

**APPLICATION FOR APPROVAL OF THE  
BLACKGOLD EXPANSION PROJECT  
*VOLUME 2 – ENVIRONMENTAL IMPACT ASSESSMENT***

Submitted to:  
**Energy Resources Conservation Board**  
*and*  
**Alberta Environment**

Submitted by:  
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Korea  
National Oil Corporation

## **Executive Summary**

*This section has been reissued in [Volume 4](#)*

## CONCORDANCE TABLE

Terms of Reference Section	Topic	Ref. Section in Application	Ref. Section in Supporting Documents
<b>1</b>	<b>PUBLIC ENGAGEMENT AND ABORIGINAL CONSULTATION</b>		
	[A]	Vol. 1, Sec. 4.3 and 4.4	Vol. 1, Attach. 2
	a)		
	b)		
	c)		
	[B]	Vol. 1, Sec. 4.4	Vol. 1, Attach.2
	a)		
	b)		
	c)		
	d)		
	[C]	Vol. 1, Sec. 4.5	
<b>2</b>	<b>PROJECT DESCRIPTION</b>		
<b>2.1</b>	<b>The Proponent</b>		
	[A]	Vol. 1, Sec. 1.1 and 1.2	
	a)		
	b)		
	[B]	Vol. 1, Sec. 1.2, 1.3 and 1.5	

Terms of Reference Section	Topic	Ref. Section in Application	Ref. Section in Supporting Documents
<b>2.2</b>	<b>Project Development</b>		
[A]	Provide a development plan that includes: <ul style="list-style-type: none"> <li>a) the phases of development;</li> <li>b) bitumen/heavy oil recovery facilities;</li> <li>c) processing facilities;</li> <li>d) steam and/or power generation facilities;</li> <li>e) infrastructure (pipelines, access roads and power lines);</li> <li>f) other buildings and structures;</li> <li>g) field maintenance operations; and</li> <li>h) activities associated with each stage of the Project.</li> </ul>	Vol. 1, Sec. 2.0	
[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.	Vol. 1, Sec. 1.6	
[C]	Discuss the key factors controlling the schedule, restrictions for conducting certain development activities, and uncertainties.	Vol. 1, Sec. 1.6	
<b>2.3</b>	<b>Evaluation of Alternatives</b>		
<b>2.3.1</b>	<b>Project Alternatives</b>		
[A]	Discuss the need for the Project including: <ul style="list-style-type: none"> <li>a) any alternative means of carrying out the Project that are technically and economically feasible and where applicable indicate their potential environmental effects and impacts;</li> <li>b) a comparison of identified alternatives to the Project or components of the Project and the anticipated effects and impacts of the alternatives. Discuss reasons for not selecting any identified alternatives;</li> <li>c) implications resulting from a delay in proceeding with the Project, or any phase of the Project; and</li> <li>d) potential cooperative development opportunities (e.g., shared infrastructure).</li> </ul>	Vol. 1, Sec. 1.5	
[B]	Discuss the implications of not going ahead with the Project.	Vol. 1, Sec. 1.5	

Terms of Reference Section	Topic	Ref. Section in Application	Ref. Section in Supporting Documents	
2.3.2	<b>Process and Infrastructure Alternatives</b>			
	[A]	Describe the process and criteria used to select sites for facilities and infrastructure.	Vol. 1, Sec. 2.1	
	[B]	Discuss the route or site selection criteria for any linear or other infrastructure development or modification and provide the rationale for selecting the proposed alignment and design.	Vol. 1, Sec. 2.1	
	[C]	Discuss the options considered for supplying the thermal energy and electric power required for the Project and their environmental implications. Discuss the implications that alternate fuel sources may have on the selection of pollution abatement equipment or technologies.	Vol. 1, Sec. 2.3	
	[D]	Describe the criteria and rationale for selecting the preferred water supply sources. Include options for using saline groundwater and the criteria used to assess the feasibility of its use.	Vol. 1, Sec. 2.6	
	[E]	Discuss the potential for new or additional technology to increase resource recovery at later times in the field development and to affect the number of wells required.	Vol. 1, Sec. 2.2 and 2.3	
	[F]	Discuss options and technologies considered for wastewater treatment, wastewater management and wastewater disposal and reasons, including water quality and environmental considerations for selecting the preferred options in the context of best management practices and best available technologies.	Vol. 1, Sec. 2.7	
	[G]	Discuss options and technologies considered for air emission and air quality management and the evaluation of emission minimization options, including air emission control technology considerations, for selecting the preferred options in the context of best management practices and best available technologies.	Vol. 1, Sec. 2.5	
	[H]	Discuss the waste disposal options. Discuss the strategy for on-site waste disposal versus off-site waste disposal and identify: <ul style="list-style-type: none"> <li>a) the location of on-site waste disposal;</li> <li>b) the availability of off-site waste disposal facilities;</li> <li>c) site suitability from a groundwater protection perspective;</li> <li>d) site suitability from a geotechnical perspective; and</li> <li>e) site suitability with regard to existing and potential human activities in the area.</li> </ul>	Vol. 1, Sec. 2.7	

Terms of Reference Section	Topic	Ref. Section in Application	Ref. Section in Supporting Documents
2.4	<b>Project Processes and Facilities</b>		
[A]	Provide maps and/or drawings of the Project components and activities including: <ul style="list-style-type: none"> <li>a) existing infrastructure, leases and clearings, including exploration clearings;</li> <li>b) proposed central processing/treatment and field facilities;</li> <li>c) other buildings and infrastructure (pipelines and utilities);</li> <li>d) temporary structures;</li> <li>e) transportation and access routes;</li> <li>f) on-site hydrocarbon storage;</li> <li>g) containment structures such as retention ponds and storage ponds (e.g., lime sludge, stormwater runoff, boiler blow-down);</li> <li>h) water wells/intakes, pipelines, and storage structures;</li> <li>i) sources of aggregate resources, borrow material and other construction material and locations of any stockpiles that will be developed; and</li> <li>j) waste storage area and disposal sites.</li> </ul>	Vol. 1, Fig. 1.3-1 and 1.3-2	
[B]	Provide a list of facilities for which locations will be determined later.	N/A	
[C]	Describe the primary resource recovery process, any proposed follow-up recovery process and other related processes and process facilities of the Project.	Vol. 1, Sec. 2.2	
[D]	Discuss the amount and source of energy required for the Project.	Vol. 1, Sec. 2.3	
[E]	Describe the proposed method to transport product to markets.	Vol. 1, Sec. 2.3 and 2.4	
[F]	Provide a listing 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: <ul style="list-style-type: none"> <li>a) <i>Canadian Environmental Protection Act, 1999</i> toxics;</li> <li>b) listed on the National Pollutant Release Inventory;</li> <li>c) dangerous goods as defined by the federal <i>Transportation of Dangerous Goods Act</i>, and</li> <li>d) on the Domestic Substances List and categorized as requiring further assessment under Canada's Chemicals Management Plan.</li> </ul>	Vol. 1, Sec. 2.7	
[G]	Describe the nature and amount of on-site hydrocarbon storage. Discuss containment and other environmental protection measures.	Vol. 1, Sec. 2.3	

Terms of Reference Section	Topic	Ref. Section in Application	Ref. Section in Supporting Documents
2.5	<b>Transportation Infrastructure</b>		
	[A] Provide a summary of any Traffic Impact Assessment study carried out for the Project, or where no Traffic Impact Assessment study has been conducted, describe the anticipated changes to traffic (e.g., type, volume) on highways, including an assessment of impacts for all stages of the Project. Consider other existing and planned uses of the same highway.	Vol. 2, Sec. 17.6	
	[B] 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.	Vol. 1, Sec. 2.3 and 2.4	
	[C] Identify the type, volume, location and availability of road 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.	Vol. 1, Sec. 3.4	
	[D] Describe access corridors needed and/or planned by other resource development stakeholders including those responsible for Forest Management Areas and other timber quota holders, and  a) describe how their needs are accommodated to reduce overall environmental impact from resource development; and b) describe opportunities for cooperation in access development.	Vol. 1, Sec. 2.3	
	[E] Indicate where Crown land dispositions may be needed for roads or other infrastructure for the Project.	N/A	
	[F] Describe crossings of watercourses or waterbodies required and provide example diagrams of each type of crossing. Discuss:  a) timing; b) construction standards or methods; and c) environmental protection plans.	Vol. 1, Sec. 2.3 Vol. 2, Sec. 7.6	

Terms of Reference Section	Topic	Ref. Section in Application	Ref. Section in Supporting Documents	
2.6	<b>Land Management</b>			
	[A]	Provide a description and timing of land clearing activities.	Vol. 1, Sec. 1.6	
	[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.	Vol. 1, Sec. 3.4	
	[C]	Identify any access restrictions including where appropriate, measures taken to control access to the Project Area while ensuring continued access to adjacent wildland areas.	Vol. 1, Sec. 2.4	
	[D]	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.	Vol. 1, Sec. 2.8	
2.7	<b>Air Emissions Management</b>			
	[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 and discuss how it compares with similar projects; d) the Project's contribution to total provincial and national greenhouse gas emissions on an annual basis; e) KNOC'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;	Vol. 1, Sec. 2.5	



Terms of Reference Section		Topic	Ref. Section in Application	Ref. Section in Supporting Documents
2.7 (cont)	l)	applicability of sulphur recovery, acid gas re-injection or flue gas desulphurization to reduce sulphur emissions; and	Vol. 1, Sec. 2.5	
	m)	fugitive emissions control technology to detect, measure and control emissions and odours from equipment leaks.		
2.8	<b>Water Management</b>			
	[A]	Discuss potential cooperation with other parties regarding water related infrastructure and management including, but not limited to, water intakes, pipelines, water storage and withdrawals, flow monitoring and reporting and ecological monitoring.	Vol. 1, Sec. 2.6	
2.8.1	<b>Water Supply</b>			
	[A]	Describe the water supply requirements for the Project, including: <ul style="list-style-type: none"> <li>a) the expected water balance during all stages of the Project. Discuss assumptions made or methods chosen to arrive at the water balances;</li> <li>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;</li> <li>c) the location of sources/intakes and associated infrastructure (e.g., pipelines for water supply);</li> <li>d) the variability in the amount of water required on an annual and seasonal basis as the Project is implemented;</li> <li>e) the expected cumulative effects on water losses/gains resulting from the Project operations;</li> <li>f) potable water treatment systems for all stages of the Project;</li> <li>g) type and quantity of potable water treatment chemicals used; and</li> <li>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.</li> </ul>	Vol. 1, Sec. 2.6	

Terms of Reference Section	Topic	Ref. Section in Application	Ref. Section in Supporting Documents	
2.8.2	<b>Surface Water</b>			
	[A]	Describe the surface water management strategy for all stages of the Project, including: <ul style="list-style-type: none"> <li>a) design factors considered, such as:               <ul style="list-style-type: none"> <li>i) site drainage,</li> <li>ii) run-on management,</li> <li>iii) road, well pad and plant run-off;</li> <li>iv) erosion and sediment control,</li> <li>v) groundwater and surface water protection,</li> <li>vi) groundwater seepage,</li> <li>vii) produced water management,</li> <li>viii) flood protection, and</li> <li>viii) geotechnical stability concerns; and</li> </ul> </li> <li>b) permanent or temporary alterations or realignments of watercourses, wetlands and other waterbodies.</li> </ul>	Vol. 1, Sec. 2.6	
	[B]	Provide a description of navigable waterways and the results of navigability assessment(s) for waterways that may be affected by the Project.	Vol. 2, Sec. 7.6	
2.8.3	<b>Wastewater Management</b>			
	[A]	Describe the wastewater management strategy, including: <ul style="list-style-type: none"> <li>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;</li> <li>b) the proposed disposal locations and methods for each wastewater stream;</li> <li>c) formations for the disposal of wastewaters;</li> <li>d) design of facilities that will collect, treat, store and release wastewater streams;</li> <li>e) type and quantity of chemicals used in wastewater treatment; and</li> <li>f) sewage treatment, disposal and the anticipated quality of wastewater effluent.</li> </ul>	Vol. 1, Sec. 2.6	
2.9	<b>Waste Management</b>			
	[A]	Characterize and quantify the anticipated dangerous goods, and hazardous, non-hazardous, and recyclable wastes generated by the Project, and: <ul style="list-style-type: none"> <li>a) describe the composition and volume of specific waste streams and discuss how each stream will be managed;</li> <li>b) identify the amount of drilling wastes and the options considered for disposal and the option(s) chosen;</li> </ul>	Vol. 1, Sec. 2.7	

Terms of Reference Section	Topic	Ref. Section in Application	Ref. Section in Supporting Documents
2.9 (cont)	<ul style="list-style-type: none"> <li>c) describe how the disposal sites and sumps will be constructed; and</li> <li>d) describe plans for pollution prevention, waste minimization, recycling, and management to reduce waste quantities for all stages of the Project.</li> </ul>	Vol. 1, Sec. 2.7	
2.10	<p><b>Conservation and Reclamation</b></p> <p>[A] Provide a conceptual conservation and reclamation plan for the Project considering:</p> <ul style="list-style-type: none"> <li>a) any existing Conservation and Reclamation Plan;</li> <li>b) existing information with respect to land capability, vegetation, commercial forest land base by commercialism class, forest productivity, recreation, wildlife, aquatic resources, aesthetics, and land use resources;</li> <li>c) integration of operations, decommissioning, reclamation planning and reclamation activities;</li> <li>d) 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;</li> <li>e) constraints to reclamation such as timing of activities, availability of reclamation materials and influence of natural processes and cycles including natural disturbance regimes;</li> <li>f) post-development land capability with respect to:               <ul style="list-style-type: none"> <li>i) self-sustaining topography, drainage and surface watercourses representative of the surrounding area,</li> <li>ii) existing traditional use with consideration for traditional vegetation and wildlife species in the reclaimed landscape,</li> <li>iii) wetlands,</li> <li>iv) self-sustaining vegetation communities representative of the surrounding area, and</li> <li>v) reforestation and forest productivity;</li> </ul> </li> <li>g) a revegetation plan for the disturbed terrestrial and aquatic areas;</li> <li>h) reclamation material salvage, storage areas and handling procedures;</li> <li>i) reclamation material replacement indicating depth, volume and type;</li> <li>j) existing and final reclaimed site drainage plans;</li> <li>k) integrating surface and near-surface drainage within the Project Area; and</li> <li>l) promotion of biodiversity.</li> </ul>	Vol. 1, Sec. 3.0	

Terms of Reference Section		Topic	Ref. Section in Application	Ref. Section in Supporting Documents
2.10 (cont)	[B]	Provide a predicted Ecological Land Classification map for the post-reclamation landscape considering potential land uses, including traditional uses, and how the landscape and soils have been designed to accommodate future land use.	Vol. 1, Sec. 3.4	Vol. 1, Attach.1
	[C]	Provide a conceptual plan to monitor reclamation performance and success (including soils, vegetation, wildlife and aquatic resources).	Vol. 1, Sec. 3.5	
	[D]	Discuss uncertainties related to the conceptual reclamation plan.	Vol. 1, Sec. 3.4	
2.11	<b>Environmental Management Systems</b>			
	[A]	Summarize key elements of KNOC's existing or proposed environment, health and safety management system.	Vol. 1, Sec. 2.5 to 2.8	
	[B]	Describe adaptive management plans that minimize the impact of the Project. Describe the flexibility built into the Project to accommodate future modifications required as a result of: a) any change in environmental standards, limits and guidelines; or b) findings from Project-specific regional monitoring programs.	Vol. 1, Sec. 3.4	
	[C]	Describe KNOC'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.	Vol. 1, Sec. 2.5, 2.7 and 3.5	
	[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 KNOC's environmental management system.	Vol. 1, Sec. 2.5, 2.7, 2.8 and 3.5	
2.12	<b>Regional and Cooperative Initiatives</b>			
	[A]	Discuss KNOC's involvement in regional and cooperative efforts to address environmental and socio-economic issues associated with regional development, including: a) potential cooperative ventures that KNOC has initiated, could initiate or could develop with other operators and other resource users; b) how KNOC will work to develop and implement such cooperative opportunities; c) KNOC's participation in any regional forums; d) how KNOC would design and implement research programs; and e) how regional environmental management initiatives will be incorporated into KNOC's management practices.	Vol. 1, Sec. 3.2	

Terms of Reference Section		Topic	Ref. Section in Application	Ref. Section in Supporting Documents
2.12 (cont)	[B]	Discuss KNOC's regional monitoring activities including:	Vol. 1, Sec. 3.2	
	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 KNOC;		
	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.		
3	<b>ENVIRONMENTAL ASSESSMENT</b>			
3.1	<b>Air Quality, Climate and Noise</b>			
3.1.1	<b>Baseline Information</b>			
	[A]	Discuss the baseline climatic and air quality conditions including:	Vol. 4, Sec. 4.5	Vol. 4, App. B
	a)	the type and frequency of meteorological conditions that may result in poor air quality; and		
b)	appropriate ambient air quality parameters.			
	[B]	Provide representative baseline noise levels at receptor locations.	Vol. 2, Sec. 5.5	
3.1.2	<b>Impact Assessment</b>			
	[A]	Identify components of the Project that will affect air quality, and:	Vol. 4, Sec. 4.6	Vol 4, App. B
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;			
e)	discuss interactive effects that may occur resulting from co-exposure of a receptor to all emissions; and			
f)	describe air quality impacts resulting from the Project, and their implications for other environmental resources, including habitat diversity and quantity, soil resources, vegetation resources, and water quality.			



Terms of Reference Section		Topic	Ref. Section in Application	Ref. Section in Supporting Documents
3.1.2 (cont)	[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.	Vol. 4, Sec. 4.6	
	[C]	Identify components of the Project that have the potential to increase noise levels and discuss the implications. Present the results of a noise assessment. Include: 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.	Vol. 2, Sec. 5.6	
	[D]	Describe how air quality and noise impacts resulting from the Project will be mitigated.	Vol. 4, Sec. 4.6 Vol. 2, Sec. 5.6	
	[E]	Describe the residual air quality and noise effects of the Project and KNOC's plans to manage those effects.	Vol. 4, Sec. 4.6 Vol. 2, Sec. 5.6	
3.1.3	<b>Monitoring</b>			
	[A]	Describe the monitoring programs proposed to assess any Project impacts to air quality and noise and to measure the effectiveness of mitigation.	Vol. 4, Sec. 4.8 Vol. 2, Sec. 5.6	
	[B]	Describe any monitoring programs proposed to monitor the effects of acid deposition.	Vol. 4, Sec. 4.8	
3.2	<b>Hydrogeology</b>			
3.2.1	<b>Baseline Information</b>			
	[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;	Vol. 4, Sec. 6.5	Vol. 3, App. C Vol. 4, App. C

Terms of Reference Section	Topic	Ref. Section in Application	Ref. Section in Supporting Documents
3.2.1 (cont)	b) present regional and Project Area hydrogeology describing: <ul style="list-style-type: none"> <li>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,</li> <li>ii) the chemistry of groundwater aquifers including baseline concentrations of major ions, metals and hydrocarbon indicators,</li> <li>iii) the potential discharge zones, potential recharge zones and sources, areas of groundwater-surface water interaction and areas of Quaternary aquifer-bedrock groundwater interaction,</li> <li>iv) water well development and groundwater use, including an inventory of groundwater users,</li> <li>v) the recharge potential for Quaternary aquifers,</li> <li>vi) potential hydraulic connection between bitumen production zones, deep disposal formations and other aquifers resulting from Project operations,</li> <li>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</li> <li>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.</li> </ul>	Vol. 4, Sec. 6.5	
3.2.2	<b>Impact Assessment</b>		
	[A] Describe Project components and activities that have the potential to affect groundwater resource quantity and quality at all stages of the Project.	Vol. 4, Sec. 6.6	
	[B] Describe the nature and significance of the potential Project impacts on groundwater with respect to: <ul style="list-style-type: none"> <li>a) inter-relationship between groundwater and surface water in terms of surface water quantity and quality;</li> <li>b) implications for terrestrial or riparian vegetation, wildlife and aquatic resources including wetlands;</li> <li>c) changes in groundwater quality and quantity;</li> <li>d) conflicts with other groundwater users, and proposed resolutions to these conflicts;</li> <li>e) potential implications of seasonal variations; and</li> <li>f) groundwater withdrawal for Project operations, including any expected alterations in the groundwater flow regime during and following Project operations.</li> </ul>	Vol. 4, Sec. 6.6 and 6.7	



Terms of Reference Section		Topic	Ref. Section in Application	Ref. Section in Supporting Documents
3.2.2 (cont)	[C] a) b)	Describe programs to manage and protect groundwater resources including: the early detection of potential contamination; and groundwater remediation options in the event that adverse effects are detected.	Vol. 4, Sec. 6.6	
	[D]	Identify measures to reduce the environmental risks from casing failures.	Vol. 4, Sec. 6.6	
	[E]	Describe the residual effects of the Project on groundwater quality and quantity and KNOC's plans to manage those effects.	Vol. 4, Sec. 6.6	
3.2.3	<b>Monitoring</b>			
	[A]	Describe the monitoring programs proposed to assess any Project impacts to groundwater quality and quantity and to measure the effectiveness of mitigation plans.	Vol. 4, Sec. 6.8	
3.3	<b>Hydrology</b>			
3.3.1	<b>Baseline Information</b>			
	[A]	Describe and map the surface hydrology. Include flow regimes of streams in the Project Area.	Vol. 2, Sec. 7.5	
	[B] a) b)	Provide surface flow baseline data, including: seasonal variation, low, average and peak flows for watercourses, and low, average and peak levels for waterbodies.	Vol. 2, Sec. 7.5	
	[C]	Identify any surface water users who have existing approvals, permits or licenses.	Vol. 2, Sec. 7.5	
3.3.2	<b>Impact Assessment</b>			
	[A]	Discuss changes to watersheds, including surface and near-surface drainage conditions, potential flow impediment, and potential changes in open-water surface areas caused by the Project.	Vol. 2, Sec. 7.6	
	[B] a) b)	Describe the extent of hydrological changes that will result from disturbances to groundwater and surface water movement: 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; 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;	Vol. 2, Sec. 7.6	





Terms of Reference Section	Topic	Ref. Section in Application	Ref. Section in Supporting Documents	
3.3.2 (cont)	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	Vol. 2, Sec. 7.6	
	d)	identify any potential erosion problems in watercourses resulting from the Project.		
	[C]	Discuss changes in sedimentation patterns in receiving waters resulting from the Project.	Vol. 2, Sec. 7.6	
	[D]	Describe impacts on other surface water users resulting from the Project. Identify any potential water use conflicts.	Vol. 2, Sec. 7.6	
	[E]	Describe potential downstream impact if surface water is removed.	Vol. 2, Sec. 7.6	
	[F]	Discuss the impact of low flow conditions and in-stream flow needs on water supply and water and wastewater management strategies.	Vol. 2, Sec. 7.6	
	[G]	Discuss how potential impacts of temporary and permanent roads and wellpads on wetland hydrology will be minimized and mitigated.	Vol. 2, Sec. 7.6	
	[H]	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.	Vol. 2, Sec. 7.6	
	[I]	Describe residual effects of the Project on hydrology and KNOC's plans to manage those effects.	Vol. 2, Sec. 7.6	
3.3.3	<b>Monitoring</b>			
	[A]	Describe the monitoring programs proposed to assess the impacts of changes in surface water flows and levels on aquatic resources, wildlife and vegetation and to measure the effectiveness of mitigation plans.	Vol. 2, Sec. 7.6	
3.4	<b>Surface Water Quality</b>			
3.4.1	<b>Baseline Information</b>			
	[A]	Describe the baseline water quality of watercourses and waterbodies. Discuss the effects of seasonal variations, flow and other factors on water quality.	Vol. 4, Sec. 8.5	Vol. 4, App. D
3.4.2	<b>Impact Assessment</b>			
	[A]	Identify Project components that may influence or impact surface water quality.	Vol. 4, Sec. 8.6	

Terms of Reference Section		Topic	Ref. Section in Application	Ref. Section in Supporting Documents
3.4.2 (cont)	[B]	Describe the potential impacts of the Project on surface water quality:		
	a)	discuss any changes in water quality resulting from the Project that may exceed the <i>Surface Water Quality Guidelines for Use in Alberta</i> or the <i>Canadian Water Quality Guidelines</i> ;	Vol. 4, Sec. 8.6	Vol. 4, App. D
	b)	discuss the significance of any impacts on water quality and implications to aquatic resources (e.g., biota, biodiversity and habitat);		
c)	discuss seasonal variation and potential effects on surface water quality;			
d)	assess the potential Project related and cumulative impacts of acidifying and other air emissions on surface water quality; and			
e)	discuss the effect of changes in surface runoff or groundwater discharge on water quality in surface waterbodies.			
[C]	Describe proposed mitigation measures to maintain surface water quality at all stages of the Project.	Vol. 4, Sec. 8.6		
[D]	Describe the residual effects of the Project on surface water quality and KNOC's plans to manage those effects.	Vol. 4, Sec. 8.6		
3.4.3	<b>Monitoring</b>			
[A]	Describe the monitoring programs proposed to assess any Project impacts to surface water quality and to measure the effectiveness of mitigation plans.	Vol. 4, Sec. 8.8		
3.5	<b>Aquatic Ecology</b>			
3.5.1	<b>Baseline Information</b>			
[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.	Vol. 2, Sec. 9.5		
[B]	Describe and map, as appropriate, the fish habitat and aquatic resources of the lakes, rivers, ephemeral waterbodies and other waters and identify:	Vol. 2, Sec. 9.5		
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.	Vol. 2, Sec. 9.5		

Terms of Reference Section	Topic	Ref. Section in Application	Ref. Section in Supporting Documents
3.5.2	<b>Impact Assessment</b>		
	<p>[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:</p> <ul style="list-style-type: none"> <li>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;</li> <li>b) potential impacts on riparian areas that could affect aquatic biological resources and productivity;</li> <li>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 effects, including any plans to restrict employee and visitor access;</li> <li>d) changes to benthic invertebrate communities that may affect food quality and availability for fish; and</li> <li>e) the potential for increased fragmentation of aquatic habitat.</li> </ul>	Vol. 2, Sec. 9.6	
	[B] Discuss the design, construction and operational factors to be incorporated into the Project to minimize effects to fish and fish habitat and protect aquatic resources. Describe how any water intakes have been designed to avoid entrapment and entrainment of fish and provide information on the species of fish considered.	Vol. 2, Sec. 9.6	
	[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.	Vol. 2, Sec. 9.6	
	[D] Describe the effects of any surface water withdrawals considered including cumulative effects on fish, fish habitat and other aquatic resources.	Vol. 2, Sec. 9.6	
	[E] Describe the residual effects of the Project on fish, fish habitat, and other aquatic resources and discuss their significance in the context of local and regional fisheries. Describe KNOC’s plans to manage those effects.	Vol. 2, Sec. 9.6	
3.5.3	<b>Monitoring</b>		
	[A] Describe the monitoring programs proposed to assess any Project impacts to fish, fish habitat and other aquatic resources and to measure the effectiveness of mitigation plans.	Vol. 2, Sec. 9.6	



Terms of Reference Section	Topic	Ref. Section in Application	Ref. Section in Supporting Documents
<b>3.6</b>	<b>Vegetation</b>		
<b>3.6.1</b>	<b>Baseline Information</b>		
[A]	Describe and map vegetation communities for each ecosite phase.	Vol. 2, Sec. 11.5	Vol. 3, App. F
[B]	Describe and map wetlands and discuss their distribution and relative abundance.	Vol. 2, Sec. 11.5	Vol. 3, App. F
[C]	Identify, verify and map the relative abundance of species of rare plants and the ecosite phases where they are found.	Vol. 2, Sec. 11.5	Vol. 3, App. F
[D]	Quantitatively describe the current extent of habitat fragmentation.	Vol. 2, Sec. 11.5	
[E]	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 <i>The Status of Alberta Species</i> (Alberta Sustainable Resource Development) and all species listed in Schedule 1 of the federal <i>Species at Risk Act</i> .	Vol. 2, Sec. 11.5	Vol. 3, App. F
[F]	Discuss the potential of each ecosite phase to support rare plant species, plants for traditional, medicinal and cultural purposes, old growth forests and communities of limited distribution. Consider their importance for local and regional habitat, sustained forest growth, rare plant habitat and the hydrologic regime.	Vol. 2, Sec. 11.5	Vol. 3, App. F
[G]	Describe the regional relevance of landscape units that are identified as rare.	Vol. 2, Sec. 11.5	
[H]	Provide Timber Productivity Ratings for both the Project Area and the Local Study Area, including identification of productive forested, non-productive forested and non-forested lands.	Vol. 2, Sec. 14.5	
<b>3.6.2</b>	<b>Impact Assessment</b>		
[A]	Identify the amount of vegetation and wetlands to be disturbed for all stages of the Project.	Vol. 2, Sec. 11.6	
[B]	Discuss any potential effects the Project may have on rare plants or endangered species.	Vol. 2, Sec. 11.6	
[C]	Discuss temporary (include timeframe) and permanent changes to vegetation and wetland communities and comment on: <ul style="list-style-type: none"> <li>a) the effects and their implications for other environmental resources (e.g., habitat diversity and quantity, water quality and quantity, erosion potential);</li> <li>b) the effects and their implications to recreation, aboriginal and other uses; and</li> <li>c) the sensitivity to disturbance (including acid deposition), as well as the techniques used to estimate sensitivity to disturbance and reclamation, of each vegetation community.</li> </ul>	Vol. 2, Sec. 11.6	
[D]	Describe the regional impact of any ecosite phase to be removed.	Vol. 2, Sec. 11.6	



Terms of Reference Section	Topic	Ref. Section in Application	Ref. Section in Supporting Documents	
3.6.2 (cont)	[E]	Discuss from an ecological perspective, the expected timelines for establishment and recovery of vegetative communities and the expected differences in the resulting vegetative community structures.	Vol. 1, Sec. 3.4	
	[F]	Provide a predicted Ecological Land Classification map that shows the reclaimed vegetation. Comment on the importance of the size, distribution and variety of the reclaimed landscape units from both a local and regional perspective.	Vol. 1, Sec. 3.4	
	[G]	Discuss the impact of any loss of wetlands, including how the loss will affect land use.	Vol. 2, Sec. 11.6	
	[H]	Provide a mitigation strategy that will minimize Project impacts addressing:	Vol. 2, Sec. 11.6	
	a)	mitigation of the adverse effects of site clearing on rare plants, plant communities and plants for traditional, medicinal and cultural purposes. Identify any setbacks proposed around environmentally-sensitive areas such as surface waterbodies, riparian areas and wetlands; and		
	b)	measures and techniques that will be used to minimize the impact of loss of wetlands on land use.		
	[I]	Discuss weeds and non-native invasive species and describe how these species will be assessed and controlled prior to and during operation and reclamation.	Vol. 2, Sec. 11.6	
[J]	Discuss at multiple spatial scales, the predicated changes to upland, riparian and wetland habitats resulting from increased fragmentation.	Vol. 2, Sec. 13.6		
[K]	Describe the residual effects of the Project on vegetation and KNOC's plans to manage those effects.	Vol. 2, Sec. 11.6		
3.6.3	<b>Monitoring</b>			
[A]	Describe the monitoring programs proposed to assess any Project impacts to vegetation, wetlands and riparian areas and to measure the effectiveness of mitigation plans.	Vol. 1, Sec. 3.5		
3.7	<b>Wildlife</b>			
3.7.1	<b>Baseline Information</b>			
[A]	Describe and map existing wildlife resources (amphibians, reptiles, birds and terrestrial and aquatic mammals) and their use and potential use of habitats.	Vol. 2, Sec. 12.5	Vol. 3, App. G	
[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:	Vol. 2, Sec. 12.5	Vol. 3, App. G	

Terms of Reference Section		Topic	Ref. Section in Application	Ref. Section in Supporting Documents	
3.7.1 (cont)	a)	listed as “at Risk, May be at Risk and Sensitive” in <i>The Status of Alberta Species</i> (Alberta Sustainable Resource Development);	Vol. 2, Sec. 12.5		
	b)	listed in Schedule 1 of the federal <i>Species at Risk Act</i> , 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.	Vol. 2, Sec. 12.5		
3.7.2	<b>Impact Assessment</b>				
		[A]	Describe Project components and activities that may affect wildlife and wildlife habitat.	Vol. 2, Sec. 12.6	
		[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: <ul style="list-style-type: none"> <li>a) how the Project will affect wildlife relative abundance, movement patterns, distribution and recruitment into regional populations for all stages of the Project;</li> <li>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;</li> <li>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;</li> <li>d) the spatial and temporal changes to habitat availability and habitat effectiveness (types, quality, quantity, diversity and distribution);</li> <li>e) potential effects on wildlife resulting from changes to air and water quality, including both acute and chronic effects to animal health;</li> <li>f) potential effects on wildlife from KNOC’s proposed and planned exploration, seismic and core hole activities, including monitoring/4D seismic;</li> <li>g) the resilience and recovery capabilities of wildlife populations and habitats to disturbance; and</li> <li>h) the potential for the Project Area to be returned to its existing state with respect to wildlife populations and their habitats.</li> </ul>	Vol. 2, Sec. 12.6	
		[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 effects on wildlife populations.	Vol. 2, Sec. 16.5	

Terms of Reference Section		Topic	Ref. Section in Application	Ref. Section in Supporting Documents
3.7.2 (cont)	[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: <ul style="list-style-type: none"> <li>a) consistency of the plan with applicable regional, provincial and federal wildlife habitat objectives and policies;</li> <li>b) a schedule for the return of habitat capability to areas impacted by the Project;</li> <li>c) the use of setbacks to protect riparian habitats, interconnectivity of such habitat and the unimpeded movement by wildlife species using that habitat;</li> <li>d) anticipated access controls or other management strategies to protect wildlife during and after Project operations;</li> <li>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;</li> <li>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</li> <li>g) measures to minimize the effects of light on wildlife.</li> </ul>	Vol. 2, Sec. 16.6	
	[E]	Describe the residual effects of the Project on wildlife and wildlife habitat and KNOC's plans to manage those effects.	Vol. 2, Sec. 12.6	
3.7.3	<b>Monitoring</b>			
	[A]	Describe the monitoring programs proposed to assess any Project impacts to wildlife and to measure the effectiveness of mitigation plans, giving special attention to those species <ul style="list-style-type: none"> <li>a) listed as "at Risk, May be at Risk and Sensitive" in <i>The Status of Alberta Species</i> (Alberta Sustainable Resource Development);</li> <li>b) listed in Schedule 1 of the federal <i>Species at Risk Act</i>, and</li> <li>c) listed as "at risk" by COSEWIC.</li> </ul>	Vol. 2, Sec. 12.7	
3.8	<b>Biodiversity</b>			
3.8.1	<b>Baseline Information</b>			
	[A]	Describe the terrestrial and aquatic biodiversity metrics that will be used to characterize the existing ecosystems and probable effects of the Project, and: <ul style="list-style-type: none"> <li>a) describe the process and rationale used to select biotic and abiotic indicators for biodiversity within selected taxonomic groups;</li> <li>b) determine the relative abundance of species in each ecosite phase;</li> </ul>	Vol. 2, Sec. 13.5	Vol. 3, App. H

Terms of Reference Section		Topic	Ref. Section in Application	Ref. Section in Supporting Documents
3.8.1 (cont)	c)	provide species locations, lists and summaries of observed and estimated species richness and evenness for each ecosite phase;	Vol. 2, Sec. 13.5	
	d)	provide a measure of biodiversity on baseline sites that are representative of the proposed reclamation ecosites; and		
	e)	rank each ecological unit for biodiversity potential. Describe the techniques used in the ranking process.		
3.8.2	<b>Impact Assessment</b>			
	[A]	Describe the metrics used to assess the probable effects of the Project. Discuss the contribution of the Project to any anticipated changes in regional biodiversity and the potential impact to local and regional ecosystems.	Vol. 2, Sec. 13.6	
	[B]	Identify and evaluate the extent of potential effects of fragmentation on biodiversity that may result from the Project. Discuss those effects at all relevant scales (from site specific to landscape level).	Vol. 2, Sec. 13.6	
	[C]	Discuss the mitigation measures proposed to minimize any anticipated changes in regional biodiversity.	Vol. 2, Sec. 13.6	
	[D]	Describe the residual effects of the Project on biodiversity and KNOC's plans to manage those effects.	Vol. 2, Sec. 13.6	
3.8.3	<b>Monitoring</b>			
	[A]	Describe the monitoring programs proposed to assess any Project impacts on biodiversity and to measure the effectiveness of mitigation plans.	Vol. 2, Sec. 13.6	
3.9	<b>Terrain and Soils</b>			
3.9.1	<b>Baseline Information</b>			
	[A]	Provide descriptions and maps of the terrain and soils conditions, including: <ul style="list-style-type: none"> <li>a) surficial geology and topography;</li> <li>b) soil types and their distribution. Provide an ecological context to the soil resource by supplying a soil survey report and maps to Survey Intensity Level 2 for the Project Area;</li> <li>c) suitability and availability of soils within the Project Area for reclamation;</li> <li>d) soils that could be affected by the Project with emphasis on potential acidification (by soil type); and</li> <li>e) descriptions and locations of erosion sensitive soils.</li> </ul>	Vol. 4, Sec. 10.3, 10.5 and 10.6	Vol. 3, App. E



Terms of Reference Section	Topic	Ref. Section in Application	Ref. Section in Supporting Documents
3.9.2	<b>Impact Assessment</b>		
	<p>[A] Describe Project activities and other related issues that could affect soil quality (e.g., compaction, contaminants) and:</p> <ul style="list-style-type: none"> <li>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;</li> <li>b) provide an inventory of the pre- and predicted post-disturbance land capability classes for soils in both the Project Area and the Local Study Area and describe Project impacts to land capability. Indicate the size and location of soil types and land capability classes that will be disturbed;</li> <li>c) 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;</li> <li>d) identify the potential acidification impact on soils and discuss the significance of predicted impacts by acidifying emissions resulting from the Project;</li> <li>e) describe potential sources of soil contamination;</li> <li>f) describe the impact of the Project on soil types and reclamation suitability and the approximate volume of soil materials for reclamation. Discuss any constraints or limitations to achieving vegetation/habitat reclamation based on anticipated soil conditions (e.g., compaction, contaminants, salinity, soil moisture, nutrient depletion, erosion, etc.); and</li> <li>g) discuss the potential for soil erosion for all stages of the Project.</li> </ul>	<p>Vol. 1, Sec. 3 Vol. 2, Sec. 11.5 and 13.6 Vol. 4, Sec. 10.5, 10.6 and 10.9</p>	
	<p>[B] Discuss:</p> <ul style="list-style-type: none"> <li>a) the environmental effects of proposed drilling methods on the landscape and surficial and bedrock geology;</li> <li>b) the potential for casing and pipeline failures and their environmental effects;</li> <li>c) 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</li> <li>d) 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.</li> </ul>	<p>Vol. 4, Sec. 10.6</p>	

Terms of Reference Section		Topic	Ref. Section in Application	Ref. Section in Supporting Documents
3.9.2 (cont)	[C]	Provide a mitigation plan, including: a) possible measures to minimize surface disturbance including the use of existing clearings for the Project; b) possible actions to address potential effects of acid deposition; c) possible actions to mitigate effects of any constraint or limitation to habitat reclamation such as compaction, contaminants, salinity, soil moisture, erosion, nutrient regime, etc.; d) possible measures to mitigate changes to ground surface (temperature, heave and subsidence) during operations; e) possible actions to address impacts to land capability; and f) any other measures to reduce or eliminate the potential impacts that the Project may have on soil capability and/or quality.	Vol. 4, Sec. 10.6	
	[D]	Describe the residual effects of the Project on terrain and soils and KNOC's plans to manage those effects.	Vol. 4, Sec. 10.6	
3.9.3	<b>Monitoring</b>			
	[A]	Describe the monitoring programs proposed to assess any Project impacts on terrain and soils and to measure the effectiveness of mitigation plans.	Vol. 4, Sec. 10.6	
3.10	<b>Land Use</b>			
3.10.1	<b>Baseline Information</b>			
	[A]	Identify the current land uses, including oil and gas development, agriculture, forestry, tourism, aboriginal uses and outdoor recreational activities.	Vol. 1, Sec. 3.5 Vol. 4, Sec. 10.6	
	[B]	Identify and map all Crown land and Crown Reservations (Holding Reservation, Protective Notation, Consultative Notation).	Vol. 2, Sec. 14.5	
	[C]	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).	Vol. 2, Sec. 14.5	
	[D]	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.	Vol. 2, Sec. 14.5	

Terms of Reference Section	Topic	Ref. Section in Application	Ref. Section in Supporting Documents
3.10.2	<b>Impact Assessment</b>		
	<p>[A] Identify the potential impact of the Project on land uses, including:</p> <ul style="list-style-type: none"> <li>a) impacts to unique sites or special features, including the adjacent high priority recreation area identified around Christina Lake (designated by PNT890605);</li> <li>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;</li> <li>c) the implications of relevant land use policies and resource management initiatives for the Project, including any constraints to development;</li> <li>d) potential impacts to aggregate reserves that may be located on land under KNOC's control and reserves in the region;</li> <li>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;</li> <li>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;</li> <li>g) how the Project impacts Annual Allowable Cuts and quotas within the Forest Management Agreement area;</li> <li>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</li> <li>i) impacts of the Project on public access, regional recreational activities, aboriginal land use and other land uses during and after development activities.</li> </ul>	Vol. 2, Sec. 14.6	
	<p>[B] Discuss possible mitigation strategies to address:</p> <ul style="list-style-type: none"> <li>a) the need for, and plans to address, access management during and after Project operations;</li> <li>b) the process for addressing the needs of other land users in both the Project Area and the Local Study Area;</li> <li>c) measures to mitigate Project impacts on land use; and</li> <li>d) how potentially-affected aggregate reserves will be salvaged and stockpiled with input provided by Alberta Transportation and Alberta Sustainable Resource Development.</li> </ul>	Vol. 2, Sec. 14.6	
	<p>[C] Describe the residual effects of the Project on land use and KNOC's plans to manage those effects.</p>	Vol. 2, Sec. 14.6	

Terms of Reference Section	Topic	Ref. Section in Application	Ref. Section in Supporting Documents
3.10.3	<b>Monitoring</b>		
	[A] Describe the monitoring programs proposed to assess any Project impacts on land use and to measure the effectiveness of mitigation plans.	N/A	
4	<b>HISTORIC RESOURCES</b>		
	[A] Describe consultation with Alberta Culture and Community Spirit (ACCS) concerning the need for a Historic Resource Impact Assessment (HRIA) for the Project, and: <ul style="list-style-type: none"> <li>a) provide a general overview of the results of any previous historic resource studies that have been conducted, including archaeological resources, palaeontological resources, historic period sites, and any other historic resources as defined within the <i>Historical Resources Act</i>;</li> <li>b) summarize the results from the field program performed to assess archaeological, palaeontological and historic significance of both the Project Area and the Local Study Area;</li> <li>c) provide a summary of the results of the HRIA conducted to assess the potential impact of the Project on archaeological, palaeontological and historic resources;</li> <li>d) provide an outline of the program and schedule of field investigations that ACCS may require KNOC to undertake to further assess and mitigate the effects of the Project on historic resources; and</li> <li>e) document any historic resources concerns raised during consultation on the Project.</li> </ul>	Vol. 2, Sec. 15.1	
5	<b>TRADITIONAL ECOLOGICAL KNOWLEDGE AND LAND USE</b>		
	[A] Provide: <ul style="list-style-type: none"> <li>a) a map of traditional land use areas if the aboriginal community or group is willing to have these locations disclosed);</li> <li>b) a map of cabin sites, spiritual sites, graves and other traditional use sites considered historic resources under the <i>Historical Resources Act</i> (if the aboriginal community or group is willing to have these locations disclosed), as well as traditional trails and resource activity patterns;</li> <li>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 aboriginal peoples; and</li> <li>d) a discussion of: <ul style="list-style-type: none"> <li>i) access to traditional lands in the Project Area during all stages of the Project,</li> <li>ii) the vegetation and wildlife used for traditional, food, ceremonial, medicinal and other purposes, and</li> <li>iii) aboriginal views on land reclamation.</li> </ul> </li> </ul>	Vol. 2, Sec. 16.5	

Terms of Reference Section		Topic	Ref. Section in Application	Ref. Section in Supporting Documents
5 (cont)	[B]	Determine the impact of the Project on traditional uses and culture and identify possible mitigation strategies.	Vol. 2, Sec. 16.6	
6	<b>PUBLIC HEALTH AND SAFETY ASSESSMENT</b>			
	[A]	<p>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:</p> <ul style="list-style-type: none"> <li>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;</li> <li>b) provide the data, exposure modeling calculations, and describe the methods KNOC used to assess impacts of the Project on human health and safety;</li> <li>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;</li> <li>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;</li> <li>e) identify the human health impact of the potential contamination of country foods and natural food sources taking into consideration all Project activities;</li> <li>f) document any health concerns raised by stakeholders during consultation on the Project;</li> <li>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;</li> <li>h) assess the cumulative human health effects to receptors, including First Nations and Métis receptors;</li> <li>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;</li> <li>j) describe the potential health impacts resulting from higher regional traffic volumes and the increased risk of accidental leaks and spills; and</li> <li>k) discuss mitigation strategies to minimize the potential impact of the Project on human health.</li> </ul>	Vol. 4, Sec. 18.4, 18.5, 18.6 and 18.7	Vol. 4, App. J

Terms of Reference Section		Topic	Ref. Section in Application	Ref. Section in Supporting Documents
<b>6 (cont)</b>	[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 KNOC'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; e) describe the potential safety impacts resulting from higher regional traffic volumes; and f) discuss mitigation plans to ensure workforce and public safety for all stages of the Project. Include prevention and safety measures for wildfire occurrences, water saturated plume from cooling towers, icy roads in the winter months, accidental release or spill of chemicals to the environment and failures of structures retaining water or fluid wastes.	Vol. 4, Sec. 18.1 Vol. 2, Sec. 17.6	
<b>7</b>	<b>SOCIO-ECONOMIC ASSESSMENT</b>			
<b>7.1</b>	<b>Baseline Information</b>			
	[A]	Describe the existing socio-economic conditions in the region and in the communities in the region.	Vol. 2, Sec. 17.5	
	[B]	Describe factors that may affect existing socio-economic conditions including: a) population changes; b) KNOC'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.	Vol. 2, Sec. 17.5	

Terms of Reference Section	Topic	Ref. Section in Application	Ref. Section in Supporting Documents
7.2	<b>Impact Assessment</b>		
	<p>[A] Describe the socio-economic effects of construction and operation of the Project, including:</p> <ul style="list-style-type: none"> <li>a) impacts related to:               <ul style="list-style-type: none"> <li>i) local training, employment and business opportunities,</li> <li>ii) regional and provincial economic benefits,</li> <li>iii) housing,</li> <li>iv) recreational activities,</li> <li>v) hunting, fishing, trapping and gathering, and</li> <li>vi) effects on First Nations and Métis (e.g., traditional land use and social and cultural implications);</li> </ul> </li> <li>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;</li> <li>c) impacts of the Project on the availability of affordable housing and the quality of health care services. Provide a summary of any discussions that have taken place with the local municipalities and the local environmental public health office of Alberta Health Services concerning housing availability and health care services respectively;</li> <li>d) discuss any effects expected on primary and secondary highway systems and other regional roads caused by anticipated traffic changes;</li> <li>e) the impact on local and regional infrastructure and community services, including consideration of municipal “hard services”, education/training services, social services, urban and regional recreation services, law enforcement and emergency services; and</li> <li>f) describe municipal growth pressures as they relate to the Project and the need for additional Crown land to meet these needs.</li> </ul>	Vol. 2, Sec. 17.6	
	<p>[B] Describe the socio-economic effects of any construction camp required for the Project and identify:</p> <ul style="list-style-type: none"> <li>a) its location,</li> <li>b) the number of workers it is intended to house,</li> <li>c) whether the camp will service the Project only or other clients,</li> <li>d) the length of time the camp will be in service, and</li> <li>e) describe what services will be provided in the camp (e.g., security, recreation and leisure, medical services);</li> </ul>	Vol. 2, Sec. 17.6	

Terms of Reference Section		Topic	Ref. Section in Application	Ref. Section in Supporting Documents
7.2 (cont)	[C]	Discuss options for mitigating impacts including: <ul style="list-style-type: none"> <li>a) KNOC's policies and programs regarding the use of regional and Alberta goods and services;</li> <li>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;</li> <li>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;</li> <li>d) the potential to avoid overlap with other Projects that are reasonably anticipated during all stages of the Project;</li> <li>e) mitigation plans that will be undertaken to address issues related to the availability of affordable housing and the quality of health care services; and</li> <li>f) strategies to mitigate socio-economic concerns raised by the local municipality and other stakeholders in the region.</li> </ul>	Vol. 2, Sec. 17.6	
	[D]	Describe the residual effects of the Project on socio-economic conditions and KNOC's plans to manage those effects.	Vol. 2, Sec. 17.6	
7.3	<b>Monitoring</b>			
	[A]	Describe the monitoring programs proposed to assess any Project socio-economic impacts and to measure the effectiveness of mitigation plans.	N/A	

**Notes:**

N/A – not applicable.



## GLOSSARY OF ABBREVIATIONS AND ACRONYMS

<b>µm</b>	Micrometre(s)
<b>µeq/L</b>	Microequivalent(s) per litre
<b>µg/g</b>	Microgram(s) per gram
<b>µg/L</b>	Microgram(s) per litre
<b>µg/m<sup>3</sup></b>	Microgram(s) per cubic metre
<b>µS/cm</b>	Microsiemen(s) per centimetre
<b>°</b>	Degrees
<b>°C</b>	Degrees centigrade
<b>%</b>	Percent(age)
<b>%AP</b>	Aquifer productivity
<b>%IF</b>	Induced flux
<b>AAAQO</b>	Alberta Ambient Air Quality Objectives and Guidelines
<b>AAC</b>	Annual allowable cuts
<b>AADT</b>	Average Annual Daily Traffic
<b>AAWQG</b>	Alberta Acute Water Quality Guidelines
<b>ACCS</b>	Alberta Culture and Community Spirit
<b>ACWQG</b>	Alberta Chronic Water Quality Guidelines
<b>AEAR</b>	Anthropogenic Edge-to-Area Ratio
<b>AENV</b>	Alberta Environment
<b>AGCC</b>	Alberta Ground Cover Classification
<b>AGRASID</b>	Agricultural Region of Alberta Soil Inventory Database
<b>AGS</b>	Alberta Geological Survey
<b>AHS</b>	Alberta Health Services
<b>ALCRC</b>	Alberta Land Conservation and Reclamation Council
<b>ALG</b>	Aquatic Life Guidelines
<b>AI-Pac</b>	Alberta-Pacific Forest Industries Inc.
<b>ALG</b>	Aquatic Life Guideline
<b>ALSA</b>	Aquatics Local Study Area
<b>AMEC</b>	AMEC Earth & Environmental
<b>ANC</b>	Acid neutralizing capacity
<b>ANHIC</b>	Alberta Natural Heritage Information Centre

<b>ANR</b>	Athabasca Northern Railroad
<b>AO</b>	Aesthetic Objectives
<b>AOA</b>	Area Operating Agreement
<b>API</b>	American Petroleum Institute
<b>AQLSA</b>	Air Quality Local Study Area
<b>AQRSA</b>	Air Quality Regional Study Area
<b>ARC</b>	Alberta Research Council
<b>ARSA</b>	Aquatics Regional Study Area
<b>ASL</b>	Ambient Sound Level
<b>ASWQG</b>	Alberta Surface Water Quality Guidelines
<b>ASP</b>	Area Structure Plan
<b>AT</b>	Alberta Transportation
<b>ATV</b>	All Terrain Vehicle
<b>AVI</b>	Alberta Vegetation Inventory
<b>AWI</b>	Alberta Wetland Inventory
<b>b/d (or) bpd</b>	Barrels per day
<b>BLCN</b>	Beaver Lake Cree Nation
<b>BFW</b>	Boiler Feed Water
<b>BGWP</b>	Base of Groundwater Protection
<b>BS&amp;W</b>	Basic Sediment and Water
<b>C&amp;R</b>	Conservation and Reclamation
<b>CAC</b>	Criteria air contaminant(s)
<b>CAESA</b>	Canada-Alberta Environmentally Sustainable Agriculture
<b>CALMET</b>	California Meteorological
<b>CASA</b>	Clean Air Strategic Alliance
<b>CCME</b>	Canadian Council of Ministers of the Environment
<b>CDWQG</b>	Canadian Drinking Water Quality Guidelines
<b>CEA</b>	Cumulative Effects Assessment
<b>CEMA</b>	Cumulative Environmental Management Association
<b>CEQG</b>	Canadian Environmental Quality Guidelines
<b>CH<sub>4</sub></b>	Methane
<b>CNRL</b>	Canadian Natural Resources Limited
<b>CO</b>	Carbon monoxide

<b>CO<sub>2</sub></b>	Carbon dioxide
<b>CO<sub>2</sub>E</b>	Carbon dioxide equivalent
<b>COSEWIC</b>	Committee on the Status of Endangered Wildlife in Canada
<b>CPDFN</b>	Chipewyan Prairie Dene First Nation
<b>CPF</b>	Central Processing Facility
<b>CRDAC</b>	Conklin Resource Development Action Committee
<b>CSS</b>	Cyclic Steam Stimulation
<b>CWS</b>	Canada-wide standards
<b>dam<sup>3</sup></b>	Cubic decametre
<b>dB</b>	Decibel
<b>dBA</b>	A-weighted decibel
<b>dBC</b>	C-weighted decibel
<b>dBz</b>	Linear or unweighted decibel
<b>Devon</b>	Devon Canada Corporation and/or Devon ARL Corporation
<b>DFO</b>	Fisheries and Oceans Canada
<b>DO</b>	Dissolved oxygen
<b>dS/m</b>	DeciSiemens per metre
<b>DTS</b>	Distributed Temperature Sensing
<b>EC</b>	Electrical conductivity
<b>EIA</b>	Environmental Impact Assessment
<b>ELC</b>	Ecological Land Classification
<b>EMP</b>	Environmental Management Plan
<b>EMS</b>	Emergency Medical Services
<b>EMT</b>	Emergency Medical Technician
<b>EnCana</b>	EnCana FCCL Oil Sands Ltd. and/or EnCana Corporation
<b>EPC</b>	Engineering Procurement and Construction
<b>EPEA</b>	<i>Environmental Protection and Enhancement Act</i>
<b>ERCB</b>	Energy Resources Conservation Board
<b>ERP</b>	Emergency Response Plan
<b>ESCC</b>	Endangered Species Conservation Committee
<b>ESA</b>	Environmentally Significant Area
<b>FMA</b>	Forest Management Agreement
<b>FMFN</b>	Fort McMurray #468 First Nation

<b>FN</b>	First Nation(s)
<b>FWKO</b>	Free-Water Knockout
<b>FWMIS</b>	Fish and Wildlife Management Information System
<b>GDP</b>	Gross Domestic Product
<b>GHG</b>	Greenhouse gas
<b>GIS</b>	Geographic Information System
<b>GJ/h</b>	Gigajoule(s) per hour
<b>Gj/m<sup>3</sup></b>	Gigajoule(s) per cubic metre
<b>GPS</b>	Global Positioning System
<b>GWh</b>	Gigawatt hour
<b>H<sub>2</sub>O</b>	Water
<b>H<sub>2</sub>S</b>	Hydrogen sulphide
<b>ha</b>	Hectare(s)
<b>HCl</b>	Hydrochloric acid
<b>HEC-HMS</b>	Hydrology model
<b>HGMA</b>	Hydrogeology Groundwater Model Area
<b>HLFN</b>	Heart Lake First Nation
<b>HLFNCO</b>	Heart Lake First Nation Consultation Office
<b>HLSA</b>	Hydrogeology Local Study Area
<b>HRSA</b>	Hydrogeology Regional Study Area
<b>HNO<sub>3</sub></b>	Nitric acid
<b>HP</b>	High Pressure
<b>hr</b>	Hour
<b>HRA</b>	<i>Historical Resources Act</i>
<b>HRIA</b>	Historical Resources Impact Assessment
<b>HRV</b>	Historical Resource Value
<b>HSI</b>	Habitat Suitability Index
<b>Hz</b>	Hertz
<b>I-O</b>	Input-Output
<b>IGF</b>	Induced Gas Floatation
<b>INAC</b>	Indian and Northern Affairs Canada
<b>IRC</b>	Industry Relations Corporation
<b>ISO</b>	International Organization for Standardization



<b>ISP</b>	Industrial Sample Plot
<b>ISQG</b>	Interim Sediment Quality Guidelines
<b>JACOS</b>	Japan Canada Oil Sands Limited
<b>keq/ha/y</b>	Kiloequivalents per hectare per year
<b>kg/hr</b>	Kilograms per hour
<b>KIRs</b>	Key indicator resources
<b>km</b>	Kilometre(s)
<b>km<sup>2</sup></b>	Kilometre(s) square
<b>KNOC</b>	Korea National Oil Corporation
<b>kPa</b>	Kilopascal
<b>kt/y</b>	Kilotonne(s) per year
<b>kV</b>	Kilovolt
<b>kVA</b>	Kilovolt-amps
<b>kw</b>	Kilowatt
<b>L/s</b>	Litres per second
<b>LACT</b>	Lease Automatic Custody Transfer
<b>lb/hr</b>	Pound(s) per hour
<b>LCC</b>	Land Capability Classification
<b>LCP</b>	Least Cost Path
<b>L<sub>eq</sub></b>	Energy Equivalent Sound Level
<b>LFN</b>	Low Frequency Noise
<b>LHV</b>	Lower Heating Value
<b>LL</b>	Lower Lift
<b>LOC</b>	License of Occupation
<b>LP</b>	Low Pressure
<b>LSA</b>	Local Study Area
<b>LSAS</b>	Land Status Automated System
<b>LUB</b>	Land Use Bylaw
<b>LUF</b>	Land Use Framework
<b>m</b>	Metre(s)
<b>mm</b>	Millimetre(s)
<b>m/s</b>	Metre(s) per second
<b>m<sup>3</sup>/d</b>	Cubic metre(s) per day

<b>m<sup>3</sup>/s</b>	Cubic metre(s) per second
<b>m<sup>3</sup>/y</b>	Cubic metre(s) per year
<b>MAC</b>	Maximum Acceptable Concentrations
<b>masl</b>	Metres above sea level
<b>MAST</b>	Mean annual soil temperature
<b>mbgs</b>	Metres below ground surface
<b>mbpd</b>	Million barrels per day
<b>mbsl</b>	Metres below seal level
<b>MDL</b>	Method Detection Limits
<b>MEG</b>	MEG Energy Corporation
<b>mg/L</b>	Milligram(s) per litre
<b>MJ/hr</b>	Megajoule(s) per hour
<b>MJ/kg</b>	Megajoule (s) per kilogram
<b>mmbbl</b>	million barrels
<b>MPOI</b>	Overall maximum
<b>MSC</b>	Meteorological Service of Canada
<b>MSES</b>	Management and Solutions in Environmental Science
<b>MSI</b>	Municipal Sustainability Initiative
<b>MSL</b>	Mineral Surface Lease
<b>mTVD</b>	Measurement of true vertical depth
<b>MVA</b>	Mega volt-amperes
<b>MVC</b>	Mechanical Vapour Compression
<b>N</b>	Nitrogen
<b>N/A (or) n/a</b>	Not applicable
<b>NAD</b>	North American Datum
<b>NaOH</b>	Sodium hydroxide
<b>NIA</b>	Noise Impact Assessment
<b>NLHC</b>	Northern Lights Health Centre
<b>NO</b>	Nitric oxide (gas)
<b>NO<sub>2</sub></b>	Nitrogen dioxide (gas)
<b>NO<sub>x</sub></b>	Gaseous oxides of nitrogen (NO, NO <sub>2</sub> ) or all nitrogen species (e.g., NO <sub>x</sub> , N <sub>2</sub> O, N <sub>3</sub> O).
<b>NWWG</b>	National Wetlands Working Group

<b>O<sub>2</sub></b>	Oxygen
<b>O<sub>3</sub></b>	Ozone
<b>OBIP</b>	Original Bitumen in Place
<b>OHSA</b>	<i>Occupational Health and Safety Act</i>
<b>OLM</b>	Ozone Limiting Method
<b>ORF</b>	Oil Removal Filter
<b>OSCA</b>	<i>Oil Sands Conservation Act</i>
<b>OSDG</b>	Oil Sands Developers Group
<b>P</b>	Phosphorus
<b>PA</b>	Project Area
<b>PAH</b>	Polycyclic aromatic hydrocarbon
<b>PAI</b>	Potential Acid Inputs
<b>PDA</b>	Pre-Disturbance Assessment
<b>PHC</b>	Petroleum hydrocarbons
<b>PIL</b>	Pipeline installation lease
<b>PM</b>	Particulate matter
<b>PO<sub>4</sub></b>	Phosphate
<b>ppb</b>	Parts per billion
<b>ppmv</b>	Parts per million by volume
<b>QA/QC</b>	Quality assurance/quality control
<b>RAP</b>	Restricted activity period
<b>RCMP</b>	Royal Canadian Mounted Police
<b>RD</b>	Rural District
<b>RELAD</b>	Regional Lagrangian Acid Deposition
<b>REPD</b>	Regional Emergency Preparedness Department
<b>RFMA</b>	Registered Fur Management Area
<b>Rge</b>	Range
<b>RID</b>	Regional Integrated Decision
<b>RIWG</b>	Regional Industrial Working Group
<b>RMWB</b>	Regional Municipality of Wood Buffalo
<b>ROW</b>	Right Of Way
<b>RRD</b>	Registered Roadway Disposition
<b>RSDS</b>	Regional Sustainable Development Strategy

<b>RSA</b>	Regional Study Area
<b>RSEA</b>	Regional Strategic Environmental Assessment
<b>S</b>	Sulphur
<b>SAGD</b>	Steam Assisted Gravity Drainage
<b>SAR</b>	Sodium absorption rate
<b>SARA</b>	<i>Species At Risk Act</i>
<b>SCA</b>	Soil Correlation Area
<b>Sec</b>	Section
<b>SEIA</b>	Socio-Economic Impact Assessment
<b>SEWG</b>	Sustainable Ecosystems Working Group
<b>SO<sub>2</sub></b>	Sulphur dioxide
<b>SOP</b>	Standard operating procedure
<b>SRD</b>	Alberta Sustainable Resource Development
<b>STC</b>	Sound Transmission Class
<b>Sw</b>	Water Saturation
<b>t ha<sup>-1</sup>yr<sup>-1</sup></b>	Tonne(s) per hectare per year
<b>t/d</b>	Tonnes per day
<b>TDS</b>	Total Dissolved Solids
<b>TEK</b>	Traditional Environmental Knowledge
<b>TFA</b>	Temporary field authorizations
<b>TK</b>	Traditional Knowledge
<b>TKN</b>	Total Kjeldahl Nitrogen
<b>TLSA</b>	Terrestrial Local Study Area
<b>TLU</b>	Traditional Land Use
<b>TOR</b>	Terms of Reference
<b>TPA</b>	Trapping area
<b>TPI</b>	Timber Productivity Index
<b>TPR</b>	Timber Productivity Rating
<b>TRSA</b>	Terrestrial Regional Study Area
<b>TSP</b>	Total Suspended Particulates
<b>TSS</b>	Total Suspended Solids
<b>TU</b>	Traditional Use
<b>Twp</b>	Township





<b>UL</b>	Upper Lift
<b>UPS</b>	Uninterruptible Power Supply
<b>USLE</b>	Universal Soil Loss Equation
<b>UTM</b>	Universal Transverse Mercator
<b>V</b>	Volt
<b>VC</b>	Valued Components
<b>VEC</b>	Valued Ecosystem Component
<b>VOC</b>	Volatile organic compound
<b>VRU</b>	Vapour Recovery Unit
<b>wt. %</b>	Weight percent
<b>W4M</b>	West of 4 <sup>th</sup> Meridian
<b>WA</b>	<i>Water Act</i>
<b>WBEA</b>	Wood Buffalo Environmental Association
<b>WCSB</b>	Western Canadian Sedimentary Basin
<b>WMU</b>	Wildlife Management Unit
<b>WSC</b>	Water Survey of Canada
<b>XRD</b>	X-ray diffraction

## GLOSSARY OF TERMS

<b>Administrative Completeness</b>	A regulatory step in which the Approvals Director determines that the approval application addresses the information required by regulation and is sufficiently completed to commence a detailed technical review of the application.
<b>API°</b>	A unit of measurement to assess how heavy or light a petroleum liquid is compared to water. Also referred to as American Petroleum Institute gravity, or API gravity. Mathematically, API gravity has no units but it is nevertheless referred to in degrees.
<b>Application Case</b>	The Application Case describes the Baseline Case with the effects of the project added.
<b>Baseline Case</b>	The Baseline Case establishes the conditions that exist or would exist prior to development of the project or the conditions that would exist if the project were not developed.
<b>Baseline Studies</b>	Initial scientific investigations that determine the present ecological state of an area and establish a basic reference necessary for further studies.
<b>Concordance Table</b>	A table in the Environmental Impact Assessment report that identifies which sections of the report contain the information for each of the Terms of Reference requirements.
<b>Confidence</b>	An attribute used in the evaluation of the impacts from the project. The confidence attribute and ranking is based upon the amount and adequacy of data, as well as an understanding of the relationship(s) between the potential cause(s) of the residual project impact(s). Confidence is defined as poor, moderate or high.
<b>Constraint</b>	Site conditions (structural, geographic or environmental) that could result in potentially higher impact from project activities. The area identified as having constraints should be avoided or special mitigation measures developed
<b>Constraints Mapping</b>	A technique where environmental (and other) sensitivities or constraints are identified during the project design phase and are mapped on the proposed project area to help planners avoid or reduce the potential environmental impact of the project.
<b>Cumulative Effects</b>	Changes to the environment that are caused by a project in combination with other past, present, and planned projects in the region.
<b>Dispersion Model</b>	A computer model that calculates a concentration or deposition value at a particular point; this value changes from hour to hour, eventually reaching an absolute maximum concentration or deposition value for the particular point.

<b>Direction</b>	An attribute used in the evaluation of the impacts from the project. The direction of an impact may be described as positive (beneficial), negative (detrimental) or neutral.
<b>Duration</b>	An attribute used in the evaluation of the impacts from the project. Some impacts may persist for short periods of time, others may be permanent. The following designations for duration of impact are used: short-term, mid-term and long-term.
<b>Effect</b>	Any response by an environmental or social component to a proposed project's impact.
<b>Environmental Management System (EMS)</b>	A set of management processes and procedures that allows an organization to analyze and reduce the environmental impact of its activities.
<b>Environmental Monitoring</b>	Systematic, geo-referenced observations of the environment essential to detecting changes in ecosystems over time.
<b>Environmental Protection Plan (EPP)</b>	A practical tool that describes the actions required to minimize environmental effects before, during and after project implementation. The plan may include details about the implementation of the mitigation measures identified in the environmental assessment, such as who is responsible for implementation, where the measures are intended to be implemented, and within what timeframe.
<b>Final Impact Rating</b>	For each individual impact assessment, a final impact rating of low, moderate or high is stated. This is based upon the integration of quantitative analysis (where possible) and professional judgment that takes into account the various rankings for each attribute (direction, magnitude, geographic extent, duration and confidence). This is applied to both the project specific impact and cumulative effects assessments.
<b>Fragmentation</b>	The breaking up of contiguous blocks of habitat into increasingly smaller blocks as a result of direct loss and/or sensory disturbance (i.e., habitat alienation).
<b>Geographic Extent</b>	An attribute used in the evaluation of the impacts from the project. Impacts from the project may be confined to small areas or may occur over a large geographic extent. These impacts may be described as local or regional:
<b>Habitat</b>	Land and water used by wildlife. This may include biotic and abiotic aspects such as vegetation, exposed bedrock, water, and topography.
<b>Habitat Suitability Index (HSI)</b>	<p>The value of habitat for wildlife species estimated/modeled by relating a species' need for food and cover to structural and spatial attributes of vegetation types within a defined area. The HSI refers to the quality or suitability for a species or species group, and ranges from 1.0 (optimal value) to 0.0 (no value).</p> <p>The relative potential of an area to support individuals or a population of wildlife species. HSI models are often used to quantify potential habitat losses or gains arising from the project's development and reclamation.</p>

<b>Historic Resources Impact Assessment (HRIA)</b>	A review of the effects that a proposed development will have on the local and regional historic and prehistoric heritage of an area.
<b>Human Health Risk Assessment (HHRA)</b>	A systematic and well documented process to define and quantify potential human health risks from exposure to chemicals released from a proposed project alone and in combination with other past, present, and future projects in the region.
<b>Impact</b>	Any aspect of a project that may cause an effect; for example, land clearing during construction is an impact, while a possible effect is loss and fragmentation of wildlife habitat.
<b>Industry Relations Corporation (IRC)</b>	The corporation or organization that a First Nation has created to manage the First Nation's relations, including Consultation with Alberta, Canada and Industry.
<b>Integrated Application</b>	An application to the appropriate regulatory bodies that contains both the EIA report and the relevant approval applications.
<b>Key Indicator Resource (KIRs)</b>	Environmental attributes or components identified as a result of a social scoping exercise as having legal, scientific, cultural, economic, or aesthetic value.
<b>Local Study Area (LSA)</b>	The area existing outside the boundaries of the project area, where there is a reasonable potential for immediate environmental impacts due to ongoing project activities.
<b>Magnitude</b>	Defines the spatial extent directly or indirectly affected by the project. An attribute used in the evaluation of the impacts from the project. Three levels of magnitude of the impact have been selected: low, moderate or high. The definition of these levels may vary among the different disciplines examined in the Environmental Impact Assessment.
<b>Mitigation</b>	The elimination, reduction or control of the adverse environmental effects of the project. Mitigation includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means.
<b>Model</b>	A simplified representation of a relationship or a system of relationships. Modeling involves calculation techniques used to make quantitative estimates of an output parameter based on its relationship to input parameters.
<b>Movement Corridor</b>	Travel way used by wildlife for daily, seasonal, annual and/or dispersal movements from one area or habitat to another.
<b>pH</b>	A measure of the acidity or alkalinity (based upon the concentration of the hydrogen ion) of a solution. The pH is expressed as the negative logarithm of hydrogen ion concentration.

<b>Planned Development Case</b>	The Planned Development Case includes past, existing and anticipated future environmental conditions, based on existing and approved projects or activities, plus planned projects and activities reasonably expected to occur. The Planned Development Case describes the environmental conditions that would exist as a result of the interaction of the proposed project, other existing projects and other planned projects.
<b>Project</b>	The activity or group of activities proposed by the Proponent. The types of activities that could be subject to Alberta’s environmental assessment process are listed in the Schedule of Activities in the <i>Environmental Protection and Enhancement Act</i> and in the <i>Water Act</i> . The project includes all associated construction, operation, decommissioning and reclamation activities and all phases of development described by the Proponent.
<b>Project Area</b>	The area includes all lands subject to direct disturbance from the project and associated infrastructure.
<b>Project Footprint</b>	The land or water area covered by a project. This includes direct physical coverage (i.e., all lands subject to direct disturbance from the project and associated infrastructure) and direct effects (i.e., the disturbances that may directly emanate from the project, such as noise).
<b>Regional Strategic Environmental Assessment (RSEA)</b>	A process designed to systematically assess alternative strategic options, plans, or programs for a particular region, including the potential cumulative environmental effects of alternative future development scenarios, in order to arrive at a preferred scenario(s) and recommendations for regional environmental management and downstream development decision making.
<b>Regional Study Area (RSA)</b>	The area within which there is the potential for cumulative and socio-economic effects, and that may be relevant to the assessment of any wider-spread effects of the project.
<b>Residual Effect</b>	An effect that remains after mitigation has been applied.
<b>Reversibility</b>	An attribute used in the evaluation of the impacts from the project. Capability of the environment to return to a capacity or condition equivalent to the baseline after the impact ceases. Reversibility rating is either yes or no.
<b>Scenario</b>	A description of environmental and development conditions at a certain time to allow comparisons of change (e.g., pre-development, current, and reasonably foreseeable). The common scenarios are: Baseline Case, Application Case, and Planned Development Case.
<b>Setback</b>	A setback is the minimum distance that must be maintained between a development and an environmental feature (e.g., river valley, lake) or human feature (e.g., dwelling, rural housing development, urban centre, or public facility). Setbacks may vary according to the type of development and the sensitivity of the environmental or human feature.

<b>Socio-Economic Impact Assessment (SEIA)</b>	<p>A systematic analysis which seeks to understand the economic impacts and the social consequences on communities that result from project employment, and from project-related expenditures and sales. The Socio-Economic Impact Assessment is intended to communicate the potential effects (including cumulative effects) of a project on the economy and population base and, in turn, the implications for local public services and infrastructure. It should also address other quality of life issues that are of interest to the communities affected.</p> <p>An assessment of the effects that a project will have on the social and economic factors in the region.</p>
<b>Study Area</b>	<p>The sum of the areas included in the project area, local study area and regional study area.</p>
<b>Traditional Environmental Knowledge (TEK)</b>	<p>Knowledge and values that have been acquired through experience and observation, from the land or from spiritual teachings, and handed down from one generation to another. Also referred to as Traditional Ecological Knowledge.</p>
<b>Traditional Lands</b>	<p>Lands used by Aboriginal communities or individuals for purposes such as burial grounds, gathering sites, and historic or ceremonial locations, and existing constitutionally protected rights to hunt, trap and fish. Does not include proprietary interests in the land.</p>
<b>Traditional Land Use</b>	<p>Activities involving the harvest of traditional resources such as hunting and trapping, fishing, gathering medicinal plants and traveling to engage in these activities. Land use maps can document the locations where the activities occur.</p> <p>How a culture used (and uses) the land and its resources.</p>
<b>Valued Ecosystem Component (VEC)</b>	<p>The environmental element of an ecosystem that is identified as having scientific, social, cultural, economic, historic, archaeological or aesthetic importance. The value of an ecosystem component may be determined on the basis of cultural ideals or scientific concern. Valued ecosystem components that have the potential to interact with project components should be included in the assessment of environmental effects.</p>
<b>Watershed</b>	<p>All lands enclosed by a continuous hydrologic-surface drainage divide and lying upslope from a specified point on a stream.</p>

**Note:** Many of the definitions are from AENV 2009.