

**FINAL TERMS OF REFERENCE  
ENVIRONMENTAL IMPACT ASSESSMENT REPORT  
FOR EASTERN IRRIGATION DISTRICT'S PROPOSED  
SNAKE LAKE RESERVOIR EXPANSION PROJECT**

**Approximately 22 km southeast of Bassano and 22 km northwest of Brooks, Alberta**

**ISSUED BY: Environment and Protected Areas**

**DATE: July 4, 2024**

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

The purpose of this document is to identify for Eastern Irrigation District (EID), Indigenous communities, and appropriate stakeholders, the information required by government agencies for an Environmental Impact Assessment (EIA) report prepared under the *Environmental Protection and Enhancement Act* (EPEA) for the Snake Lake Reservoir Expansion Project (the Project).

## **PROJECT BACKGROUND**

The existing Snake Lake Reservoir is located within Townships 19 and 20, Ranges 16 and 17, W4M, approximately 15 kilometers (km) southeast of Bassano and 32 km northwest of Brooks, Alberta. The reservoir is contained by two earth-fill dams: the first along the east end (East Dam) located in Section 31-19-16 W4M, and the second along the west end (West Dam) located in Section 3-20-17 W4M. The reservoir is an off-stream irrigation storage facility originally constructed from 1995 to 1997 and is owned and operated by the EID.

The existing reservoir covers 320 hectares (ha) and has a storage volume of 14,900 acre-feet (ac-ft) (18.4 million cubic meters (m<sup>3</sup>)) at full supply level (FSL) with a geodetic elevation of 781.70 metres (m) above sea level (masl). Water sourced from the Bow River at Bassano Dam is diverted into the reservoir from EID's East Branch Canal via a gated inlet chute combined with an online check structure. Outflow from the reservoir is through the East Dam Low Level Outlet, located near the north end of the East Dam. This water helps support 50,000 acres (20,000 ha) of downstream irrigated agriculture.

The Project will expand the reservoir by constructing a 9 km long earthen berm in Sections 29, 30, 31, and 32 in Township 19, Range 16, W4M, extending the reservoir approximately 3 km to the south and 3 km to the east. The Project will remove all or a portion of the East Dam which will connect the existing reservoir with the reservoir expansion. The Project will increase the reservoir area by 780 ha to a total area of 1,100 ha. The volume of stored water will increase to 70,000 ac-ft (86 million m<sup>3</sup>). The dam and reservoir will be permanent features.

The Project will not require an increase to the EID's water allocation or maximum diversion rate. Water will be transferred into the reservoir when flows are abundant in the Bow River and will store a full year's supply of water for downstream users. During extended droughts and periods of low flow, the reservoir will supply agricultural and other downstream water needs, such that additional water withdrawals from the Bow River will not be required. This will allow more water to remain in the Bow River, helping to maintain instream flow needs.

## **SCOPE OF THE EIA REPORT**

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

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

The EIA report shall be prepared in accordance with these Terms of Reference and the environmental information requirements prescribed under EPEA and associated regulations, and the Impact Assessment Act, if applicable. The EIA report will form part of the application to the Natural Resources Conservation Board (NRCB).

EID shall refer to the Guide to Preparing Environmental Impact Assessment Reports in Alberta published by Alberta Environment and Protected Areas (the Guide) and these Terms of

Reference when preparing the Environmental Impact Assessment report. In any case where there is a difference in requirements between the Guide and the Terms of Reference, the Terms of Reference shall take precedence.

## **CONTENT OF THE EIA REPORT**

### **1 PUBLIC AND INDIGENOUS ENGAGEMENT**

1. Document the Project's public engagement program including:
  - a) a list of all in-person and virtual meetings including dates, attendees, materials and documents presented, project information discussed, and the specific comments or issues raised;
  - b) a list of other engagement methods including communication via websites, radio, television and newspapers, and the potential audience reached;
  - c) a description and documentation of concerns and issues expressed by the public, analysis of those concerns and issues, and actions taken to address those concerns and issues; and
  - d) a description of how public input was incorporated into project development, impact mitigation, and planned monitoring.
2. Document the Project's Indigenous engagement program including:
  - a) a list of in-person and virtual meetings including dates, attendees, materials, and documents presented, project information discussed, and the specific comments or issues raised;
  - b) a description and documentation of concerns and issues expressed by Indigenous communities and groups, the EID's analysis of those concerns and issues;
  - c) a description of how Indigenous input was incorporated into project development, impact mitigation, and planned monitoring and reclamation; and
  - d) any studies of traditional ecological knowledge and traditional use of land and water undertaken with Indigenous communities.
3. Describe plans to maintain the public and Indigenous engagement process following completion of the EIA report to ensure that the public and Indigenous peoples will have an appropriate forum for expressing their views on the ongoing development, operation, and reclamation of the Project.

### **2 PROJECT DESCRIPTION**

#### **2.1 Overview**

1. Identify the legal entity that is the proponent for the Project, the legal entities that will develop, design, and construct the Project, and the legal entity that will manage and operate the completed Project and hold the operating approvals.
2. Provide a brief project description in sufficient detail to provide context for the EIA including:
  - a) proponent information;
  - b) the need for the Project and why this project was chosen over other projects;
  - c) roles of various government departments and agencies and non-governmental organizations;
  - d) which communities would benefit from the Project; and
  - e) the development plan and schedule.

3. Describe how the Project links to and realizes the outcomes of the Alberta Irrigation Modernization Program.
4. Describe the benefits of the Project, including jobs created, local training, employment and business opportunities, and royalties and taxes generated to accrue to:
  - a) the proponent;
  - b) local and regional communities, including Indigenous communities;
  - c) the local authority;
  - d) Alberta; and
  - e) Canada.
5. Detail historic and planned water conservation practices adopted by EID and the outcomes on the water balance, including:
  - a) total water volume realized through efficiency gains over the past ten years;
  - b) how past water savings gained through efficiency improvements are currently stored and/or returned to natural systems; and
  - c) a description of the need for additional storage considering past and future gains realized through conservation and efficiency practices.
6. Discuss the current need for the Project including:
  - a) the need for drought mitigation and climate resiliency;
  - b) rural and regional economic development objectives;
  - c) changes in agricultural practices on lands using the water supply from EID and on lands currently without a secure water supply; and
  - d) enhancement of public recreational opportunities.
7. Identify opportunities for improvement in water management and sustainability based on potential changes in water supply and future demands. Describe the purpose and need, providing quantitative rationale where possible, of the Project to:
  - a) improve the operational efficiency of the EID including supporting existing irrigators and other water users during droughts;
  - b) address rural and regional economic development objectives;
  - c) help maintain instream flow needs in the Bow River; and
  - d) provide enhanced recreational opportunities.
8. Describe the priority rights of EID for the licensed allocation of water in comparison to upstream users, and how decisions are made with respect to annual diversions from the source of the EID water supply.
9. Describe how the existing Snake Lake reservoir affects downstream users, including junior license holders, municipal and industrial uses, and Indigenous communities.
10. Provide a summary of existing water demand and an estimate of future trends in water demand across the district as well as downstream of the reservoir. Discuss the water sourcing for the reservoir as per EID's water license and the average and range of water output levels expected in normal, wet, or drought years.
11. Discuss the alternatives for the Project and the rationale for not selecting the identified alternatives.
12. Describe key project activities during construction and operations stages.

13. Discuss the potential for future expansion or modification of the dam or reservoir.
14. Discuss the implications of a delay in proceeding with the Project, or any phase of the Project, and the implications of not proceeding with the Project.
15. Describe and provide maps and/or drawings of the components of the Project, including but not limited to:
  - a) the proposed dam structure;
  - b) existing East Dam;
  - c) existing infrastructure, leases, and clearings;
  - d) proposed facilities, buildings and infrastructure (e.g., pipelines and utilities);
  - e) temporary structures;
  - f) transportation and access routes;
  - g) containment structures;
  - h) sources of aggregate resources, borrow material and other construction material and locations of any stockpiles that will be developed if known;
  - i) waste and debris storage area and disposal sites;
  - j) borrow pits;
  - k) the water supply system;
  - l) water conveyance structures;
  - m) reservoirs;
  - n) total potential areas to be flooded in extreme (e.g., 1 in 100-year and 1 in 300-year) flood scenarios; and
  - o) water wells/intakes, pipelines, and storage structures.
16. Identify sources of construction materials, including use of in-situ aggregate materials, off-site borrow pits, or purchased materials. Describe excavation methods and temporary stockpiling plans. Provide information on studies of the suitability of in-situ materials for dam construction.
17. Describe the construction activities in detail for regulatory permitting for the proposed dam and appurtenant structures and the flooded area, where appropriate, including:
  - a) site clearing and grubbing;
  - b) topsoil stripping;
  - c) construction and use of temporary works or structures (e.g., temporary roads, runoff controls, construction camps, and laydown areas);
  - d) excavations, slope stabilization, and foundation preparations;
  - e) construction of the dam and its appurtenant structures;
  - f) management and authorization of design changes during construction;
  - g) methods to ensure quality assurance and quality control (QAQC) during construction;
  - h) installation of impervious linings and erosion protection measures, if required;
  - i) installation of instrumentation, mechanical, and electrical equipment, if required;
  - j) upgrading existing access roads, if required;
  - k) testing and commissioning the facility; and
  - l) removal and reclamation of temporary construction facilities.
18. Discuss preparations and filling of the expanded reservoir, including:
  - a) management of water levels in the existing reservoir;

- b) the planned approach to ensure successful first filling;
  - c) planning for how and when the existing East Dam will be breached;
  - d) estimated time for the new reservoir to be filled, and the expected water elevation, surface area and distribution of water, and volumes of water during the filling process;
  - e) management efforts to ensure dam safety during this activity, including development of a safety management plan and an emergency management plan, including an assessment of effects on downstream infrastructure if the new dam will be breached while filling; and
  - f) methods for managing fish, wildlife, debris, and shoreline stability during reservoir filling.
19. Describe the decommissioning of temporary construction facilities and any associated reclamation.
  20. Provide the adaptive management approach that will be implemented throughout the life of the Project. Include how monitoring, mitigation and evaluation were incorporated.
  21. Provide a list of commitments EID has made. This would include any mitigation, monitoring and operational commitments made as part of this assessment.
  22. Discuss the overall positive and negative economic, environmental, and social impacts of the Project.

## 2.2 Constraints

1. Discuss the process and criteria used to identify constraints to development, and how the Project has been designed to accommodate those constraints: Include the following:
  - a) Any applicable *Alberta Land Stewardship Act* Regional Plan, sub-regional plan;
  - b) Any approved water management plan enacted under the *Water Act*;
  - c) Any watershed plans;
  - d) the apportionment agreement with Saskatchewan and the Master Agreement on Apportionment with the Prairie Provinces Water Board and how apportionment commitments are met; specifically,
    - i) the effects of water withdrawal on the minimum daily flows of the South Saskatchewan River, particularly under low flows conditions,
    - ii) the effects of water storage on the monthly and annual flow volume of the South Saskatchewan River,
    - iii) potential implications on minimum daily flows and monthly/annual flow volumes under future climatic conditions,
    - iv) The Economic Development in Rural Alberta Plan (EDRAP),
    - v) management plan implemented by Watershed Planning and Advisory Councils and/or Watershed Stewardship Groups (e.g., Bow Basin Watershed Management Plan);
  - e) applicable municipal plans;
  - f) Indigenous traditional land and water use;
  - g) land use policies and resource management initiatives that pertain to the Project;
  - h) the environmental setting;
  - i) results of project-specific and regional monitoring; and
  - j) potential for changes in the regulatory regime.

2. Describe the process and criteria used and options considered to select sites for project components, including:
  - a) the dam;
  - b) additional reservoir land area;
  - c) the source of water;
  - d) water conveyance structures;
  - e) borrow sites;
  - f) temporary facility, transportation, and storage sites; and
  - g) material disposal sites, including materials from temporary facilities and the decommissioned dam.
3. Describe roads, pipelines, well sites, power lines, or other infrastructure that may be affected by the Project.
4. Document communication with the owners of infrastructure regarding potential impacts and relocation requirements, and other measures required to mitigate permanent or short-term impacts.
5. Describe proposed protection, relocation, or reconstruction of infrastructure and measures proposed to mitigate impacts during construction.
6. Identify constraints related to onsite biophysical features, socioeconomic conditions, and cultural activities in the local and regional areas, including:
  - a) important species and their habitats, ecological communities, landscape features, open water and wetland features, or environmentally sensitive features;
  - b) Indigenous traditional use sites;
  - c) cultural use and recreational use sites;
  - d) monitoring sites; and
  - e) protected sites.
7. Describe any public lands or public land uses that may conflict with the Project.
8. Provide a list of project components for which locations will be determined later. Discuss the selection criteria that will be used to determine the specific location of these.
9. Describe the cumulative effects of the Project in combination with any other activities in the Regional Study Area.

### **2.3 Regional and Cooperative Efforts**

1. Discuss EID's involvement in regional and cooperative efforts to address environmental and socio-economic issues associated with regional development, including environmental stewardship and habitat improvement programs or initiatives, participation in regional organizations or forums, or multi-party research programs.
2. Describe opportunities for sharing infrastructure (e.g., access roads, utility corridors, water infrastructure) with other resource development stakeholders or the local municipality. Provide rationale where these opportunities will not be implemented.
3. Discuss potential cooperation with other parties regarding water-related infrastructure and management including, but not limited to, water supply, water intakes, pipelines, water storage and withdrawals, flow monitoring and reporting, and ecological monitoring.



## 2.4 Transportation Infrastructure

1. Prepare a Traffic Impact Assessment as per the latest Transportation and Economic Corridors' Traffic Impact Assessment Guidelines (<https://open.alberta.ca/publications/traffic-impact-assessment-guidelines>), including the following:
  - a) Describe and map the Project boundary, internal road network and any existing or proposed access location to/from the provincial highway system;
  - b) Discuss the options considered for the proposed highway access locations and provide rationale for selecting the preferred option;
  - c) Discuss compatibility of the preferred option with Transportation and Economic Corridors' future highway plans;
  - d) Describe existing and future background traffic and development traffic, and consider the cumulative effects from other existing and planned developments that are or will be using the same highways and highway accesses;
  - e) Consider the potential traffic impacts for all stages of the Project (e.g., construction, operations, expansion, shutdown, etc.), and determine any necessary improvements to maintain the safe operations of the highway intersection and access road infrastructure; and
  - f) Provide a schedule for undertaking the necessary improvements prior to commencing the Project.
2. Describe any project- infrastructure (e.g., utilities and facilities that cross or are in close proximity to a provincial highway) that may impact the provincial highways, and any effects from the Project (e.g. smoke, dust, light, noise, precipitation, etc.) that may impact the highway users, and provide solutions.
3. Provide a summary of discussions with Alberta Transportation and Economic Corridors regarding the Project and its traffic impacts.
4. If the Project involves the transport of Dangerous Goods by truck::
  - a) State the classes, divisions, and characteristics of the Dangerous Goods;
  - b) State where the Dangerous Goods will be transported to; and
  - c) Confirm the availability of an Emergency Response Assistance Plan (ERAP).

## 2.5 Dam Safety

1. Describe how the Project will adhere to the *Alberta Dam and Canal Safety Directive* and include:
  - a) the Project components and scope;
  - b) the overall approach for design and technical specification;
  - c) any hypotheses and assumptions used;
  - d) data collection methods, models, and studies;
  - e) the degree of uncertainty, reliability and sensitivity of models used to reach conclusions; and
  - f) any gaps in knowledge and understanding related to key conclusions, including steps to address these gaps.
2. Describe the physical characteristics of the proposed reservoir, including:
  - a) normal operating range;
  - b) spatial extent/overlap into other tributaries, if any;

- c) surface area at the maximum normal reservoir level;
  - d) normal operating water volume; and
  - e) the volume between the maximum normal reservoir level and the minimum normal reservoir level.
3. Describe the normal operating characteristics of the proposed reservoir, including:
    - a) operating depth and volume ranges; and
    - b) flooded surface area at maximum reservoir level.
  4. Determine the Consequence Classification of the proposed dam and its appurtenant structures as per Schedule 1 of the *Alberta Dam and Canal Safety Directive*.
  5. Describe the following for the dam, reservoir, and/or appurtenant structures:
    - a) principal dimensions of the main dam;
    - b) anticipated quantities of construction materials;
    - c) use of stability analysis and factors of safety in the designs;
    - d) freeboard requirements;
    - e) flood infrastructure and controls;
    - f) the characteristics and geotechnical properties of naturally available surface and sub-surface materials for construction;
    - g) field and lab testing to determine material suitability for construction;
    - h) potential challenges or issues that could impact design and safety during construction and operation stages, and potential mitigation measures;
    - i) any assessments completed of alternative design concepts, technical options, and structure locations to demonstrate the selection of best available technology;
    - j) the expected performance of the structures under usual and unusual loading conditions, including required mitigation measures for unusual conditions;
    - k) characteristics of the proposed site, including field and lab test results and geotechnical properties;
    - l) principal dimensions of the appurtenant structures;
    - m) seepage control and drainage provisions for both the dam and rim of the proposed reservoir extension; and
    - n) stability under usual and unusual loading conditions.
  6. Provide details regarding potential accidents or malfunctions, including:
    - a) identification of potential accidents and malfunctions that could occur during all stages of the Project's construction (e.g., cofferdam leakage, failure, or other dam safety incidents);
    - b) description of the effects of a failure by tabulating the flow arrival time at downstream of the structures until the estimated contents of the reservoir are within the estimated 100-year flood level; and
    - c) assessment of the potential for cascade failure and the impacts of such a cascade failure if there are other dam or canal structures located downstream.
  7. Identify if any blasting will be required. If so, list the frequency and methods, types of explosives, and plans for safe storage and use of explosives.
  8. Describe challenges that could affect safety of the proposed structures, and measures to minimize the risk of accidents and malfunctions during excavation, reservoir filling, dam operations, and maintenance activities.

9. Describe planned mitigation measures and management practices to address accidents or malfunctions, water and debris management, emergency preparedness, and response plans.
10. Describe the expected performance of the proposed dam and appurtenant structures during and after extreme events (e.g., floods, windstorms, earthquakes, etc.), including:
  - a) ability of the structures (e.g., earth dams, diversions, flow control) to withstand those events and potential challenges and mitigation measures;
  - b) potential challenges that could impact the safety of the proposed structures; and
  - c) proposed measures to mitigate challenges identified.
11. Provide details of dam, reservoir, canal and other infrastructure performance monitoring during construction, reservoir filling, and project operations, to ensure potential failures are identified and addressed proactively and to ensure the Project will meet environmental and performance objectives.
12. Describe construction activities of the proposed structures including:
  - a) site clearing and grubbing;
  - b) construction and operation of any temporary structures required (e.g., cofferdam, river diversion, etc.);
  - c) excavation and stockpiling of suitable material, including drilling, blasting, sorting and screening in rock quarries, and moisture conditioning of impervious material;
  - d) excavated slope stabilization and foundation preparation;
  - e) placing impervious lining and erosion protection;
  - f) installation of instrumentation, mechanical and electrical equipment; and
  - g) testing and commissioning.
13. Describe decommissioning, removal and/or reclamation of the existing or temporary structures including:
  - a) removal of temporary structures (e.g., coffer dams etc.); and
  - b) breach/removal of any existing structures.
14. Describe the operation of structures, including:
  - a) approach used for first filling of the reservoir;
  - b) debris management during reservoir filling;
  - c) shoreline stabilization during reservoir filling, including potential impacts with higher reservoir water levels on the reservoir shoreline;
  - d) operation, maintenance and surveillance needs for safe operation of the structures;
  - e) expected fluctuations in the reservoir and its impacts; and
  - f) approach to manage the reservoir in usual and unusual conditions.

## **2.6 Water Management**

### **2.6.1 Water Supply**

1. Describe the Project's effects on flows within the Bow River downstream of the Project area and whether this may affect apportionment requirements, instream flow needs, water conservation objectives, and transboundary objectives.
2. Describe the water supply requirements for the Project as it relates to the source of water for the reservoir, including:

- a) the status of EID's current water license and the expected annual volumes diverted against the licensed volume;
  - b) the water requirements and sources for normal operation of the reservoir. Identify the volume of water to be diverted from each source;
  - c) expected upstream and downstream demands with a discussion on priority rights;
  - d) the variability in the amount of water required on an annual and seasonal basis, considering the range of climate (normal, wet, and drought years) as the Project is implemented;
  - e) the expected water balance prior to and resulting from the Project including, but not limited to:
    - i) total annual diverted volumes of water;
    - ii) schedule and duration of diversions;
    - iii) volume of water lost from canals and reservoirs;
    - iv) volume of return flows;
    - v) licensed volumes used for purposes other than irrigation (e.g., agricultural and industrial water convenience agreements),
    - vi) volume of remaining license water available for crop use; and
    - vii) volume of consumptive use;
  - f) a complete water balance for the reservoir (including existing and proposed, using historical hydrologic data [especially watershed natural runoff yield and natural flow]);
  - g) a discussion of assumptions made, or methods chosen to arrive at the water balances; and
  - h) the expected cumulative effects on water losses/gains resulting from the Project's operations.
3. Describe the water supply requirements for the Project as they relate to process and/or potable water needs during construction, operation and/or decommissioning, including:
- a) the process water, potable water, and non-potable water requirements and basin water supply sources for construction and normal operation of the reservoir. Identify the volume of water to be withdrawn from each source and potential changes in the operation of upstream water supply reservoirs;
  - b) potable water treatment systems for all stages of the Project;
  - c) type, quantity, and process of potable water treatment chemicals used; and
  - d) measures for ensuring efficient use of water such as water use minimization, recycling, conservation, and technological improvements.

### **2.6.2 Surface Water**

1. Describe the surface water management strategy for all stages of the Project, including:
- a) prior to filling, during filling and during normal and abnormal operating conditions;
  - b) design factors considered, such as:
    - i) site drainage;
    - ii) run-on and run-off management;
    - iii) erosion and sediment controls;
    - iv) geotechnical stability concerns;
    - v) surface water quality issues;
    - vi) surface water protection and groundwater interaction;

- vii) water body dewatering, groundwater interactions;
  - viii) wetland and water body draw-down or increases in water level;
  - ix) groundwater seepage; and
  - x) flood protection.
- c) permanent or temporary alterations or realignments of drainages, watercourses, wetlands (including the relevance of the *Alberta Wetland Policy*), and other water bodies; and
  - d) the pre- and post-disturbance alignment and condition of ephemeral and permanent streams, wetlands and waterbodies including those created by the Project.
2. Describe and map all roadway, pipeline, powerline, and any other crossings of drainages, watercourses, wetlands, or water bodies pre- and post-construction.
  3. Evaluate the agricultural water needs downstream of the Project in normal and severe drought years and compare to the current reservoir volume and planned expansion reservoir volume.
  4. Discuss the effects of the Project on maintenance of the Bow River including water conservation objectives and instream objectives on instream flow needs in normal and drought conditions.
  5. Discuss effects of the Project on Bow River water quality downstream of the EID Main Branch Canal near Headgate (05BM020).

## **2.7 Wastewater Management**

1. Describe the types and characteristics of wastewater that will be generated during all stages of the Project.
2. Describe the wastewater management strategy for each wastewater type generated during all stages of the Project, including:
  - a) the criteria used, options considered and rationale for the selection of wastewater treatment and wastewater disposal, and a discussion of why the other options were not chosen;
  - b) the proposed mitigation and monitoring measures (water management and wastewater management treatment systems) to protect water quality; and
  - c) design of facilities that will collect, treat, store and release wastewater streams.

## **2.8 Waste Management**

1. Describe the types and characteristics of waste that will be generated during all stages of the Project.
2. Discuss the selection criteria, options considered, and rationale for waste disposal during construction and decommissioning. Include:
  - a) the location and availability of on- and off-site waste disposal; and
  - b) site suitability from a water quality protection perspective, geotechnical perspective and with regard to existing and potential human activities.
3. Characterize and quantify the anticipated dangerous goods, hazardous, non-hazardous, and recyclable wastes generated by all stages of the Project and describe:
  - a) the composition and volume of specific waste streams and discuss how each stream will be managed; and

- b) plans for pollution prevention, waste minimization, recycling, and management to reduce waste quantities for all stages of the Project;
4. Describe the nature and amount of on-site hydrocarbon storage. Discuss containment and other environmental protection measures.

## **2.9 Conservation and Reclamation**

1. Provide a conceptual conservation and reclamation plan for all phases of the Project. Describe and map as applicable:
- a) borrow pits;
  - b) waste material disposal sites;
  - c) temporary roadways or utility corridors;
  - d) any other disturbance;
  - e) current land use and capability and proposed post-development land use and capability;
  - f) anticipated timeframes for completion of reclamation stages including an outline of the key milestone dates for reclamation and how progress to achieve these targets will be measured;
  - g) constraints to reclamation such as timing of activities, availability of reclamation materials and influence of natural processes and cycles including natural disturbance regimes;
  - h) a revegetation plan for the disturbed terrestrial, riparian, and wetland areas;
  - i) reclamation material salvage, storage areas, and handling procedures; and
  - j) existing and final reclaimed site drainage plans.
2. Discuss, from an ecological perspective, the expected timelines for establishment and recovery of vegetative communities and wildlife habitat, the expected success of establishment and recovery, and the expected differences in the resulting communities.
3. Describe how EID considered the use of progressive reclamation in project design and reclamation planning.
4. Discuss uncertainties related to the conceptual reclamation plan.

## **3 ENVIRONMENTAL ASSESSMENT**

### **3.1 Air Quality and Noise**

#### **3.1.1 Baseline Information**

1. Identify residences or other facilities that could be affected by air emissions, dust, noise or vibration from construction operation and decommissioning.
2. Discuss baseline air quality conditions, including appropriate ambient air quality parameters.
3. Discuss baseline soil drifting from the footprint of the reservoir during current reservoir draw-down.
4. Discuss baseline noise conditions. Identify key sources of noise, including the intensity and frequency of sound generated and the distance to the Project site and to the nearest receptors.

### **3.1.2 Impact Assessment**

1. Identify construction and operational components of the Project that have the potential to increase noise levels or affect air quality.
2. Discuss the nature, severity, extent, and duration of activities likely to produce noise, vibration, dust, or affect air quality that could impact residences, livestock, other facilities or receptors during construction and operation.
3. Assess the probability of soil drifting during reservoir draw-down from the expanded reservoir.
4. Discuss the frequency, severity, and potential impacts of dust generation.
5. Describe how air quality, dust and noise impacts resulting from the Project will be mitigated. Include dust and noise management and monitoring plans, and complaint resolution, if applicable.
6. Discuss the Project's relative contribution to cumulative effects on regional air quality and noise.

## **3.2 Hydrogeology**

### **3.2.1 Baseline Information**

1. Provide an overview of the existing geologic and hydrogeologic setting. Document new hydrogeological investigations, including methodologies, analysis, results, and interpretations 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; and
  - b) describe and review the geology of the region and project area, including both surficial and bedrock units (both aquifer and non-aquifer units).
2. Present regional and project area hydrogeology describing:
  - a) major aquifers, aquitards and aquicludes (quaternary and bedrock), their spatial distribution, properties, hydraulic connections between aquifers, hydraulic heads, gradients, groundwater flow directions and velocities, including maps and cross sections;
  - b) the chemistry of groundwater aquifers including baseline concentrations of major ions, metals and hydrocarbon indicators;
  - c) potential groundwater discharge zones, sources and zones of groundwater recharge, areas of groundwater-surface water interaction, and areas of quaternary aquifer-bedrock groundwater interaction; and
  - d) an inventory of water well development and groundwater use.
3. Provide a detailed review and inventory with site reconnaissance for the entire project area to determine what boreholes are present, including:
  - a) a determination of which party will be responsible for the cost of decommissioning and if replacement is required. Identify where the new wells will be installed;
  - b) an outline of how decommissioning will be completed. Identify what regulatory authorizations are required for the replacement of existing water wells; and
  - c) details of the compensation requirements if new wells cannot be installed.

4. Describe the potential for current seeps or flows from creeks, streams (permanent or intermittent) to bring potential overland runoff with agricultural contamination into the proposed reservoir expansion area, affecting the water quality and potential contamination of underlying/connected aquifer water quality.

### **3.2.2 Impact Assessment**

1. Describe project components and activities that could affect groundwater resource quantity and quality at all stages of the Project.
2. Identify areas that may experience seepage from the reservoir and predicted interactions with aquifers or surface water bodies. Detail the proposals, monitoring plans and mitigation strategies to protect the potential contamination of groundwater aquifers.
3. Describe the nature and significance of the potential project impacts on groundwater with respect to:
  - a) inter-relationship between groundwater and surface water in terms of surface water quantity and quality;
  - b) implications for terrestrial or riparian vegetation, wildlife and aquatic resources, including wetlands;
  - c) changes in groundwater quality, quantity, and flow;
  - d) conflicts with other groundwater users, and proposed resolutions to these conflicts;
  - e) groundwater protection including reclaiming wells in the Project area prior to construction of the Project;
  - f) potential implications of seasonal variations;
  - g) groundwater withdrawal for project operations, including expected alterations in the groundwater flow regime during and following project operations; and
  - h) a discussion of the groundwater vulnerability below the proposed reservoir expansion and along the meltwater valley channel.
4. Discuss the Project's relative contribution to cumulative effects on regional groundwater with respect to:
  - a) Changes in regional groundwater quality and quantity; and
  - b) conflicts with regional groundwater users.

## **3.3 Hydrology**

### **3.3.1 Baseline Information**

1. Define and map Local and Regional Study Areas for hydrological assessment by:
  - a) describing the rationale used to define the local and regional study areas considering the location and range of probable project and cumulative effects;
  - b) providing maps illustrating the boundaries of the local and regional study areas and how the boundaries were determined;
  - c) describing environmental conditions that affect hydrology in these areas, including climatic and topographical considerations.
  - d) describing meteorological conditions;
  - e) describing and mapping the surface hydrology, including waterbodies and drainage at the highest possible resolution; and
  - f) describing the sediment yield.



2. Describe baseline surface water quantity characteristics, including:
  - a) seasonal variation, low, average, and peak flows for watercourses including the Bow River;
  - b) seasonal variation of flow or depth and water storage in the inlet canal, existing reservoir, and outlet canal; and
  - c) low, average, and peak levels and temporal and spatial trends for the waterbodies impacted by the Project; and
  - d) existing data on water input, outlet, and storage levels within the Snake Lake Reservoir.
3. Identify local sites susceptible to erosion and sedimentation.
4. Provide an inventory of surface water users who have existing approvals, permits or licenses in the local and regional study areas, including traditional agricultural and household users.

### **3.3.2 Impact Assessment**

1. Identify project activities that may affect surface water during all stages of the Project, including site preparation, construction, reservoir filling, operation, maintenance decommissioning, and reclamation.
2. Discuss potential hydrological changes (in terms of quantity, extent, frequency, duration, and seasonality) in the local and regional extent due to the Project implementation, including changes in:
  - a) surface and near-surface drainage conditions;
  - b) channel regime for Bow River (during minimum, average, and peak flows);
  - c) water levels in water bodies and water courses;
  - d) evaporation, transpiration, and seepage amounts;
  - e) sediment transport and yield; and
  - f) open-water surface areas.
3. Describe the extent of hydrological changes that will result from potential changes to groundwater, surface seepage, and surface water movement, and:
  - a) include changes and timing of those changes to the quantity of surface flow and water levels in watercourses (during minimum, average, and peak flows) and water levels in waterbodies and wetlands;
  - b) assess the potential impact of alterations in flow and water levels on local or regional hydrology, and identify temporary and permanent alterations or disturbances;
  - c) assess changes in runoff rates and volumes before, during, and after construction of the Project; and
  - d) identify changes in erosion including changes in sedimentation in watercourses resulting from the Project.
4. Discuss changes to surface and near-surface drainage conditions surrounding the expanded reservoir such as flow impediments, run-off capture, and open water surface areas.
5. Describe how water conservation objectives and instream objectives may be adversely affected with the development of the Project.

6. Describe the impacts on other surface water users resulting from the Project. Identify any potential water use conflicts.
7. Discuss how potential hydrological impacts of new temporary and permanent roads will be minimized and mitigated. Identify if a Code of Practice notification for crossing a waterbody is required or if a *Water Act* application for approval of temporary-to-permanent direct or indirect effects on waterbodies is required.
8. Describe mitigation measures to address surface quantity impacts during all stages of the Project, including:
  - a) alteration in flow regimes;
  - b) potential flood events;
  - c) potential drought events; and
  - d) potential water use conflicts.
9. Discuss the Project's relative contribution to cumulative effects on regional water quantity (e.g., timing, volume, peak and minimum flow rates of water courses, waterbody levels).
10. Discuss the impact of low-flow conditions on water conservation objectives, instream objectives, and water and wastewater management strategies.
11. Discuss the Project's contribution to cumulative effects on regional surface water, including:
  - a) water quantity (e.g., timing, volume, peak and minimum flow rates of water courses or waterbody levels); and
  - b) conflicts with regional surface water users.

### **3.4 Surface Water Quality**

#### **3.4.1 Baseline Information**

1. Describe the baseline water quality of water courses and water bodies (existing reservoir and downstream (natural or man-made) bodies of water). Discuss the effects of seasonal and flow variations, other controlling factors, and temporal and spatial trends. Include water quality for high-flow events (1 in 20-year and 1 in 100-year and 1 in 300year) under current conditions. Consider appropriate water quality parameters (e.g., metals, nutrients, pesticides, temperature, Biochemical Oxygen Demand/Total Organic Carbon (BOD/TOC), bacteria, aquatic and benthic invertebrates, aquatic plants, algae, dissolved oxygen, etc.) Provide a summary of existing information available from literature review(s).
2. Identify, describe, and map current point sources and non-point sources that may influence water quality in the Project area.
3. Describe all current water uses of the Snake Lake Reservoir (e.g., flood storage, fish habitat, hydroelectric, municipal discharge, recreation, etc.).

#### **3.4.2 Impact Assessment**

1. Identify project activities that may affect surface water during all stages of the Project (including site preparation, construction, operation, reservoir filling, maintenance, decommissioning, and reclamation). Determine the local and regional extent of potential impacts as well as their frequency, duration, magnitude, and seasonality.

2. Describe and predict the potential impacts of the Project (during site preparation, construction, operation, maintenance, decommissioning, and reclamation) on surface water quality of the existing reservoir and downstream (natural or man-made) bodies of water using modelling or another scientifically defensible approach, including:
  - a) any changes in water quality that may result in potential exceedances of the Environmental Quality Guidelines for Alberta Surface Waters, the Canadian Water Quality Guidelines for the Protection of Aquatic Life, the Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses, or Guidelines for Canadian Recreational Water Quality, or (for mainstem reaches) the South Saskatchewan Region Surface Water Quality Management Framework (SWQMF) under the South Saskatchewan Regional Plan;.
  - b) changes in concentrations, loading amounts, and timing of key water quality parameters including routine parameters that could impact the current Snake Lake reservoir and downstream (natural or man-made) waterbodies, including:
    - i) impacts on their current and potential water uses;
    - ii) potential implications to aquatic resources (e.g., aquatic and benthic invertebrate, biota, vegetation, algae, biodiversity, habitat);
    - iii) changes in water quality due to seasonal and flow variation;
    - iv) groundwater and surface water interactions;
    - v) changes in the quality of surface water runoff;
    - vi) implications to the health and extent of riparian lands;
    - vii) impacts in the event of a catastrophic failure of the structure.
    - viii) impacts on their use as a drinking water supply, recreation, agriculture, domestic use, aesthetics, and other water uses;
    - ix) potential implications to water quality on the current reservoir and downstream (natural or man-made) bodies of water due to the water drawn during the initial filling of the Project; and
    - x) impact on creek banks during flood events;
  - c) the level of uncertainty derived from the models and tools used in the analysis; and
  - d) any limitations of expected water quality on municipal/domestic use, recreational use, fisheries, stock watering, or other uses.
3. Describe the water quality expected in the Project and downstream (natural or man-made) bodies of water. Include water quality for both high-flow and low-flow events (1 in 20-year and 1 in 100-year and 1 in 300-year) under expected reservoir conditions.
4. Describe the potential and implications for metals (e.g., lead, arsenic, cadmium, selenium, and mercury) methylation in the Project to:
  - a) enter the aquatic food chain, including downstream in the Project and downstream (natural or man-made) bodies of water; and
  - b) impact the Project and downstream (natural or man-made) water bodies in their various water uses, and impact treatment of water from the Project and downstream (natural or manmade) bodies of water for drinking water purposes.
5. Describe the potential and implications for release and contamination of hydrocarbons and associated materials from pipelines and other oil and gas infrastructure, farm infrastructure and/or contaminated surface soil or subsoil in the area, on water quality and aquatic environment.

6. Describe the potential and implications for cyanobacteria/microcystin in the proposed Snake Lake Reservoir to:
  - a) impact recreation of the Project and downstream (natural or man-made) bodies of water.
  - b) impact treatment of water from the Project and downstream (natural or man-made) bodies of water for drinking water purposes if applicable.
7. Describe mitigation measures to address surface water quality and quantity impacts during all stages of the Project, including:
  - a) alteration in flow regimes;
  - b) potential flood or drought events;
  - c) potential water use and operations conflicts; and
  - d) increased loading of water quality parameters of concern.
8. Discuss the impact of the return flow loadings to the receiving water body and water and wastewater management strategies.
9. Provide a summary of the management plan to prevent or reduce impacts to surface water, and a spill response plan in the event of an accidental release.
10. Describe the potential and implications for organic carbon and nutrient management in the Project, based on the proposed operating regime, to:
  - a) impact treatment of water and downstream (natural or man-made) bodies of water for drinking water purposes (e.g., disinfection by-products); and
  - b) impact productivity of aquatic vegetation (e.g., macrophyte, algae).
11. Discuss the contribution of the Project to cumulative effects on water quality, including downstream (natural or man-made) water bodies, and discuss implications to the South Saskatchewan Region Surface Water Quality Management Framework and any other regional initiatives.
12. Identify the Surface water quality monitoring program that will be implemented to assess the future impacts of construction and operation (including maintenance) of the reservoir project on the Bow. Consider appropriate water quality parameters (e.g. metals, nutrients, pesticides, temperature, BOD/TOC, bacteria, aquatic and benthic invertebrates, aquatic plants, algae, dissolved oxygen, etc.) and their seasonal and flow variations.

### **3.5 Aquatic Ecology**

#### **3.5.1 Baseline Information**

1. Describe and map the distribution of fish and other aquatic resources (e.g., aquatic, and benthic invertebrates) for water bodies and watercourses and other waters affected by the Project that may provide habitat for fish. Describe the species composition, distribution, relative abundance, quantitative population estimates, seasonal movement trends, and general life history parameters.
  - a) Identify any fish species that are:
    - i) listed as “At Risk,” “May Be At Risk,” and “Sensitive” in *The General Status of Alberta Wild Species* (Alberta Environment and Protected Areas);
    - ii) listed as “Threatened” or “Endangered” under the *Alberta Wildlife Act*;
    - iii) listed as “Threatened” or “Endangered” under Schedule 1 of the federal *Species at Risk Act*;

- iv) listed as “Threatened” or “Endangered” by COSEWIC;
  - v) species of cultural significance;
  - vi) sportfish and/or traditionally used species; and
  - vii) invasive fish species.
- b) Quantify abundance of listed fish species, sportfish and/or traditionally used fish species, and invasive fish species using approved standard methods.
2. Identify key indicator fish species and provide the rationale and criteria used to select indicator species.
  3. Describe current and potential use of the fish resources by Indigenous peoples or sport fisheries.
  4. Quantitatively describe the current extent of aquatic habitat. Describe and map fish habitat and aquatic resources in water bodies and watercourses and:
    - a) identify habitat used by fish, seasonally or year-round, for water bodies and connected watercourses that may provide habitat for fish, including critical or sensitive areas such as spawning, rearing, and over-wintering habitats; and
    - b) describe water quality parameters in water bodies and watercourses that may affect suitability for fish.

### **3.5.2 Impact Assessment**

1. Describe and assess the potential impacts of the Project to fish, fish habitat and other aquatic resources, including but not limited to:
  - a) change in habitat suitability and availability during construction and operation of the Project;
  - b) survival of fish at multiple life stages (eggs, fry, juveniles, adults), chronic or acute health effects, and increased stresses on fish populations from contaminants, bioaccumulation of methylmercury, sedimentation, flow alterations, or from temperature and habitat changes;
  - c) changes to movements of fish, including entrainment of fish in canals and resulting immigration/emigration;
  - d) changes to riparian areas that could affect aquatic biological resources and productivity;
  - e) changes to benthic invertebrate communities that may affect food quality and availability for fish;
  - f) the potential for increased fragmentation of aquatic habitat;
  - g) potential water quality and quantity changes;
  - h) acidification and/or eutrophication;
  - i) groundwater-surface water interactions; and
  - j) potential for thermal plumes to affect aquatic habitat.
2. Discuss the design, construction, and operational factors including specific diversion and reservoir operations that will be incorporated into the Project to minimize impacts to fish and fish habitat and protect aquatic resources.
3. 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.

4. Discuss the potential impacts of new water control structures on seasonal fish movements, including entrainment and exclusion from the expanded reservoir, relative to baseline conditions.
5. Discuss the potential effects on fish and their habitat during the filling of the expanded reservoir and decommissioning of the existing East Dam, including mitigations to protect fish during the filling process.
6. Discuss the potential for aquatic invasive species to occur and the potential for the Project to affect occurrence or distribution of these species. Describe measures to monitor for and remove aquatic invasive species should they be encountered during project works.
7. Discuss the potential increase in fishing pressures that could arise from the improved access resulting from the Project in the region and how the sport fishery could change.
8. Discuss changes in the aquatic environment with predicted climate change scenarios, with and without the Project, in the local and regional study areas.
9. Describe the effects of surface water withdrawals and water diversions, including the cumulative effects on fish, fish habitat, and other aquatic resources.

### **3.6 Terrain and Soils**

#### **3.6.1 Baseline Information**

1. Describe and map the terrain and soil resources, including:
  - a) surficial geology and topography;
  - b) soil types and distribution, including description of soil profiles;
  - c) agricultural land capability;
  - d) soil capability of reclamation;
  - e) soils that could be affected by the Project;
  - f) specific locations of erosion-sensitive and saline-sodic soils; and
  - g) an inventory of geohazards, such as erosion, landslides, floods, etc.

#### **3.6.2 Impact Assessment**

1. Describe project activities in the Project area and other related issues that could affect soil quality (e.g., wetting/drying/re-wetting of soil, salinization, silt accumulation, soil crusting, compaction, anaerobic decomposition of organic matter, contaminants) and:
  - a) indicate the amount (ha) of surface disturbance from the Project construction, operation, and decommissioning activities;
  - b) indicate the size and location of soil types and land capability classes that will be disturbed;
  - c) describe potential sources of soil contamination (e.g., industry infrastructure and activities, agricultural infrastructure and activities, contaminated sites, etc.), along with the appropriate remedial measures;
  - d) describe the impact of the Project on soil types and reclamation suitability and the approximate volume of soil materials that are salvaged for reclamation. Discuss constraints or limitations to achieving vegetation/habitat reclamation based on anticipated soil conditions (e.g., compaction, contaminants, salinity, soil moisture, nutrient depletion, erosion, etc.);
  - e) discuss potential changes to the rate and type of soil erosion;

- f) discuss potential changes to slope instability, wind erosion, and other geohazards; and
  - g) discuss the relevance of changes for the local landscape on biodiversity, productivity, ecological integrity, aesthetics, and future use.
2. Discuss the potential impacts caused by the mulching and storing of woody debris, considering, but not limited to, vulnerability to fire, degradation of soil quality and increased footprint.
  3. Provide a mitigation plan including:
    - a) possible measures to minimize surface disturbance;
    - b) possible actions to mitigate effects of constraints or limitations to habitat reclamation;
    - c) possible actions to address impacts to land capability; and
    - d) any other measures to reduce or eliminate the potential impacts that the Project may have on soil capability and/or quality and include:
      - i) soil mapping and typical profiles,
      - ii) losses of agricultural soils,
      - iii) erosion issues, and
      - iv) characteristics related to handling and reclamation of site disturbances.
  4. Describe the Project's relative contribution to cumulative effects on terrain and soil resources.

### **3.7 Vegetation**

#### **3.7.1 Baseline Information**

1. Describe and map the vegetation communities, native grasslands, wetlands, wetland habitat, riparian lands, rare plants, invasive species, and communities of rare and scarce distribution. Identify the occurrence, relative abundance and distribution and identify any species that are:
  - a) listed as "At Risk," "May Be At Risk," and "Sensitive" in The *General Status of Alberta Wild Species* (Alberta Environment and Protected Areas);
  - b) listed as "Threatened" or "Endangered" under the *Alberta Wildlife Act*;
  - c) listed as "Threatened" or "Endangered" under Schedule 1 of the federal *Species at Risk Act*;
  - d) listed as "Threatened" or "Endangered" by COSEWIC;
  - e) species tracked by the Alberta Conservation Information Management System (ACIMS) as being SU, S1, S2, S3;
  - f) rare ecological communities as tracked by ACIMS, and
  - g) traditionally used species.
2. Describe the regional relevance of landscape units that are identified as rare.
3. Discuss the potential of each ecosite phase or ecological range site to support rare plant species, plant species of cultural significance, and plant communities of limited distribution. Consider their importance for local and regional habitat, rare plant habitat and the hydrologic regime.

4. Describe and map the occurrence and distribution of Prohibited Noxious and Noxious weeds, and of other non-native plant species.
5. Describe and quantify the current extent of community fragmentation.
6. Identify, classify, and delineate wetlands as per the *Alberta Wetland Classification System* and the *Alberta Wetland Policy* and associated directives. Identify, describe, and map other surface hydrological features including springs, ephemeral water bodies, ephemeral drainages, watercourses, and anthropogenic water bodies. Describe these hydrological features, including:
  - a) distribution and area of each class;
  - b) for wetlands classified under the *Alberta Wetland Classification System*, wetland function and relative wetland value per the Alberta Wetland Rapid Evaluation Tool Actual (ABWRET-A); and
  - c) dominant and indicator plant species, observed wildlife, basin characteristics, topographical influences and capture basins, soil characteristics, and hydrology including assessed hydroperiod and mineralogy.
7. Describe and quantify the local and regional relevance of native grassland, and:
  - a) discuss the distribution and relative abundance of native grassland units;
  - b) discuss locations and size of native grassland units;
  - c) characterize the flora and fauna of the native grassland units; and
  - d) evaluate and discuss native grassland integrity.

### **3.7.2 Impact Assessment**

1. Identify the area of each vegetation community mapped, including various native grassland plant communities, that would be permanently lost due to the Project.
2. Identify and quantify areas that will be temporarily lost to the Project and will be reclaimed (e.g., access routes).
3. Discuss the predicted changes to upland, native grassland, riparian, and wetland habitats resulting from increased fragmentation.
4. Identify areas (e.g., native grassland) that will be avoided during construction.
5. Discuss the potential project impacts on rare plants, endangered species, or rare ecological communities, and describe any required regulatory authorizations and/or possible mitigation plans/strategies needed to address these impacts.
6. For temporary disturbances, 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.
7. Describe and assess the potential impacts of the Project on vegetation communities considering:
  - a) both temporary (include timeframe) and permanent impacts;
  - b) the potential for introduction and colonization of weeds and non-native invasive species and how those species will be managed;
  - c) potential increased fragmentation and loss of upland, native grassland, riparian and wetland habitats;



- d) implications of vegetation changes for other environmental resources (e.g., terrestrial and aquatic habitat diversity and quantity, water quality and quantity, erosion potential); and
  - e) the species that will be used in reclaiming areas disturbed during construction and for erosion control and site stabilization.
8. Describe how requirements of the *Alberta Wetland Policy* will be met in the assessment of impacts, including but not limited to:
    - a) avoidance, minimization, reclamation, or replacement of wetlands in accordance with the *Alberta Wetland Mitigation Directive*;
    - b) temporary and permanent alterations (direct and indirect) to wetlands classified under the *Alberta Wetland Classification System*;
    - c) any expected changes in wetland class or type and cause for this change; and
    - d) consideration of cumulative effects on wetlands in the watershed.
  9. Discuss strategies for control of weeds and other non-native species during construction, berm reclamation, and operations.
  10. Discuss the effect of a loss or development of wetlands and riparian areas, including how the loss or development will affect land use.
  11. Discuss the regional significance of the indirect effects of the conversion of native grassland pasture to tame pasture or cultivated lands with an increase in water availability.
  12. Describe the Project's relative contribution to cumulative effects on:
    - a) native grassland communities;
    - b) populations of plant "species of conservation concern" and "communities of conservation concern"; and
    - c) wetlands.

### **3.8 Wildlife and Wildlife Habitat**

#### **3.8.1 Baseline Information**

1. Describe and map current and potential wildlife resources (amphibians, reptiles, birds, and terrestrial and aquatic mammals). Describe species relative abundance, distribution and their use and potential use of habitats. Also identify species that are:
  - a) listed as "At Risk," "May be at Risk," and "Sensitive" in the *General Status of Alberta Wild Species* (Alberta Environment and Protected Areas);
  - b) listed as "Threatened" or "Endangered" under the *Alberta Wildlife Act*;
  - c) listed as "non-game" and "upland game" bird under the *Alberta Wildlife Act*;
  - d) listed as "Threatened" or "Endangered" under Schedule 1 of the federal *Species at Risk Act*;
  - e) listed as "Threatened" or "Endangered" by COSEWIC;
  - f) migratory bird species listed under the *Migratory Birds Convention Act*; and
  - g) species of cultural significance.
2. Describe and map existing wildlife habitat and habitat disturbance including assessment activities. Identify habitat disturbances that are related to existing and approved projects.

### 3.8.2 Impact Assessment

1. Describe and assess the potential impacts of the Project to wildlife, wildlife habitats, and biodiversity considering:
  - a) how the Project will affect wildlife relative abundance, habitat availability, habitat fragmentation, mortality, movement patterns, and distribution for all stages of the Project, including a prediction of future use due to habitat alteration;
  - b) how improved or altered access may affect wildlife, including future prediction of wildlife use and movements, potential obstruction of movements (reservoir expansion and inundation), and increased vehicle wildlife collisions;
  - c) how altered habitat conditions (loss, change, fragmentation) may effect wildlife and biodiversity values. Consider habitat change (e.g., riparian), the availability of habitat, and the influence of anthropogenic features and infrastructure on wildlife movements and predator-prey relationships;
  - d) the contribution of the Project to changes in regional biodiversity and the impact to local and regional ecosystems;
  - e) the potential effects on wildlife resulting from changes to air and water quality (e.g., contamination), including both acute and chronic effects to animal health;
  - f) how the risk to wildlife and habitat can be managed, including the use of setbacks;
  - g) the potential and expected effects on wildlife, wildlife habitats and biodiversity from the loss of habitat due to the conversion of native prairie to irrigated cultivation; and
  - h) the resilience and recovery capabilities of wildlife populations and habitats to disturbance.
  
2. Provide a strategy and mitigation plan to avoid or minimize effects on wildlife and wildlife habitat for all stages of the Project considering:
  - a) consistency of the plan with applicable regional, provincial, and federal wildlife habitat objectives and policies;
  - b) a schedule for the return of habitat capability to areas temporarily affected by the Project;
  - c) pre-clearing of vegetation prior to the breeding season, to reduce nesting, denning opportunities, and wildlife interactions;
  - d) measures to prevent human-wildlife encounters and consequent destruction of wildlife;
  - e) use of pre-construction wildlife sweeps during the breeding seasons to identify species in need of protection;
  - f) the use of setbacks to protect habitat and connectivity of habitat for species of conservation concern;
  - g) measures to prevent wildlife from contacting or ingesting harmful substances;
  - h) anticipated access controls or other management strategies to protect wildlife during construction and operation;
  - i) management of noise, lighting, and use of equipment to reduce sensory disturbance effects;
  - j) installation of offset habitat structures such as nesting platforms in suitable offsite habitat areas;
  - k) programs to capture and transport sensitive wildlife to suitable off-site habitat areas;

- l) use of habitat enhancements or planting of selected species to improve habitat quality in areas temporarily affected by the Project;
  - m) measures to deter use of reservoir substrate for nesting or denning prior to filling of the expanded reservoir;
  - n) measures to enhance use of the new reservoir by aquatic and semiaquatic wildlife species; and
  - o) habitat fragmentation and habitat connectivity resulting from linear features (e.g., above-ground canals, roads etc.) and other project infrastructure and activities.
3. Identify opportunities for habitat creation or enhancement which may result from the Project.
  4. Identify the key wildlife and habitat indicators used to assess project impacts. Discuss the rationale for their selection.
  5. Describe the Project's relative contribution to cumulative effects on:
    - a) wildlife habitat quality;
    - b) movement patterns and distribution; and
    - c) wildlife "species of conservation concern."

### **3.9 Climate Change**

#### **3.9.1 Baseline Information**

1. Describe climate norms and variability as they relate to agricultural productivity in the Project area.
2. Discuss the baseline climatic conditions including the type and frequency of meteorological conditions.
3. Describe the greenhouse gas emissions and carbon sequestration capacity of the Project area.

#### **3.9.2 Impact Assessment**

1. Describe and assess the greenhouse gas emissions during construction, operation, and decommissioning phases of the Project.
2. Estimate the impacts of the Project on carbon sequestration capacity, including impacts on sequestration in soil and water systems across the expanded reservoir.
3. Identify elements of the Project that are sensitive to changes or variability in climate parameters, including frequency and severity of extreme weather events, and discuss the potential impacts over the life of the Project.
4. Discuss the benefits and consequences of the Project on the affected area with regard to its ability to counteract climate change impacts and the associated risks.
5. Evaluate the feasibility of the Project under scenarios of climate change, including an explanation of:
  - a) how drier conditions would affect the long-term viability of local agriculture with and without the Project; and
  - b) how potential adverse effects of excess rainfall events will be mitigated by the Project.

6. Review and discuss potential changes in local climate under multiple climate projections, and:
  - a) identify representative climate change scenarios that reflect a full range of future climate variability (e.g., wet and dry conditions); and
  - b) evaluate relative changes in climate indices (e.g., annual/seasonal precipitation and temperature) between baseline and future periods.
7. Describe potential effects of climate change on water demands and supply, including:
  - a) changes in water demand for irrigation;
  - b) potential changes in flow and impacts on downstream watercourses and waterbodies; and
  - c) a description of adaptations (e.g., reservoir operation) to climate change for sustainable water resource management.

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

#### **3.10.1 Baseline Information**

1. Describe and map the ownership status of the subject lands, including lands owned by the Crown, local municipalities, and patented lands. Describe and map the current land uses in the Project area, including private land, Crown land dispositions, and Crown land reservations.
2. Describe and map the existing land and resource uses and potential conflicts that exist, considering oil and gas development, renewable energy production, agriculture, tourism, Indigenous uses, and outdoor recreational activities.
3. 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 (e.g., World Heritage Sites, Ramsar Sites, Internationally Important Bird Areas).
4. Identify 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.
5. Describe and map land clearing activities, showing the timing of the activities.
6. Describe existing access control measures.

#### **3.10.2 Impact Assessment**

1. Identify the potential impacts of the Project on land uses, including:
  - a) unique sites or special features;
  - b) effects caused by changes in public access, including secondary effects related to
  - c) increased hunter, angler and other recreational access, and access to traditional use sites;
  - d) the implications of relevant land use policies and resource management initiatives for
  - e) the Project, including constraints to development; and
  - f) the anticipated changes (type and extent) to the topography, elevation, and drainage pattern within the Project area.
2. Identify existing private land uses that would be impacted by the Project and describe the:
  - a) area of land affected and the nature of the impacts;

- b) opportunities for mitigation and compensation, including the cost of implementation; and
  - c) procedures that will be followed in compensating landowners for lands required for the Project and for associated damages or disturbances.
3. Discuss possible mitigation strategies to address:
    - a) the need for and plans for addressing access management during and after project operations (e.g., for public and traditional users);
    - b) the process for addressing the needs of other land users in the Project Area; and
    - c) project effects that may lead to changes in land use.
  4. Provide a fire control plan highlighting:
    - a) fire prevention, detection, reporting, and suppression measures, including proposed fire equipment and onsite infrastructure;
    - b) measures taken to ensure municipal fire services access to adjacent areas; and
    - c) coordination of fire control with municipal government or provincial departments.

## **4 HISTORIC RESOURCES**

### **4.1 Baseline Information**

1. Provide a brief overview of the regional historic resources setting, including a discussion of the relevant archaeological, historic and paleontological records.
2. Describe and map known historic resource sites in the Project Area, considering:
  - a) site type and assigned Historic Resource Values; and
  - b) existing site-specific *Historical Resources Act* requirements.
3. Provide an overview of previous Historic Resources Impact Assessments that have been conducted within the Project Area, including:
  - a) a description of the spatial extent of previous assessments relative to the Project Area, noting any assessment gap areas; and
  - b) a summary of *Historical Resources Act* requirements, conditions or approvals that have been issued for the Project to date.
4. Identify locations within the Project Area that are likely to contain previously unrecorded historic resources. Describe the methods used to identify these areas.
5. Describe consultation with Alberta Arts, Culture, and Status of Women concerning the program and schedule of *Historical Resources Act* requirements for the Project, including:
  - a) any historic resources issues raised during the consultation on the Project; and
  - b) any *Historical Resources Act* programs required to evaluate and mitigate the impacts of the Project on historic resources.

### **4.2 Impact Assessment**

1. Provide a summary of the results of any Historic Resources Impact Assessments that have been conducted for the Project.
2. Describe the project components and activities, including all ancillary activities, that have the potential to affect historic resources at all stages of the Project.

3. Describe the nature and magnitude of the potential project impacts on historic resources, considering:
  - a) effects on historic resource site integrity; and
  - b) implications for the interpretation of the archaeological, historic, and paleontological records.

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

1. Discuss any limitations to access for traditional uses that may occur during all stages of the Project.
2. Determine the impacts and benefits of the Project on traditional, medicinal, and cultural land use and identify strategies to encourage or improve Traditional Use in the Study Area.
3. If consultation with Indigenous groups reveals traditional use areas and spiritual sites within lands affected by the Project, provide:
  - a) a map and description of traditional land use areas including fishing, hunting, trapping, water use (e.g., for drinking, cooking and navigation) and nutritional, medicinal, or cultural plant harvesting by affected Indigenous peoples (if the Indigenous community or group is willing to have these locations disclosed); and
  - b) a map of cabin sites, spiritual sites, cultural sites, graves, and other traditional use sites considered historic resources under the *Historical Resources Act* (if the Indigenous community or group is willing to have these locations disclosed), as well as traditional trails and resource activity patterns.
4. Discuss the species, abundance and availability of vegetation, fish and wildlife used for food, traditional, medicinal, and cultural purposes in the identified traditional land use areas, considering all project-related impacts.
5. Discuss access for traditional uses during all stages of the Project.
6. Describe how Traditional Ecological Knowledge and Traditional Land Use information was incorporated into the Project, EIA development, the conservation and reclamation plan, monitoring and mitigation.
7. Determine the impacts of the Project on traditional, medicinal, and cultural land use and identify possible mitigation strategies.

## **6 PUBLIC HEALTH AND SAFETY**

### **6.1 Public Health**

1. Describe aspects of the Project's activities and emissions during construction and operation that may have implications for public health or the delivery of regional health services.
2. Conduct a human health risk assessment following guidance from Alberta Health for project components that have implications for public health and describe the results.
3. Document health concerns raised by stakeholders during consultation on the Project.
4. Document health concerns identified by Indigenous communities or groups resulting from impacts of existing development and of the Project, specifically on their traditional lifestyle. Include an Indigenous receptor type in the assessment.

5. Describe mitigation plans for adverse impacts to public health resulting from the Project.

## **6.2 Public Safety**

1. Describe aspects of the Project that may have implications for public safety, including:
  - a) the emergency response plan including public notification protocol and safety procedures to ensure public safety and minimize adverse environmental effects, including emergency reporting procedures for spill containment and management;
  - b) any safety concerns raised by stakeholders during consultation on the Project and the actions taken to address those concerns;
  - c) how local residents will be contacted during an emergency and the type of information that will be communicated to them;
  - d) 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 or other industry partner emergency response/spill response agreements; and
  - e) the potential safety impacts resulting from higher regional traffic volumes.
2. Discuss mitigation plans to safeguard workforce and public safety for the construction and operation of the Project.

## **7 SOCIO-ECONOMIC ASSESSMENT**

### **7.1 Baseline Information**

1. Describe the existing socio-economic conditions in the region and in the communities in the region.
2. Describe factors that may affect existing socio-economic conditions, including:
  - a) population changes;
  - b) workforce requirements for all stages of the Project, including a description of when peak activity periods will occur;
  - c) planned accommodations for the workforce for all stages of the Project. Discuss the rationale for their selection;
  - d) EID's policies and programs regarding the use of local, regional, and Alberta goods and services;
  - e) the Project schedule; and
  - f) the overall engineering and contracting plan for the Project.
3. Describe the socio-economic contribution of current agricultural operations (irrigated and non-irrigated) in the local and regional study areas, including:
  - a) historic and current livestock operations;
  - b) historic and current cropping patterns;
  - c) historic and current irrigated acreages; and
  - d) other agricultural uses (e.g., greenhouses).
4. Describe the current impacts of drought on agricultural operations in the local and regional study area, including:
  - a) revenue losses (e.g., productivity loss and forced timing of sale of products);
  - b) drought-related costs (e.g., emergency water supply, and trucking of livestock and feed);
  - c) impacts to operations (e.g., forced herd reduction);

- d) costs related to drought recovery; and
  - e) long-term community impacts.
5. Describe the process used to establish rates (\$/unit water) for supplying water to irrigated crop producers, and include:
    - a) current water rates (2020-2023); and
    - b) forecast water rates following the Project.
  6. Describe the socio-economic impacts of the current wetlands within the Project area.

## 7.2 Impact Assessment

1. Describe the socio-economic impacts of construction and operation of the Project on:
  - a) landowners;
  - b) agricultural productivity;
  - c) availability and quality of health care services;
  - d) local training, employment, and business opportunities;
  - e) housing;
  - f) local and regional infrastructure and community services;
  - g) recreational activities;
  - h) agricultural productivity;
  - i) First Nations and Métis (e.g., traditional land use and social and cultural implications); and
  - j) local and regional infrastructure and community services.
2. Provide a discussion as to which communities will benefit from the Project.
3. Discuss opportunities to work with Indigenous communities and groups, and other local residents and businesses regarding employment, training needs, and economic development opportunities arising from the Project.
4. Provide the estimated total project cost, including a breakdown for engineering and project management, equipment and materials, and labour for construction and operation stages, including maintenance of the Project. Indicate the percentage of expenditures expected to occur in the region, Alberta, Canada, outside of Alberta, and outside of Canada.
5. Provide a description of how the dam decommissioning will be financed.
6. Provide an estimate of the costs and benefits of providing livestock watering facilities supported by the Project as it relates to improved range management and livestock production.
7. Provide an estimate of the Project's impact on current irrigators (e.g., increased output, more stable output, increased demand, water rates) and impact on average annual farm income.
8. Provide details on the total number of existing and new irrigable acres to be serviced by the Project, including the costs and benefits of expanding irrigable acres.
9. Discuss considerations made by irrigation districts when evaluating requests to add new irrigated parcels (e.g., sustaining native grasslands).



10. Provide an estimate of the nature and cost of the development of recreational infrastructure.
11. Provide a benefit/cost analysis of the Project, including costs of construction, operation, and maintenance, increased value of agricultural production, indirect and induced benefits (livestock production, food processing etc.), recreational activities, and sport fisheries. Present a sensitivity analysis of assumptions used to generate these values.
12. Identify non-quantifiable benefits and costs expected during the life of the Project. Discuss how these might affect the overall project benefit/cost analysis.
13. Provide an estimate of the wetland losses and gains related to the Project and the economic costs and benefits considering Alberta's current wetland policy.
14. Provide an estimate of the losses and gains of native grasslands and associated biodiversity related to the Project and the economic costs and benefits.

## **8 MITIGATION MEASURES**

1. Discuss mitigation measures planned to avoid, minimize, or eliminate the potential impacts for all stages of the Project.
2. Identify the mitigation objectives for each associated impact and describe the mitigation measures that will be implemented. Provide rationale for their selection, including a discussion on the effectiveness of the proposed mitigation.

## **9 RESIDUAL IMPACTS**

1. Describe and characterize the residual impacts of the Project following implementation of EID's mitigation measures and EID's plans to manage those residual impacts.

## **10 MONITORING**

1. Describe the surface water quality monitoring program that will be implemented to assess the future impacts of construction and operation (including maintenance) of the Project. Consider appropriate water quality parameters (e.g., metals, nutrients, pesticides, temperature, BOD/TOC, bacteria, aquatic and benthic invertebrates, aquatic plants, algae, dissolved oxygen, etc.) and their spatial (e.g., lateral and depth) and temporal (e.g., seasonal) flow variations.
2. Describe EID's current and proposed monitoring programs, including:
  - a) how the monitoring programs will assess any project impacts and measure the effectiveness of mitigation plans. Discuss how EID will address any project impacts identified through the monitoring program;
  - b) how EID will contribute to current and proposed regional monitoring programs;
  - c) monitoring performed in conjunction with other stakeholders, including Indigenous communities and groups;
  - d) new monitoring initiatives that may be required as a result of the Project;
  - e) regional monitoring that will be undertaken to assist in managing environmental effects and improve environmental protection strategies;
  - f) how monitoring data will be disseminated to the public, Indigenous communities, or other interested parties;
  - g) how the results of monitoring programs and publicly available monitoring information will be integrated with EID's environmental management system; and

- h) how these programs help address monitoring needs for the various disciplines in the EIA report.