DRAFT
TERMS OF REFERENCE
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

FOR THE PROPOSED

TAMARACK INTEGRATED OIL SANDS PROJECT

Approximately 16 km Northeast from Fort McMurray, Alberta

ISSUED BY: **Ivanhoe Energy**

DATE: **April 8, 2010**

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PURPOSE OF THE TERMS OF REFERENCE

The purpose of this document is to identify for Ivanhoe Energy Inc. (Ivanhoe), 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 Tamarack Integrated Oil Sands Project (the Project).

These Terms of Reference have been prepared to reflect specific conditions of the Tamarack Project, which is located in an area that has already been impacted by industrial development and has been the subject of previous environmental assessments. The Project is located immediately south of Suncor Energy's (Suncor) South Tailings Pond - in fact the Tailings Pond extends onto the northern part of the Tamarack lease. The local study areas used for the Suncor South Tailings Pond Environmental Impact Assessment included large portions of the area of the Tamarack Lease. Given that the Project area is well understood and the fact that the Project is located adjacent to an area of intense industrial development, the Terms of Reference have been designed to address specific impacts associated with this type of project within that context. Specifically, the following principles were used in developing the Terms of Reference:

- The purpose of the EIA is to provide information to the Energy Resources Conservation Board (ERCB) in support of the public interest decision;
- The focus is on the Project Area and the Application Case, and the main emphasis of the technical assessment is on air emissions and hydrogeology (water source and disposal);
- The EIA focuses on a limited number of key indicators on which to design the Project and assess and manage impacts; and
- Common requirements (e.g., residual impacts and monitoring) were placed in separate sections to reduce duplication.

The proposed Project lease is a 6,880-acre contiguous block located in Sections 22 to 36, Township 90, Range 9, West of the 4th Meridian, approximately 16 km northeast of Fort McMurray, Alberta. The Project will integrate established SAGD thermal recovery techniques with its patented HTL^{TM} upgrading process to produce and market a synthetic sour crude.

The Project has an estimated bitumen production capacity of approximately 50,000 barrels per day (bpd) for 30 years and is proposed to be developed in two phases. The initial phase (Phase 1) will produce 20,000 bpd and the second phase (Phase 2) will support an additional production capacity of approximately 30,000 bpd. Phase 1 is scheduled to commence once regulatory approval and project financing are obtained. Phase 2 plans will be further defined following the completion of future delineation programs and engineering design.

SCOPE OF THE EIA REPORT

Ivanhoe shall prepare and submit an EIA report that examines the environmental and socio-economic effects of the Project for both Phases 1 and 2.

The EIA report shall be prepared with consideration for all applicable provincial and federal legislation, codes of practice, guidelines, standards and directives. Ivanhoe shall identify the legislation, policies, approvals, and current multi-stakeholder planning initiatives applicable to the Project.

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 Ivanhoe's application to the ERCB. An EIA report summary will also be included as part of the ERCB Application.

The EIA report will include a glossary of terms and a list of abbreviations to assist the reader in understanding the material presented. It will also include a concordance table that cross-references the report to the sub-section level (lower case letters) of the Terms of Reference.

Ivanhoe shall refer to the *Guide to Preparing Environmental Impact Assessment Reports in Alberta* published by Alberta Environment (the Guide) 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 First Nation, Métis and other aboriginal communities and the actions taken to address those concerns and issues, including how community input was incorporated into the Project development, impact mitigation and monitoring. Describe consultation undertaken with First Nation, Métis and other aboriginal communities and groups with respect to traditional ecological knowledge and traditional use of land.

[C] Describe plans to maintain the public engagement and First Nation, Métis and aboriginal consultation process following completion of the EIA report to ensure that the public and First Nation, Métis and other 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 THE PROPONENT

[A] Provide:

a) a corporate profile; and
b) the name of the legal entity that will develop, manage and operate the Project and hold the operating approvals.

[B] Describe Ivanhoe's experience in developing oil sands resources.

2.2 PROJECT DEVELOPMENT

[A] Provide a development plan that includes:

a) the phases of development;
b) bitumen/heavy oil recovery facilities;
c) processing facilities;
d) steam and/or power generation facilities;
e) infrastructure (pipelines, access roads and power lines);
f) other buildings and structures;
g) field maintenance operations; and
h) activities associated with each stage of the Project.

[B] Provide a schedule outlining the proposed phases of development and the sequence and duration of key project components, including the timing of key steps in the construction, operation, decommissioning and reclamation stages of each phase.

[C] Discuss the key factors controlling the schedule, restrictions for conducting certain development activities, and uncertainties.

2.3 PROCESS AND INFRASTRUCTURE ALTERNATIVES

[A] Discuss the selection criteria used, options considered, and rationale for selecting:

a) location and route for linear infrastructure;
b) thermal energy and electric power required for the Project;
c) water supply sources;
d) wastewater treatment, wastewater management and wastewater disposal;
e) air emission and air quality management; and
f) waste disposal.

2.4 PROJECT PROCESSES AND FACILITIES

[A] 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, upgrading, 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) on-site sulphur and coke storage;
h) containment structures such as retention ponds and storage ponds (e.g., lime sludge, stormwater runoff, boiler blow-down);
i) water wells/intakes, pipelines, and storage structures;
j) sources of aggregate resources, borrow material and other construction material and locations of any stockpiles that will be developed; and
k) waste storage area and disposal sites.

[B] Provide a list of facilities for which locations will be determined later.

[C] Describe the primary resource recovery process, any proposed follow-up recovery process and other related processes and process facilities of the Project.

[D] Discuss the amount and source of energy required for the Project.

[E] Describe the proposed method to transport product to markets.

[F] Provide a list of chemical products to be manufactured, processed or otherwise used for the Project and describe, in general terms, how these products will be stored and managed. Identify products containing substances that are:

a) *Canadian Environmental Protection Act*, 1999 toxics;
b) listed on the National Pollutant Release Inventory;
c) dangerous goods as defined by the federal *Transportation of Dangerous Goods Act*; and
d) on the Domestic Substances List and categorized as requiring further assessment under Canada's Chemicals Management Plan.

[G] Describe the nature and amount of on-site hydrocarbon storage. Discuss containment and other environmental protection measures.

[H] Describe the amount of any on-site sulphur and coke storage. Discuss containment and other environmental protection measures.

2.5 TRANSPORTATION INFRASTRUCTURE

[A] Describe and map the locations of any new road or intersection construction, or any improvements to existing roads or intersections, related to the development of the Project, from the boundary of the Project Area up to and including the highway access, and

a) discuss the alternatives and the rationale for selection of the preferred alternative;

b) describe the impacts to local communities of the changes in transportation infrastructure;
c) provide a proposed schedule for the work;
d) provide the estimated cost of the work; and
e) provide a summary of consultation with Alberta Transportation and the local authority, including their views on the compatibility of the proposed work with their own local or regional infrastructure development plans.

[B] Identify the type, volume, location and availability of construction and reclamation materials for all road construction and road improvement work, related to the development of the Project, within and outside of the Project Area.

2.6 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 examples of 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) Ivanhoe's overall greenhouse gas management plans;
f) amount and nature of Criteria Air Contaminant 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.

2.7 WATER MANAGEMENT

2.7.1 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, 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.

2.7.2 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] Provide a description of navigable waterways and the results of navigability assessment(s) for waterways that may be affected by the Project.

[C] Describe crossings of watercourses or waterbodies required and provide example diagrams of each type of crossing.

2.7.3 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.

2.8 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) identify the amount of drilling wastes and the options considered for disposal and the option(s) chosen;
c) describe how the disposal sites and sumps will be constructed; and
d) describe plans for pollution prevention, waste minimization, recycling, and management to reduce waste quantities for all stages of the Project.

2.9 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.

2.10 REGIONAL AND COOPERATIVE INITIATIVES

[A] Discuss Ivanhoe's involvement in regional and cooperative efforts to address environmental and socio-economic issues associated with regional development, including:

a) potential cooperative ventures that Ivanhoe has initiated, could initiate or could develop with other operators and other resource users;
b) how Ivanhoe will work to develop and implement such cooperative opportunities;
c) Ivanhoe's participation in any regional forums;
d) how Ivanhoe would design and implement research programs; and
e) how regional environmental management initiatives will be incorporated into Ivanhoe's management practices.

[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.

3 ENVIRONMENTAL ASSESSMENT

3.1 AIR QUALITY AND CLIMATE

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, including SO_2, CO, H_2S, NO_X, PAH, individual hydrocarbons of concern in the THC and VOC mixtures, ground-level ozone (O_3), representative heavy metals and particulates (TSP, PM_{10} and $PM_{2.5}$).

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 change to climate parameters may have on elements of the Project that are sensitive to climate parameters.

[C] Describe how air quality impacts resulting from the Project will be mitigated.

3.2 NOISE

[A] Discuss the design, construction and operational factors to be incorporated into the Project to comply with the ERCB's Directive 38.

[B] Identify components of the Project that have the potential to increase noise levels and discuss:

a) potentially-affected people and wildlife;
b) an estimate of the potential for increased noise resulting from the development; and
c) the implications of any increased noise levels.

3.3 HYDROGEOLOGY

3.3.1 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. Document any new hydrogeological investigations, including methodology and results, undertaken as part of the EIA, and:

a) present regional and Project Area geology to illustrate depth, thickness and spatial extent of lithology, stratigraphic units and structural features;
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.

3.3.2 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 and quantity;
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] Describe programs to manage and protect groundwater resources including:
a) the early detection of potential contamination; and
b) groundwater remediation options in the event that adverse effects are detected.

[D] Identify measures to reduce the environmental risks from casing failures.

3.4 HYDROLOGY

3.4.1 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.

3.4.2 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 both the Project and cumulative effect of these changes on hydrology (e.g., timing, volume, peak and minimum flow rates, river regime and lake levels), including the significance of effects for downstream watercourses; and
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] Describe mitigation measures to address impacts during all stages of the Project including:
a) alteration in flow regimes;
b) potential water use conflicts; and
c) increased sediment loadings.

3.5 SURFACE WATER QUALITY

[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.

3.6 AQUATIC ECOLOGY

3.6.1 Baseline Information

[A] Describe the existing fish and other aquatic resources (e.g., benthic invertebrates). Identify species composition, distribution, relative abundance, movements and general life history parameters.

[B] Describe and map, as appropriate, the fish habitat and aquatic resources of the lakes, rivers, ephemeral water bodies and other waters and identify:
a) key indicator species and provide the rationale and selection criteria used;
b) critical or sensitive areas such as spawning, rearing, and over-wintering habitats. Discuss seasonal habitat use including migration and spawning routes; and
c) current and potential use of the fish resources by aboriginal, sport or commercial fisheries.

[C] Quantitatively describe the current extent of aquatic habitat fragmentation.

3.6.2 Impact Assessment

[A] Describe the potential impacts to fish, fish habitat, and other aquatic resources (e.g., stream alterations and changes to substrate conditions, water quality and quantity) considering:

a) fish tainting, survival of eggs and fry, chronic or acute health effects, and increased stress on fish populations from release of contaminants, sedimentation, flow alterations, temperature and habitat changes;
b) potential impacts on riparian areas that could affect aquatic biological resources and productivity;
c) the potential for increased fishing pressures in the region that could arise from the increased workforce and improved access resulting from the Project. Identify the implications on the fish resource and describe any mitigation strategies that might be planned to minimize these impacts, including any plans to restrict employee and visitor access;
d) changes to benthic invertebrate communities that may affect food quality and availability for fish; and
e) the potential for increased fragmentation of aquatic habitat.

[B] Discuss the design, construction and operational factors to be incorporated into the Project to minimize impacts to fish and fish habitat and protect aquatic resources.

[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.

[D] Describe the effects of any surface water withdrawals considered including cumulative effects on fish, fish habitat and other aquatic resources.

3.7 VEGETATION

3.7.1 Baseline Information

[A] Describe and map vegetation communities, wetlands, rare plants, old growth forests, communities of limited distribution and plants for traditional, medicinal and cultural purposes in the Project Area.

[B] Identify key indicators and discuss the rationale for their selection. Identify composition, distribution, relative abundance, and habitat requirements. Address those species listed as "at Risk, May be at Risk and Sensitive" in The Status of Alberta Species (Alberta Sustainable Resource Development) and all species listed in Schedule 1 of the federal *Species at Risk Act*.

3.7.2 Impact Assessment

[A] Identify the vegetation and wetlands to be disturbed for all stages of the Project.

[B] Discuss any potential effects the Project may have on key indicators, rare plants, endangered species, wetlands, old growth forests, communities of limited distribution and plants for traditional, medicinal and cultural purposes.

[C] Discuss temporary (include timeframe) and permanent changes to vegetation and wetland communities and comment on:

a) the effects and their implications for other environmental resources (e.g., habitat diversity and quantity, water quality and quantity, erosion potential); and
b) the effects and their implications to recreation, aboriginal and other uses.

[D] Provide a mitigation strategy that will minimize Project impacts.

[E] Discuss weeds and non-native invasive species and describe how these species will be assessed and controlled prior to and during operation and reclamation.

3.8 WILDLIFE

3.8.1 Baseline Information

[A] Describe and map existing wildlife resources (amphibians, reptiles, birds and terrestrial and aquatic mammals) and their use and potential use of habitats.

[B] Identify key indicator species and discuss the rationale for their selection. Identify composition, distribution, relative abundance, seasonal movements, movement corridors, habitat requirements, key habitat areas, and general life history. Address those species:

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.

[C] Describe, quantify and map all existing habitat disturbance (including exploration activities) and identify those habitat disturbances that are related to existing and approved Project operations.

3.8.2 Impact Assessment

[A] Describe Project components and activities that may affect wildlife and wildlife habitat.

[B] Describe and assess the potential impacts of the Project on key indicator species and related those impacts to wildlife populations and wildlife habitats, addressing:

a) how the Project will affect wildlife relative abundance, movement patterns, distribution and recruitment into regional populations for all stages of the Project;
b) how improved or altered access may affect wildlife including potential obstruction of daily and seasonal movements, increased vehicle-wildlife collisions, and increased hunting pressures;
c) how increased habitat fragmentation may affect wildlife considering edge effects, the availability of core habitat, and the influence of linear features and infrastructure on wildlife movements and other population parameters;
d) the spatial and temporal changes to habitat availability and habitat effectiveness (types, quality, quantity, diversity and distribution);
e) potential impacts on wildlife resulting from changes to air and water quality, including both acute and chronic effects to animal health;
f) potential impacts on wildlife from the Proponent's proposed and planned exploration, seismic and core hole activities, including monitoring/4D seismic;
g) the resilience and recovery capabilities of wildlife populations and habitats to disturbance; and
h) the potential for the Project Area to be returned to its existing state with respect to wildlife populations and their habitats.

[C] Comment on the availability of species for traditional use considering habitat loss, habitat avoidance, vehicle-wildlife collisions, increased non-aboriginal hunting pressure and other Project related impacts on wildlife populations.

[D] Provide a strategy and mitigation plan to minimize impacts on wildlife and wildlife habitat for all stages of the Project and to return productive wildlife habitat to the area, considering:

a) consistency of the plan with applicable regional, provincial and federal wildlife habitat objectives and policies;
b) a schedule for the return of habitat capability to areas impacted by the Project;
c) the use of setbacks to protect riparian habitats, interconnectivity of such habitat and the unimpeded movement by wildlife species using that habitat;

d) anticipated access controls or other management strategies to protect wildlife during and after Project operations;
e) measures to prevent habituation of wildlife to minimize the potential for human-wildlife encounters and consequent destruction of wildlife, including any staff training program, fencing camps, garbage containment measures or regular follow-up;
f) measures to mitigate habitat fragmentation considering impacts to habitat connectivity and wildlife movements resulting from linear features (e.g., above ground pipelines, roads etc.) and other Project infrastructure and activities; and
g) measures to minimize the impacts of light on wildlife.

3.9 BIODIVERSITY

[A] Describe any unique features of the Project Area that affect its biodiversity in comparison to the Local Study Area.

[B] Describe the changes to the biodiversity of the Project Area during operations and post-reclamation and the significance of these changes in a local and regional context.

3.9.1 Impact Assessment

[A] Discuss the mitigation measures proposed to minimize any anticipated changes in regional biodiversity.

3.10 TERRAIN AND SOILS

3.10.1 Baseline Information

[A] Describe and map the terrain and soils conditions in the Project Area.

[B] Describe and map soil types in the Study Area that could be affected by potential acidification.

3.10.2 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 resulting from disturbance for all stages of the Project;
c) identify the potential acidification impact on soils and discuss the significance of predicted impacts by acidifying emissions resulting from the Project; 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] Provide a mitigation plan to:

a) minimize surface disturbance including the use of existing clearings for the Project;
b) address potential effects of acid deposition;
c) mitigate changes to ground surface (temperature, heave and subsidence) during operations; and

d) address impacts to land capability.

3.11 LAND USE AND MANAGEMENT

3.11.1 Baseline Information

[A] Provide a description and timing of land clearing activities.

[B] Provide a timber salvage plan, highlighting end users and identifying proposed volumes for removal (by species and year) for all stages of the Project.

[C] 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.

[D] Identify the current land uses, including oil and gas development, agriculture, forestry, tourism, aboriginal uses and outdoor recreational activities.

[E] Identify and map all Crown land and Crown Reservations (Holding Reservation, Protective Notation, Consultative Notation).

[F] Identify and map unique sites or special features 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).

[G] Identify any land use policies and resource management initiatives that pertain to the Project, and discuss how the Project will be consistent with the intent of these initiatives.

3.11.2 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, decreased access to traditional use sites and facilitated predator movement;
c) the implications of relevant land use policies and resource management initiatives for the Project, including any constraints to development;
d) potential impacts to aggregate reserves that may be located on land under the Proponent's control and reserves in the region;
e) the impact of development and reclamation on commercial forest harvesting in the Project Area. Include opportunities for timber salvage, revegetation, reforestation and harvest for the reduction of fuel hazard;
f) the amount of commercial and non-commercial forest land base that will be disturbed by the Project. Compare the pre-disturbance and reclaimed percentages and distribution of all forested communities in the Project Area;
g) how the Project impacts Annual Allowable Cuts and quotas within the Forest Management Agreement area;
h) the potential impact on existing land uses of anticipated changes (type and extent) to the pre-disturbance topography, elevation and drainage pattern within the Project Area; and
i) impacts of the Project on public access, regional recreational activities, aboriginal land use and other land uses during and after development activities.

[B] Discuss possible mitigation strategies to address:

a) the need for, and plans to address, access management during and after Project operations;
b) the process for addressing the needs of other land users in both the Project Area and the Local Study Area;
c) measures to mitigate Project impacts on land use; and
d) how potentially-affected aggregate reserves will be salvaged and stockpiled with input provided by Alberta Transportation and Alberta Sustainable Resource Development.

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 implications 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 of traditional land use areas if the First Nation community or group is willing to have these locations disclosed;
b) a map of cabin sites, spiritual sites, graves and other traditional use sites considered historic resources under the *Historical Resources Act* (if the First Nation community or group is willing to have these locations disclosed), as well as traditional trails and resource activity patterns;
c) a description of the extent of traditional use of land in both the Project Area and the Local Study Area, including fishing, hunting, trapping, nutritional or medicinal plant harvesting, and cultural use by affected First Nation peoples; and
d) a discussion of:
    i) access to traditional lands in the Project Area during all stages of the Project,
    ii) the vegetation and wildlife used for traditional, food, ceremonial, medicinal and other purposes, and
    iii) First Nation views on land reclamation.

[B] Determine the impact of the Project on traditional uses and culture and identify possible mitigation strategies.

6 PUBLIC HEALTH AND SAFETY ASSESSMENT

[A] Describe those aspects of the Project that may have implications for public health or the delivery of regional health services. Determine whether there may be implications for public health arising from the Project. Specifically:

a) assess the potential health implications of the compounds that will be released to the environment from the Project in relation to exposure limits established to prevent acute and chronic adverse effects on human health;
b) provide the data, exposure modeling calculations, and describe the methods the Proponent used to assess impacts of the Project on human health and safety;
c) provide information, including chemical analyses and modeling results, on samples of selected environmental media (e.g., soil, water, air, vegetation, wild game, etc.) used in the assessment;
d) discuss the potential for changes to water quality, air quality and soil quality to increase human exposure to contaminants taking into consideration all Project activities;
e) identify the human health impact of the potential contamination of country foods and natural food sources taking into consideration all Project activities;

f) document any health concerns raised by stakeholders during consultation on the Project;
g) 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;
h) assess the cumulative human health impacts to receptors, including First Nations and Métis receptors;
i) as appropriate, describe anticipated follow-up work, including regional cooperative studies. Discuss how such work will be implemented and coordinated with ongoing air, soil and water quality initiatives;
j) describe the potential health impacts resulting from higher regional traffic volumes and the increased risk of accidental leaks and spills; and
k) discuss mitigation strategies to minimize the potential impact of the Project on human health.

[B] Describe those aspects of the Project that may have implications for public safety. Determine whether there may be implications for public safety arising from the Project. Specifically:

a) describe Ivanhoe'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) Ivanhoe's policies and programs regarding the use of regional and Alberta goods and services;
c) a project schedule and a general description of the overall engineering and contracting plan for the Project;
d) workforce requirements for the Project, including a description of when peak activity periods will occur; and
e) planned accommodations for the workforce for all stages of the Project.

7.2 IMPACT ASSESSMENT

[A] Describe the socio-economic effects of construction and operation of the Project, including:

a) impacts related to:
    i) housing,
    ii) recreational activities,
    iii) hunting, fishing, trapping and gathering, and
    iv) effects on First Nations and Métis (e.g., traditional land use and social and cultural implications).
b) 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.

[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] Discuss options for mitigating impacts including:

a) Ivanhoe's policies and programs regarding the use of regional and Alberta goods and services;
b) plans to work with First Nations and Métis communities and groups and other local residents and businesses regarding employment, training needs, and other economic development opportunities arising from the Project;
c) steps that have been undertaken by industry, the municipality, provincial government or through regional and cooperative initiatives to address socio-economic concerns and impacts to local and regional transportation infrastructure;
d) the potential to avoid overlap with other Projects that are reasonably anticipated during all stages of the Project; and
e) strategies to mitigate socio-economic concerns raised by the local municipality and other stakeholders in the region.

8 RESIDUAL IMPACTS

[A] Describe the residual effects of the Project following implementation of the Proponent's mitigation measures and Ivanhoe's plans to manage those effects.

9 MONITORING

[A] Describe Ivanhoe's current and proposed monitoring programs with respect to:

a) source air emissions, including fugitive emissions;
b) wastewater treatment and release; and
c) hazardous and non-hazardous waste treatment and storage.

[B] Describe the monitoring programs proposed to assess any Project impacts to wildlife, fisheries and vegetation and to measure the effectiveness of mitigation plans, giving special attention to those species:

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.

[C] Discuss Ivanhoe's regional monitoring activities including:

a) monitoring that will be undertaken to assist in managing environmental effects, confirm performance of mitigative measures and improve environmental protection strategies;
b) monitoring done independently by the Proponent;
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) how monitoring data will be disseminated to the public or other interested parties; and

b) how the results of monitoring programs and publicly available monitoring information will be integrated with the Proponent's environmental management system.