Describe and map the terrain and soils conditions in the Project Area.
- [B] Describe and map soil types in the areas that are predicted in 3.1.2[A]d) to exceed Potential Acid Input (PAI) critical loading criteria.

### **3.9.2 Impact Assessment**

- [A] Describe Project activities and other related issues that could affect soil quality (e.g., compaction, contaminants) and:
  - a) indicate the amount (ha) of surface disturbance from plant, field (pads, pipelines, access roads), aggregate and borrow sites, construction camps, drilling waste disposal and other infrastructure-related construction activities;
  - b) discuss the relevance of any changes for the local and regional landscapes, biodiversity, productivity, ecological integrity, aesthetics and future use;
  - c) identify the potential acidification impact on soils and discuss the significance of predicted impacts by acidifying emissions; and
  - d) describe potential sources of soil contamination.
- [B] Discuss:
  - a) the environmental effects of proposed drilling methods on the landscape and surficial and bedrock geology;
  - b) the potential for changes in the ground surface during steaming and recovery operations (e.g., ground heave and/or subsidence) and their environmental implications; and
  - c) the potential impacts caused by the mulching and storage of woody debris considering, but not limited to vulnerability to fire, degradation of soil quality, increased footprint, etc.
- [C] Discuss mitigation strategies to minimize the potential impact of the Project on soils or terrain.

### **3.10 Land Use and Management**

#### **3.10.1 Baseline Information**

- [A] Describe and map the current land uses in the Project Area, including all Crown land and Crown Reservations (Holding Reservation, Protective Notation, Consultative Notation).
- [B] Indicate where Crown land dispositions may be needed for roads or other infrastructure for the Project.
- [C] Identify and map unique sites or special features in the Project Area and Local Study Area such as Parks and Protected Areas, Heritage Rivers, Historic Sites, Environmentally Significant Areas, culturally significant sites and other designations (World Heritage Sites, Ramsar Sites, Internationally Important Bird Areas, etc).
- [D] Describe and map land clearing activities, showing the timing of the activities.
- [E] Describe the status of timber harvesting arrangements, including species and timing.
- [F] Describe access control measures proposed for the Project Area.

#### **3.10.2 Impact Assessment**

- [A] Identify the potential impact of the Project on land uses, including:
  - a) impacts to unique sites or special features;

- b) impacts caused by changes in public access arising from linear development, including secondary effects related to increased hunter, angler and other recreational access and facilitated predator movement;
  - c) potential impacts to aggregate reserves that may be located on land under Laricina's control and reserves in the region;
  - d) the impact of development and reclamation on commercial forest harvesting and fire management in the Project Area;
  - e) the amount of commercial and non-commercial forest land base that will be disturbed by the Project, including the Timber Productivity Ratings for the Project Area. Compare the pre-disturbance and reclaimed percentages and distribution of all forested communities in the Project Area;
  - f) how the Project impacts Annual Allowable Cuts and quotas within the Forest Management Agreement area;
  - g) the impact (type and extent) to the pre-disturbance topography, elevation and drainage pattern within the Project Area; and
  - h) impacts of the Project on public access, regional recreational activities, aboriginal land use and other land uses during and after development activities.
- [B] Provide a fire control plan highlighting:
- a) measures taken to ensure continued access for firefighters to adjacent wildland areas;
  - b) forest fire prevention, detection, reporting, and suppression measures, including proposed fire equipment;
  - c) measures for determining the clearing width of power line rights-of-way; and
  - d) required mitigative measures for areas adjacent to the Project Area based on the FireSmart Wildfire Assessment System.
- [C] Discuss mitigation strategies to minimize the potential impact of the Project on land uses.

#### **4 HISTORIC RESOURCES**

- [A] Describe the Historic Resource Impact Assessment (HRIA) work done to date for the Project, and provide a schedule for any future work.
- [B] Describe the impacts of the findings of the HRIA work on Project design and scheduling.
- [C] Describe any Project uncertainties arising from the need for future HRIA work.

#### **5 TRADITIONAL ECOLOGICAL KNOWLEDGE AND LAND USE**

- [A] Provide:
- a) a map and description of traditional land use areas including fishing, hunting, trapping and nutritional, medicinal or cultural plant harvesting by affected aboriginal peoples (if the aboriginal community or group is willing to have these locations disclosed);

- b) a map of cabin sites, spiritual sites, cultural sites, graves and other traditional use sites considered historic resources under the *Historical Resources Act* (if the aboriginal community or group is willing to have these locations disclosed), as well as traditional trails and resource activity patterns; and
  - c) a discussion of:
    - i) the availability of vegetation, fish and wildlife species for food, traditional, medicinal and cultural purposes in the identified traditional land use areas considering all Project related impacts,
    - ii) access to traditional lands in the Project Area during all stages of the Project, and
    - iii) aboriginal views on land reclamation.
- [B] Determine the impact of the Project on traditional, medicinal and cultural purposes and identify possible mitigation strategies.

## **6 PUBLIC HEALTH AND SAFETY**

### **6.1 Public Health**

- [A] Describe those aspects of the Project that may have implications for public health or the delivery of regional health services. Determine quantitatively whether there may be implications for public health arising from the Project.
- [B] Document any health concerns raised by stakeholders during consultation on the Project;
- [C] Document any health concerns identified by aboriginal communities or groups resulting from impacts of existing development and of the Project specifically on their traditional lifestyle and include an aboriginal receptor type in the assessment;
- [D] Describe the potential health impacts resulting from higher regional traffic volumes and the increased risk of accidental leaks and spills.
- [E] Discuss mitigation strategies to minimize the potential impact of the Project on human health.

### **6.2 Public Safety**

- [A] Describe those aspects of the Project that may have implications for public safety. Determine whether there may be implications for public safety arising from the Project. Specifically:
- a) describe Laricina's emergency response plan, including public notification protocol and safety procedures, to minimize adverse environmental effects, including emergency reporting procedures for spill containment and management;
  - b) document any safety concerns raised by stakeholders during consultation on the Project;
  - c) describe how local residents will be contacted during an emergency and the type of information that will be communicated to them;
  - d) describe the existing agreements with area municipalities or industry groups such as safety cooperatives, emergency response associations, regional mutual aid programs and municipal emergency response agencies; and
  - e) describe the potential safety impacts resulting from higher regional traffic volumes.

## **7 SOCIO-ECONOMIC ASSESSMENT**

### **7.1 Baseline Information**

- [A] Describe the existing socio-economic conditions in the region and in the communities in the region.
- [B] Describe factors that may affect existing socio-economic conditions including:
  - a) population changes;
  - b) workforce requirements for the Project, including a description of when peak activity periods will occur;
  - c) planned accommodations for the workforce for all stages of the Project;
  - d) Laricina's policies and programs regarding the use of regional and Alberta goods and services; and
  - e) the project schedule.

### **7.2 Impact Assessment**

- [A] Describe the effects of construction and operation of the Project on:
  - a) housing,
  - b) availability and quality of health care services;
  - c) local and regional infrastructure and community services;
  - d) recreational activities,
  - e) hunting, fishing, trapping and gathering,
  - f) First Nations and Métis (e.g., traditional land use and social and cultural implications);and
  - g) the overall engineering and contracting plan for the Project.
- [B] Describe the socio-economic effects of any construction camp required for the Project and identify:
  - a) its location,
  - b) the number of workers it is intended to house,
  - c) whether the camp will service the Project only or other clients,
  - d) the length of time the camp will be in service, and
  - e) describe what services will be provided in the camp (e.g., security, recreation and leisure, medical services).
- [C] Describe the need for additional Crown land to manage the effects in [A] and [B].
- [D] Provide the estimated total Project cost, including a breakdown for engineering and project management, equipment and materials, and labour for both construction and operation stages. Indicate the percentage of expenditures expected to occur in the region, Alberta, Canada outside of Alberta, and outside of Canada.
- [E] Discuss mitigation strategies to minimize the potential impact of the Project on socio-economic conditions in the region and communities in the region.

## **8 RESIDUAL IMPACTS**

- [A] Describe the residual impacts of the Project following implementation of Laricina's mitigation measures and Laricina's plans to manage those residual impacts.

## **9 MONITORING**

- [A] Describe Laricina's current and proposed monitoring programs.
- [B] Describe the monitoring programs proposed to assess any Project impacts and to measure the effectiveness of mitigation plans.
- [C] Discuss Laricina's regional monitoring activities including:
  - a) monitoring that will be undertaken to assist in managing environmental effects, confirm performance of mitigation measures and improve environmental protection strategies;
  - b) monitoring done independently by Laricina and how these monitoring programs are consistent with other current or proposed regional monitoring programs;
  - c) monitoring performed in conjunction with other stakeholders, including aboriginal communities and groups; and
  - d) new monitoring initiatives that may be required as a result of the Project.
- [D] Discuss:
  - a) Laricina's plans for addressing and mitigating any environmental impacts identified in the monitoring program;
  - b) how monitoring data will be disseminated to the public or other interested parties; and
  - c) how the results of monitoring programs and publicly available monitoring information will be integrated with Laricina's environmental management system.

## **10 APPENDIX – FEDERAL REQUIREMENTS**

*The information required as part of this Appendix will not be considered as part of the EIA completeness decision made by Alberta Environment. If the Federal government determines that they do not have a requirement for a Federal Environmental Assessment prior to the submission of the EIA, this information will not need to be submitted.*

### **10.1 Project Description**

#### **10.1.1 Overview**

- [A] Discuss any alternative means of carrying out the Project that are technically and economically feasible and the environmental effects of any such alternative means.
- [B] Discuss the effects of the environment on all stages and elements of the Project.

#### **10.1.2 Air Emissions Management**

- [A] Provide emission profiles (type, rate and source) for the Project's operating and construction emissions including point and non-point sources and fugitive emissions. Consider both normal and upset conditions. Discuss:
  - a) the intensity of greenhouse gas emissions per unit of bitumen produced. Provide explanations for any differences between greenhouse gas emission intensities computed for the Project and those of other similar projects; and
  - b) the Proponent's overall greenhouse gas management plans and how the Project design and greenhouse gas management plans have taken into account the need for continuous improvement with respect to greenhouse gas emissions.

### **10.1.3 Water Management - Surface Water**

- [A] Provide details of watercourse crossings including:
- a) type of water course crossing, construction methods and anticipated flows during construction;
  - b) location (latitude and longitude); and
  - c) details on capacity of crossing to withstand extreme flood events including design flood and design criteria used for the crossing.

### **10.1.4 Water Management - Wastewater Management**

- [A] Describe the wastewater management strategy, including design of facilities that will collect, treat, store and release wastewater streams including measure taken in the design to prevent or minimize potential impacts to the environment.

### **10.1.5 Waste Management**

- [A] Provide the volume of sand generated as a result of Project activities and discuss how it will be managed (e.g., landfill, re-injection etc.)

### **10.1.6 Conservation and Reclamation**

- [A] Describe how reclaimed areas will differ from existing areas with respect to wetland form and function, species diversity and occurrence of rare species and *Species at Risk* and COSEWIC listed species.
- [B] Discuss uncertainties related to the conceptual reclamation plan, including uncertainties in re-establishing faunal and floral diversity in reclaimed areas.

## **10.2 Environmental Assessment**

### **10.2.1 Hydrogeology - Impact Assessment**

- [A] Describe the nature and significance of the potential Project impacts on groundwater with respect to:
- a) steaming and recovery operations (i.e., ground heave and/or subsidence); and
  - b) wastewater disposal.

### **10.2.2 Hydrology - Impact Assessment**

- [A] Describe the extent of hydrological changes as a result of the Project, including disturbances to ground cover and groundwater and surface water movement:
- a) include changes to the quantity of surface flow, water levels and channel regime in watercourses (during minimum, average and peak flows) and water levels in waterbodies;
  - b) assess the potential impact of any alterations in flow on the hydrology and identify all temporary and permanent alterations, channel realignments, disturbances or surface water withdrawals;
  - c) discuss the effect of these changes on hydrology (e.g., timing, volume, peak and minimum flow rates, river regime and lake levels), including the significance of effects for downstream watercourses; and
  - d) identify any potential erosion problems in watercourses resulting from the Project.

### 10.2.3 Aquatic Ecology - Baseline Information

- [A] Describe and map the fish, fish habitat and aquatic resources (e.g., aquatic and benthic invertebrates) of the lakes, rivers, ephemeral water bodies and other waters. Describe the species composition, distribution, relative abundance, movements and general life history parameters of fish resources. Also identify any species that are:
- a) listed in the federal *Species at Risk Act*; and
  - b) listed by COSEWIC.

### 10.2.4 Vegetation - Baseline Information

- [A] Describe and map the vegetation communities, wetlands, rare plants, old growth forests, and communities of limited distribution. Identify the occurrence, relative abundance and distribution and also identify any species that are:
- a) listed in the federal *Species at Risk Act*; and
  - b) listed by COSEWIC.
- [B] Describe the current extent of habitat fragmentation and loss.
- [C] Identify key vegetation indicators, including any species listed under the federal *Species at Risk Act* and by COSEWIC, used to assess the Project impacts. Discuss the rationale for their selection.

### 10.2.5 Wildlife - Baseline Information

- [A] Describe and map the wildlife resources (amphibians, reptiles, birds, and terrestrial and aquatic mammals). Describe species relative abundance, distribution and their use and potential use of habitats. Also identify any species that are:
- a) listed in the federal *Species at Risk Act*; and
  - b) listed by COSEWIC.
- [B] Describe and map existing wildlife habitat, important wildlife areas and habitat disturbance (including all exploration activities). Identify those habitat disturbances that are related to existing and approved Project operations.
- [C] Identify the key wildlife and habitat indicators, including any species listed under the federal *Species at Risk Act* and COSEWIC, used to assess Project impacts. Discuss the rationale for their selection.
- [D] For key wildlife indicators, describe:
- a) occurrence distribution, relative abundance, habitat use and availability, population size and trends;
  - b) population or herd ranges based on current data;
  - c) important areas and/or critical habitat (as defined in the *Species at Risk Act*);
  - d) limited factors and sensitivity to disturbance, including known thresholds of disturbance; and
  - e) existing environmental effects and significance of existing effects on local and regional populations.

### **10.3 Monitoring**

- [A] Describe the Proponent's current and proposed monitoring programs, including the scale and duration of the proposed program.
- [B] Describe the monitoring programs proposed to verify the accuracy of the environmental assessment, assess any Project impacts and to measure the effectiveness of mitigation plans.