Table of Contents

LIST OF TABLES

3.0 SUMMARY OF ENVIRONMENTAL EFFECTS

Volumes 3A and 3B provide a detailed evaluation of the VCs selected for assessment of the Project, including project interactions, proposed mitigation measures, and the potential for residual effects on each of the VCs. The purpose of this summary table is to provide a summary of the information presented in Volumes 3A and 3B.

With the implementation of the proposed commitments and mitigation measures (summarized in Volume 4, Appendix C), adverse residual environmental effects of Project-related construction activities, operation and flood and post-flood phases are predicted to be not significant for all VCs.

Information regarding definitions and terminology shown in Table 3-1 is available in Volumes 3A and 3B.

SPRINGBANK OFF-STREAM RESERVOIR PROJECT
ENVIRONMENTAL IMPACT ASSESSMENT
VOLUME 3D: EFFECTS ASSESSMENT (ACCIDENTS AND MALFUNCTIONS, EFFECTS OF THE ENVIRONMENT ON THE PROJECT, AND SUMMARY OF ENVIRONMENTAL EFFECTS)

Summary of Environmental Effects
March 2018

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Air Quality and Climate	-	✓	✓	• change in ambient air quality • change in ambient light • change in greenhouse gases • change in odours (post-flood and flood operations) change in carbon sequestration capacity (post-flood and flood operations)	• One-way traffic flows on Highway 22 and Springbank Road, to accommodate construction activities, that may result in traffic line-ups and idling will be limited to the extent possible. • Prevent the discharge of atmospheric contaminants from construction operations in accordance with Regulatory Requirements. • Project construction vehicles will be required to meet current emission control standards. • Engines and exhaust systems will be properly maintained. Do not operate equipment, including construction equipment, that shows excessive emissions of exhaust gases until corrective repairs or adjustments are made. • The concentration of sulphur in diesel fuel shall not exceed15 mg/kg.	The main sources of air emissions due to the Project are vehicle exhaust and fugitive emissions during Project construction. As these emissions result from ground based sources, the greatest air quality changes due to these emissions occur inside and near the PDA, decreasing to Base Case levels with increasing distance from the PDA. Nighttime light levels (light trespass and glare) due to Project construction would remain below CIE guidelines for a rural area and sky glow levels would not be expected to increase. Construction GHG emissions are conservatively estimated to be 84,970 tonnes CO_2e over the entire construction period. During the dry operations phase, associated activities would be limited to periodic inspections and routine maintenance. There are no interactions of the Project with air quality, light, or climate (GHG emissions).	A/N	N/L/ M/H	LAA/ PDA	ST	IR/R/C	R	D	S/T	With the proposed mitigation, an increase in Project-related light emissions (light trespass and glare) such that the guidelines for a rural environment are exceeded is not likely. Based on this light assessment, Base Case sky glow levels in and surrounding the Project site are currently typical of an urban environment, being close to metropolitan areas, and they are not anticipated to increase due to the Project. Therefore, project residual effects on air quality and climate are predicted to be not significant. The Project releases represent a small contribution to Alberta and national GHG emissions (0.03% and 0.01%, respectively). The residual environmental effects of the Project, in relation with CEA Agency guidance on GHG emissions would be not significant. A change in fugitive dust (i.e., $PM_{2.5}$) near the PDA boundary is rated as not significant since fugitive dust emissions are only expected to occur within the reservoir if the prescribed mitigations (e.g. re-vegetation and possible application of a tackifier) are not effective.

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Air Quality and Climate (con't)					• Suspend dust generating construction activities during periods of excessive winds whereby dust suppression measures are not working adequately. • During dry periods, water will be applied to haul roads and/or disturbed areas to mitigate dust emissions. The application of water will be limited to non-freezing temperatures to prevent icing that can present a safety hazard. Watering is most effective immediately after application, and repeated watering several times a day may be required, depending on surface and meteorological conditions. • Chemical dust suppressants will be applied to haul roads as an alternative option to watering. Chemical dust suppression will be applied on an as-needed basis during high wind conditions or if PM concentrations are in exceedance of the Alberta Air Quality Objectives and if an increase of watering is determined ineffective or unfeasible at the time. Examples of suppressants	During construction and dry operations, the area that is expected to undergo a permanent land use change is the concrete diversion structure and its area is estimated to be 0.36 hectares. Given the small area that is to undergo a permanent land use change during construction and dry operations, the change in carbon sequestration capacity in the PDA is expected to be very small. Although existing background conditions for the flood and post-flood phases are like those associated with the construction and dry operations, air emissions during the flood and post flood phases are negligible compared to those during construction and dry operations. The only potential source of fugitive dust during post-flood operations is wind erosion of deposited sediments in the reservoir after they dry out, and when strong wind conditions occur. Because these emissions are ground based, the greatest air quality changes due to these emissions occur inside and near the PDA, decreasing to baseline levels with increasing distance from the PDA.									A change in odour occurrences following flood events is rated as not significant since the duration of the submerged vegetation is not considered sufficient to generate unpleasant odours. Because no sewage would be washed into the reservoir, there is negligible potential for sewage type odours to occur. A change in carbon sequestration capacity is rated as not significant since there would be ample time between floods for revegetation to occur in the reservoir.

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Air Quality and Climate (con't)					include chlorides, petroleum products, liquid polymer emulsions, and agglomerating chemicals. These suppressants, if required, will be applied, as per the manufacturer's recommendations, to preclude unintended environmental effects. • In the event of trackout and carryout of soils occurs, conduct road cleaning by manually picking up and sweeping material or by using rotary or vacuum street cleaning vehicles. • Disturbed surfaces will be revegetated promptly following construction to prevent wind erosion and to control dust. • Surfaces of temporary soil and overburden stockpiles will be stabilized during extended periods between usage, by means of vegetating or covering the exposed surfaces.	Changes in carbon sequestration are not expected during reservoir filling, reservoir draining, reservoir sediment partial cleanup, channel maintenance, and road and bridge maintenance. The changes to the carbon sequestration capacity of the PDA are expected to be minimal.								

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Air Quality and Climate (con't)					• Use silt fences and other erosion control methods such as mulching and application of tackifiers to prevent soil loss from soil stockpiles due to wind erosion. • Lights will be positioned so that the luminaires can be pointed downward with no more than a 10° tilt from the horizontal, so that only the working area is illuminated. • As much as is possible, lighting will be located such that unavoidable light spill off the working area is not directed toward receptors outside the PDA. • Lighting will be located so that the lights are not directed toward oncoming traffic on nearby roads on or off site because of the objectionable nuisance and safety hazard this may present. • Lights will be designed to avoid excessive use of the mobile flood lighting units and reduce potential effects by turning off lighting when they are not required; this would also conserve fuel.										

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Air Quality and Climate (con't)					• Adherence to lighting design guidelines, such as the CIE, IDA, IES, and the lighting requirements for workspaces as enforced by Labour Canada. • Comply with Occupational Health and Safety Part 12 General Safety Precautions - Lighting. • Project construction vehicles will be required to meet current emission control standards. • Engines and exhaust systems will be properly maintained. Do not operate equipment, including construction equipment that shows excessive emissions of exhaust gases until corrective repairs or adjustments are made. Construction vehicle idling times will be reduced to the extent possible in order to reduce emissions, as a best management practice. • Cold starts will be limited to the extent possible to reduce emissions, as a best management practice.										

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Acoustic Environment	-	✓	-	• change in existing acoustic environment	• Residents near to construction noise-generating activities will be notified. Noise abatement barriers may be used to reduce noise levels. If noise abatement barriers are ineffective residents may have to be moved temporarily to alternative accommodation during the construction phase producing the noise. • machinery and factory supplied noise-abatement equipment (e.g., mufflers) will be maintained in good working order • a complaint response procedure will be implemented to address noise complaints should they arise	The prediction results are based on the current execution plan for the Project and do not include the application of mitigation measures. Further development of mitigation and refinement of the prediction results may be completed once a detailed construction execution plan is available. The unmitigated sound levels at most receptor locations during some phases of construction exceed the noise limits established based on Health Canada's preferred approach for environmental assessments. The acoustic modelling assumed downwind conditions exist 100% of the time and that all normally operated equipment is operating at 100% throughput during their use. These conditions do not occur at all times and, therefore, the model predictions are expected to be conservative.	A/N	H/L	LAA	ST	R/IR	R	D/U	T	The residual environmental effects assessment shows that out of 45 receptors considered for the assessment, up to 33 have the potential to exceed the Health Canada limits without mitigation. It is feasible, that with the application of mitigation options, the sound levels at many of the identified receptor locations would meet noise thresholds. Upon development of the detailed construction execution plan, mitigation measures would be developed to meet assessment noise thresholds. A significant environmental effect on the acoustic environment would result in an exceedance of applicable local, provincial, federal, or international guideline limits appropriate for the Project. The noise effects at all receptor locations during the flood and post-flood operations are not predicted to exceed Health Canada noise thresholds. The residual effect on the acoustic environment is not significant. No exceedances of threshold limits were predicted for Indigenous receptors in any of the assessment scenarios.

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Hydrogeology	-	✓	✓	• change in groundwater quantity • change in groundwater quality	• Water will be discharged in a manner to avoid erosion using turbidity barriers, containment berms and settling ponds. Dewatering will be in accordance with the terms and conditions of the Environmental Protection and Enhancement Act approval conditions, and Water Act approval and the federal Fisheries Act and Navigable Waters Protection Act. • A Care of Water Plan will include the use of cofferdams, pumping systems, sumps, pipelines, channels, flumes, drains, and other dewatering works to permit construction of the work in the dry. • TSS levels will be controlled and reduced using silt fences and turbidity barriers to ensure the water quality from care of water system discharges is made equal to or better than the initial water quality. TSS levels will be monitored by carrying out frequent water quality testing.	Residual effects on groundwater quantity could be expected as a result of construction dewatering. Dewatering creates a lowering in groundwater levels that are greatest near the pumping location, and gradually rise back toward non-pumping groundwater levels with increasing distance away from the pumping location. The Project has the potential to change groundwater quantity through groundwater seepage into the diversion channel when dry. Groundwater that seeps into the diversion channel would infiltrate back into the groundwater system at a downstream location or continue to flow by gravity down the diversion channel and into the off-stream reservoir. There, groundwater seepage would become part of the surface water system, eventually draining through the outlet structure.	A/N/P	L/M/ L-H	LAA	ST/LT/ ST-LT	S/C/IR	R/I	D	N/A	Due to the limited interaction of the Project with groundwater resources, the residual effects on groundwater quantity and quality during construction and dry operations are predicted to be not significant. Due to the limited interaction of the Project with groundwater resources in the flood and post-flood phase of the Project, the residual effects on groundwater quantity are predicted to be not significant. Due to the limited areas over which groundwater infiltration could occur during the flood and post-flood phase of the Project and the short time period and eventual flow paths of flooded water, the residual effects on groundwater quality are predicted to be not significant.

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Hydrogeology (con't)					• Construction dewatering will be minimized through diligent construction planning. • Existing water wells within the reservoir footprint will be decommissioned and plugged off to prevent groundwater contamination. • Regional-scale effects on groundwater quantity can be mitigated by allowing seepage in the dry diversion channel to infiltrate back into the subsurface, or flow back into the Elbow River via surface water drainage pathways. Silt fences and turbidity barriers will be used as required to control TSS and to ensure the water quality from care of water system discharges is made equal to or better than the initial water quality by carrying out frequent water quality testing.									

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Hydrogeology (con't)					• Water will be discharged in a manner to avoid erosion using silt fences, turbidity barriers, containment berms and settling ponds. Dewatering will be in accordance with the terms and conditions of Environmental Protection and Enhancement Act, Water Act and the federal Fisheries Act and Navigable Waters Protection Act. • A Care of Water Plan will be developed to manage dewatering and discharge of water on the construction site. • At locations where flows from Care of Water operations are discharged into waterbodies, test the water quality at discharge locations and monitor the TSS to ensure the water quality is made equal to or better than the initial water source. • Construction dewatering may be minimized through diligent construction planning.										

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Hydrogeology (con't)					• Regional-scale effects on groundwater quantity can be mitigated by allowing seepage in the dry diversion channel to infiltrate back into the subsurface, or flow back into the Elbow River via surface water drainage pathways. Silt fences and turbidity barriers will be used to control TSS and to ensure the water quality from care of water system discharges is made equal to or better than the initial water quality by carrying out frequent water quality testing.									

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Hydrology	-	✓	✓	• change in hydrological regime beyond the range evident in the historical record • change in sediment transport dynamics • change in channel morphology	• All applicable regulatory notifications, permits, and authorizations including the Environmental Protection and Enhancement Act, and Water Act and the federal Fisheries Act and Navigable Waters Protection Act, will be obtained before the start of any instream construction. • Instream work areas will be isolated from the main river flow by using cofferdams, silt fences and turbidity barriers. TSS will be monitored and measured in conformance with Alberta Transportation's Turbidity and Monitoring specifications. • Clean granular fill with less than 5% fines passing the 80um sieve size will be used for instream work such as cofferdams, causeways, access ramps, Bailey bridges, river channel diversions. Fine grained soils may be used, provided only clean granular fill is exposed to the river at any time during construction and restoration operations.	The Project has the potential to change hydrology during construction and dry operation because alteration of surfaces adjacent to the Elbow River tributaries. Clearing, grading and construction of the diversion channel, dam and floodplain berm may change the runoff response to precipitation events. Increased compaction of surfaces would result in less infiltration and the potential for enhanced runoff. Similarly, removal of vegetation may also increase runoff because of lowered surface roughness. However, changes in hydrology because of enhanced runoff require hydrological connection to the Elbow River or the low-level outlet. Given the distance of most of the PDA from active channels, increases in runoff are unlikely to be measurable within the larger hydrological regime of the Elbow River.	N/A	N/H	PDA/ LAA	LT/ ST - LT	C/IR	I	D/U	S	The effects of the Project on hydrology during construction and dry operations, given mitigation measures and monitoring during construction in the PDA, are not significant. Should an increase in suspended sediment concentrations occur, it would be mitigated immediately, or the work halted until mitigation is in place. During flood and post-flood operations, determination of significance is not relevant for changes in hydrology because the purpose of the Project is to actively modify the hydrology of the Elbow River. However, as the hydrology is being intentionally modified and this modification would also change sediment transport, the significance of any resulting changes is assessed by other VCs.

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Hydrology (con't)					• Sediment and erosion control measures as detailed in Section 8 Aquatic Ecology will be used • Bank and riparian areas disturbed during construction will be reclaimed and re-vegetated. Silt fences, turbidity barriers and riprap materials will be used to prevent future bank erosion. • All applicable regulatory notifications, permits, and authorizations, if required, will be obtained before the start of any instream construction. • Sediment and erosion control measures as detailed in Volume 3A Section 8 Aquatic Ecology will be used. • Bank and riparian areas disturbed during construction will be rehabilitated and re-vegetated. Silt fences, turbidity barriers and riprap materials will be used to prevent future bank erosion.	Permanent diversion of five small tributaries intersected by the diversion channel and the dam would affect the input of flow from these tributaries into the Elbow River. However, using the gauged data from the low-level outlet and, assuming that the hydrodynamics measured are representative, direct flow input to Elbow River from the five intersected tributaries is likely to be negligible. During dry operation, localized changes in hydraulics around the diversion structures in the Elbow River may result in shifts in the location of channel scour and deposition of bedload material. However, these effects would be very localized and are unlikely to have a measurable effect on downstream sediment transport. Operation of the Project would change the nature of bedload transport in the Elbow River. However, the primary purpose of the Project is to mitigate downstream flood hazard to the City of Calgary by modifying the hydrology of the Elbow River during a high flow by temporarily diverting water.									

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Surface Water Quality	-	✓	✓	The following potential project effects are assessed for Surface Water Quality: • change in surface water quality	• Instream work areas will be isolated from the main river flow by using cofferdams, silt fences and turbidity barriers. TSS will be monitored and measured for conformance with Alberta Transportation's Turbidity and Monitoring specifications. • Clean granular fill with less than 5% fines passing the 80um sieve size will be used for instream work such as cofferdams, causeways, access ramps, Bailey bridges, river channel diversions. Fine grained soils may be used, provided only clean granular fill is exposed to the river at any time during construction and restoration operations. • Bank and riparian areas disturbed during construction will be rehabilitated and re-vegetated. Silt fences, turbidity barriers and riprap materials will be used to prevent future bank erosion. • Restrict herbicide mixing and loading within 30 m of an open body of water	The residual effect of construction on water quality through change in suspended sediment concentration, considering construction mitigation measures and construction monitoring, is adverse in direction, low in magnitude, restricted to the PDA, short-term in duration and a single event in frequency. Due to the transient nature of the effect on water quality, the effect is reversible. The effect of the Project construction on downstream water quality in the Elbow River and the Glenmore Reservoir is negligible, given that sediment concentrations will be monitored during construction and the mitigation measures. The effect of dry operation on water quality through herbicide application is adverse in direction, low in magnitude, restricted to the LAA, short-term in duration and a regular event in frequency. Given the very low frequency of herbicide detection in the watershed, the effect is reversible through dilution.	A	L/L – H/N-L	PDA/ LAA	ST/MT	S/R/IR	R	U/D	T/S	The effects of the Project on water quality during construction and dry operations, given mitigation measures and monitoring during construction in the PDA, are not significant. Should an increase in suspended sediment concentrations occur, it will be mitigated immediately, or the work halted until mitigation is in place. Herbicide application during dry operations will follow the Code of Practice and the effect on water quality in the LAA is not significant.

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Surface Water Quality (con't)					• Identify open bodies of water within the application site • mark or flag of open bodies of water that will not be clearly visible to the applicator • Transport of hazardous materials to and from the Project site, storage, use and disposal will be in accordance with regulatory requirements. • Use of construction equipment that is mechanically sound with no oil leaks, fuel or fluid leaks. Inspect equipment daily and immediately repair any leaks. • Employ persons qualified to handle Construction Equipment fuels and lubricants to perform repairs. • Service vehicles to carry fuel spill clean-up materials. • Use of containment berms and impermeable liners around fuel and lubricant storage tanks. • Maintain a minimum 100 metre setback between stored fuels and lubricants and rivers, streams and surface water bodies.	During flood operation, the Project is expected to have a reversible, short-term adverse effect on water quality. The magnitude of the effect is anticipated to be from low to high. The high magnitude effect is related to suspended sediment concentrations in the Elbow River at the end water release. During post-flood cleanup, it is not anticipated that the Project would measurably affect water quality in Elbow River or Glenmore Reservoir.								

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Aquatic Ecology	✓ Fish species at risk and navigable waters	✓	✓	The following potential project effects are assessed for Aquatic Ecology: • Permanent alteration of fish habitat • Destruction of fish habitat • Death of Fish • Change in Sediment • Change in Fish Passage • Entrainment and Stranding of Fish	• Building material used in watercourses, including concrete, silt fences, turbidity barriers, and containment berms will be used to prevent the release or leaching of substances that may be deleterious to fish into the water. • Activities near water will be planned and completed in the dry and isolated from watercourses to prevent materials such as paint, primers, blasting abrasives, rust solvents, degreasers, grout, other chemicals or other deleterious materials do not enter the watercourse. • The top substrate from a wetted channel will be stripped and stockpiled for later use as the top layer of reclaimed instream substrate to improve the recolonization rate and maintain average mobile substrate sizes.	The residual effect of construction on causing a permanent alteration to fish habitat is adverse in direction, low in magnitude, restricted to the PDA, permanent in duration, and a single event in frequency. Due to the permanence of the project structures in the river, the effect is irreversible. The residual effect of construction on causing the destruction of fish habitat is adverse in direction, low in magnitude, restricted to the PDA, permanent in duration, and as a single event in frequency. Due to the permanence of the structure in the river, the effect is irreversible. The residual effect of construction causing death of fish is adverse in direction, low in magnitude, restricted to the PDA, and as an irregular event in frequency. Given the low potential and the small portion of the fish population that could be affected, the effect is reversible.	A/N	L/N	PDA/ LAA	P/ST/ LT	S/IR/C	I/R	U/D	S/R	The residual effects on fish habitat, fish mortality, sedimentation and fish passage are unlikely to pose a long-term threat to the persistence or viability of a fish species, including SAR, in the RAA. With the application of mitigation measures, residual effects on aquatic ecology are predicted to be not significant.

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Aquatic Ecology (con't)					• Rootwads and large boulders that must been removed will be stored on-site for subsequent placement on reclaimed instream cover or for bank protection. • Fertilization of reclaimed areas in the immediate vicinity of a watercourse will not be allowed unless approved by DFO and AEP. • Streambanks and approach slopes will be revegetated using an appropriate native seed mix or erosion control mix. • Boulders will be added to increase the bed roughness of the channel immediately downstream of the diversion structure, which will increase water depths and reduce velocities. • Boulder V-weir structures will be constructed in the channel downstream of the gates to provide slower velocity and deeper resting zones. • A monitoring program will be undertaken to identify if fish passage is impeded for migratory salmonids or other fish species.	The effect of dry operation on aquatic ecology through a destruction of fish habitat is adverse in direction, low in magnitude, extends to the Elbow River through the LAA, permanent in duration, and would occur during spawning migrations at an irregular, but continuous frequency. Due to the permanence of the structure in the river, the effect is irreversible. The residual effects on fish habitat, as a function of bedload movement in Elbow River and low-level outlet during the post-flood phase are of a high magnitude, short-to-long term duration. The release of water from the reservoir through the low-level outlet will temporarily increase localized suspended sediment concentrations and turbidity in the Elbow River. Increased turbidity and the deposition of sediment on substrates could affect the quality of fish habitat in the low-level outlet channel and in Elbow River downstream of the low-level outlet. Upstream movement of fish during post-flood operations would not differ from upstream movement during dry operations.									

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Aquatic Ecology (con't)					• Structures will be designed so that storm water runoff and wash water from the access roads, decks, side slopes, and approaches will be directed into a retention pond or vegetated area to remove suspended solids, dissipate velocity, and prevent sediment and other deleterious substances from entering the watercourse. • Activities near water will be planned and completed in the dry and isolated from watercourses to prevent materials such as paint, primers, blasting abrasives, rust solvents, degreasers, grout, other chemicals or other deleterious materials do not enter the watercourse. • The cleaning and removal of debris and sediment from sediment and erosion control devices will be conducted in a manner that will prevent materials from entering the water body.	During post-flood operations, stranding in the reservoir is expected to cause mortality of fish that do not swim out of the reservoir during post-flood draining. The diversion structure and reservoir are planned and designed as mitigation measures to limit the effects of floods in the Elbow River									

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Aquatic Ecology (con't)					• Large woody debris pieces such as rootballs and logs over 50 cm in diameter, will be retained and relocated in the river downstream of the structure. • Where debris removal from the structures is required, debris removal will be timed to avoid disruption to sensitive fish life stages (i.e., outside the RAP), unless the debris and its accumulation is immediately threatening to the integrity of the structure or relates to an emergency (i.e., risk of structure failure). • Works in water will be timed with respect to the restricted activity periods (RAPs) wherever possible. For the Elbow River, the RAP is May 01 – July 15 and September 16 – April 15. Condition and use of restricted activity periods will be provided within further project permitting and authorization under the Fisheries Act. For planning purposes, the Elbow River RAP will be applied as an avoidance and mitigation measure.									

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Aquatic Ecology (con't)					• Building material used in watercourses, including concrete, will be handled and treated in a manner that prevents the release or leaching of substances that may be deleterious to fish into the water. • Activities near water will be planned and completed in the dry and isolated from watercourses to prevent materials such as paint, primers, blasting abrasives, rust solvents, degreasers, grout, other chemicals or other deleterious materials do not enter the watercourse. • Activities near water will be planned such that materials such as paint, primers, blasting abrasives, rust solvents, degreasers, grout, or other chemicals do not enter the watercourse. • Erosion and sediment control measures will be installed before starting work to prevent sediment from entering the water body.									

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Aquatic Ecology (con't)					• Erosion and sediment control measures will be regularly inspected daily and maintained during construction. • Erosion and sediment control measures will be repaired immediately if damage occurs. • Non-biodegradable erosion and sediment control materials will be removed once the site is stabilized. • Measures for managing water flowing onto the site, as well as water being pumped/diverted from the site will be implemented such that sediment is filtered out before the water enters a waterbody (e.g., silt fences, turbidity barriers, pumping/diverting water to a vegetated area, constructing a settling basin, or other filtration system).										

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Aquatic Ecology (con't)					• TSS levels will be controlled and reduced using silt fences and turbidity barriers to ensure the water quality from care of water system discharges is made equal to or better than the initial water quality. TSS levels will be monitored by carrying out frequent water quality testing. • Excavated materials and debris will be stockpiled above the highwater mark and in such a way as they do not enter the watercourse. Silt fences will be used to contain soil erosion. • Clearing of riparian vegetation will be kept to a minimum. • Herbicide use in the immediate vicinity of a watercourse will not be allowed unless approved by DFO and AEP. Weeds will be controlled during construction through multiple measures, such as herbicide, mowing, wicking, and hand picking. After construction, disturbed areas will be stabilized and reclaimed.										

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Aquatic Ecology (con't)					• Erosion and sediment control measures will be maintained monitored until vegetation has become sufficiently reestablished. • To allow for fish passage and construction of the structures in the dry, the Elbow River will be diverted, and flows will be maintained downstream by the construction of a temporary bypass channel. • Sediment laden dewatering discharge will be pumped into a vegetated area or settling basin to allow sediment to settle out before returning it to the water body. Silt fences, turbidity barriers and clean granular berms will be used to contain the sediment and other deleterious substances and to prevent it from entering a watercourse or water body. • Energy dissipaters will be used at pump outlets to prevent erosion.										

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Aquatic Ecology (con't)					• The location of any in-stream works will be isolated from the watercourses using silt fences, turbidity barriers and clean granular berms. • Isolation materials will be designed to minimize disturbance of the bed and banks of the Elbow River and other watercourses. • Clean granular fill with less than 5% fines passing the 80um sieve size will be used for instream work such as cofferdams, causeways, access ramps, Bailey bridges, river channel diversions. Fine grained soils may be used, provided only clean granular fill is exposed to the river at any time during construction and restoration operations. • Sediment and erosion control devices will be constructed to withstand anticipated flows during construction. If necessary, the outside face of granular berms may be lined with heavy poly-plastic to make them impermeable to water.									

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Aquatic Ecology (con't)					• Before isolation and dewatering works commence, a qualified environmental professional (QEP) will be retained to obtain applicable permits for relocating fish and to capture any fish trapped within an isolated/enclosed area at the work site and safely relocate them to an appropriate location in the same waters. • Pump discharge area(s) will be isolated to prevent erosion and the release of suspended sediments downstream. Any sediment build-up will be removed when the work is completed.										

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Aquatic Ecology (con't)					• Water intakes pipes will be screened to prevent entrainment or impingement of fish. Entrainment occurs when a fish is drawn into a water intake and cannot escape. Impingement occurs when an entrapped fish is held in contact with the intake screen and is unable to free itself. Screens are to comply with DFO's "Freshwater Intake End-of-Pipe Fish Screen Guidelines". • Accumulated sediment and spoil build up within the isolated areas will be removed prior to removal of the isolation barriers. • When removing the isolation barriers, the downstream isolation barriers will be gradually removed first, to equalize water levels inside and outside of the isolated area and to allow suspended sediments to settle prior to removing the upstream isolation materials.									

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Aquatic Ecology (con't)					• Boulders will be added to increase the bed roughness of the channel immediately downstream of the diversion structure, which will increase water depths and reduce velocities. • Boulder V-weir structures will be constructed in the channel downstream of the gates to provide slower velocity and deeper resting zones. • A monitoring program will be undertaken to identify if fish passage is impeded for migratory salmonids or other fish species. • Works in water will be timed with respect to the restricted activity periods (RAPs) wherever possible. For the Elbow River, the RAP is May 01 – July 15 and September 16 – April 15. Condition and use of restricted activity periods will be provided within further project permitting and authorization under the Fisheries Act. For planning purposes, the Elbow River RAP will be applied as an avoidance and mitigation measure.									

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Aquatic Ecology (con't)					• Machinery will arrive on site in a clean condition and be maintained free of fluid leaks, invasive species, and noxious weeds. • Equipment will be inspected, maintained, and repaired immediately, to prevent leaks. • Use construction equipment that is mechanically sound with no oil leaks, fuel or fluid leaks. Inspect equipment daily and immediately repair any leaks. • Employ persons qualified to handle Construction Equipment fuels and lubricants to perform repairs. • Service vehicles to carry fuel spill clean-up materials. • Use containment berms and impermeable liners around fuel and lubricant storage tanks. • Maintain a minimum 100 metre setback between stored fuels and lubricants and rivers, streams and surface water bodies.									

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Aquatic Ecology (con't)					• Stream bank and bed protection methods (e.g., swamp mats, pads) will be used if rutting is likely to occur during access to the bed and shore. Temporary access structures will be used where steep and highly erodible banks are present. • Whenever possible, machinery will be operated on land above the high-water mark in a manner that minimizes disturbance to the banks and bed of the watercourses. • Where instream works are required, non-toxic and biodegradable hydraulic fluids will be used in machinery. • Erosion and sediment control measures will be installed before starting work to prevent sediment from entering the water body. • Erosion and sediment control measures will be regularly inspected daily and maintained during construction.										

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Aquatic Ecology (con't)					• Erosion and sediment control measures will be repaired immediately if damage occurs. • Non-biodegradable erosion and sediment control materials will be removed once the site is stabilized. • Measures for managing water flowing onto the site, as well as water being pumped/diverted from the site will be implemented such that sediment is filtered out before the water enters a waterbody (e.g., silt fences, turbidity barriers, pumping/diverting water to a vegetated area, constructing a settling basin, or other filtration system). • Excavated materials and debris will be stockpiled above the highwater mark and in such a way as they do not enter the watercourse. Silt fences will be used to contain soil erosion. • Clearing of riparian vegetation will be kept to a minimum.										

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Aquatic Ecology (con't)					• Herbicide use in the immediate vicinity of a watercourse will not be allowed unless approved by DFO and AEP. Weeds will be controlled during construction through multiple measures, such as herbicide, mowing, wicking, and hand picking. After construction, disturbed areas will be stabilized and reclaimed. • After construction, disturbed areas will be stabilized and reclaimed. • Erosion and sediment control measures will be monitored until vegetation has become sufficiently reestablished. • Flows in the Elbow River will be maintained downstream of the project (e.g., bypass channel).										

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Aquatic Ecology (con't)					• Sediment laden dewatering discharge will be pumped into a vegetated area or settling basin to allow sediment to settle out before returning it to the water body. Silt fences, turbidity barriers and clean granular berms will be used to contain the sediment and other deleterious substances and to prevent it from entering a watercourse or water body. • Energy dissipaters will be used at pump outlets to prevent erosion. • Sediment and erosion control devices will be constructed to withstand anticipated flows during construction. If necessary, the outside face of granular berms may be lined with heavy poly-plastic to make them impermeable to water. • Drainage areas within the reservoir will be graded to reduce stranding of fish during release of stored flood water from the reservoir.									

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Terrain and Soils	-	✓	✓	• Change in terrain stability • Change in soil quality and quantity	• Slope stability visually monitored on infrastructure features such as berms, dam, and diversion channel. • Concrete retaining wall will be designed and constructed as part of the diversion structure to stabilize the Elbow River escarpment. • Do not stockpile materials at slopes steeper than 3H:1V. Grade slopes smooth upon completion to reduce sliding and sloughing. • Channel banks will be seeded and revegetated with native seed or erosion control mix to improve channel bank stability. • Surface drainage patterns will be re-established where possible. • Drainage and erosion control measures (e.g. silt fences) around stockpiles to prevent erosion. • Strip and stockpile topsoil for future use in the reclamation of disturbed areas.	After standard construction mitigation, there would be a change in terrain stability along the excavated diversion channel banks, off-stream dam and at the diversion structure. The diversion structure would be constructed through the Elbow River escarpment which would result in stabilization of the slope compared to existing conditions. Overall, the magnitude of the adverse residual effect following construction and dry operations is moderate. The change in agricultural land capability distribution is a decline in the extent of the class 3 soils in the area of the LAA. There are no anticipated effects on soil quality during dry operations. The predicted residual effects on slopes after recommended post-flood mitigation would be a temporary imbalance in soil pore water pressure within the reservoir. This could result in minor, localized bank slumping immediately following reservoir draining and before the dissipation of pore water pressure.	A	M/L/H	PDA/ LAA	LT/MT/ ST	IR/S	R/I	U	N/A	The effect of the Project on terrain stability following construction and dry operation is assessed as not significant. The change in soil quality and quantity following construction and dry operations is assessed as not significant. Within the reservoir, the change in terrain stability following flood and post-flood operations for all modelled floods is predicted to be not significant. For the low-level outlet channel, the change in terrain stability following flood and post-flood operations for the 1:100 year and design floods is predicted to be significant and with an extent that is not confined to the PDA. Within the reservoir, the change in agricultural land capability is predicted to be not considered significant.

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Terrain and Soils (con't)					• Topsoil horizons (O, LFH, A) will be salvaged separately and stockpiled for later use from areas intended for disturbance, to prevent admixing of soils. • A topsoil replacement plan will be developed for the reclamation of the various disturbed areas. These areas will be revegetated. • Disturbed areas associated with project components such as the water intake, water retention, water outflow and roads will use previously salvaged topsoil material to promote vegetation re-establishment. • More detail on the planned mitigation for Project effects on soil are provided in the Conservation and Reclamation Plan (C&R Plan) in Volume 4, Appendix D.	The flooding, draining and post-flood conditions of the primary reservoir basin can affect LCC through changes to the soil drainage regime, soil nutrient properties (soil anoxia), physical and chemical properties, soil depth, soil salinity, water erosion and wind erosion risk.								

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Vegetation and Wetlands	✓ 5(1)(a)(iv) - Vegetation species at risk	✓	✓	• change in landscape diversity • change in community diversity • change in species diversity • change in wetland functions	• Restrict construction activities to the approved construction footprint. • Native areas disturbed by the Project will be reseeded using an Alberta Transportation native custom seed mix. • Use a cover crop seed mixture to assist in weed and erosion control on exposed soils where warranted. • All equipment will arrive at the Project site clean and free of soil and vegetative debris. • Monitor topsoil and subsoil piles for weed growth during construction and implement corrective measures (e.g., spraying, mowing, hand-pulling) to avoid growth and establishment of regulated weeds. • Use only Certified No.1 seed. • For control of weeds, a licensed industrial pesticide applicator will be contracted to select and apply all herbicide in compliance with the procedures as outlined in the Code of Practice for Pesticides.	Residual effects on vegetation and wetlands during construction and dry operations will not result in the loss of native upland or wetland plant communities or wetland functions from the LAA. Effects on unidentified plant SOMC could occur, but such effects would likely be limited, and likely habitat for plant SOMC does exist elsewhere in the LAA. Effects to plant communities of management concern are not anticipated. Residual effects on vegetation and wetlands post-flood would not result in the loss of native upland and wetland plant communities, or wetland functions from the LAA. Effects on one rare plant as well as the potential for effects on unidentified plant SOMC could occur. It is likely that habitat for plant SOMC exists elsewhere in the RAA as affected vegetation and wetland land units exist elsewhere in the RAA. Effects on plant communities of management concern are not anticipated, because none were identified within the RAA.	A	L/M	PDA	LT/ MT	S	I/R	D	S	Residual project effects are predicted to be not significant because the Project will not result in the loss of native upland or wetland cover types, plant SOMC or wetland function in the LAA. Though there will be loss of wetland in the PDA, the loss is predicted to be low and these cover types are common in the LAA. The loss of a slender cress plant during a design flood would be considered significant if no other specimens were present in the RAA.

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Vegetation and Wetlands (con't)					• Do not apply herbicide within 30 m of plant species or ecological communities of management concern, wetland or waterbody. Spot spraying, wicking, mowing, or hand picking are acceptable measures for control of regulated weeds in this area. • A licensed industrial pesticide applicator will be contracted to select and apply all herbicide in compliance with the procedures as outlined in the Code of Practice for Pesticides. • Reduce the removal of vegetation in wetlands to the extent possible. • Where possible, conduct ground level cutting/mowing/mulching of wetland vegetation instead of grubbing.	A design flood would result in the loss of the only known occurrence of slender cress plant SOMC from the RAA. because slender cress habitat is present in the RAA. It is likely that there are other occurrences of slender cress in the RAA that are currently undocumented.								

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Vegetation and Wetlands (con't)					• Where applicable, in areas not impacted by the permanent Project footprint, if ground conditions are encountered that create potential for rutting, admixing or compaction, minimize ground disturbance by using a protective layer such as matting or biodegradable geotextile and clay ramps or other approved materials between wetland root/seed bed and construction equipment. • A site-specific erosion and sediment control plan will be developed in accordance with Alberta Transportation's Erosion and Sediment Control Manual. An appropriate native seed mix that is suitable for wetlands will be used to reclaim wetland areas. • Where possible, direct grading/drainage away from wetlands. • Where there are permanent or temporary access roads, maintain cross drainage to allow water to move freely from one side of the road to the other.										

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Wildlife and Biodiversity	✓ 5(1)(a)(iii) - migratory birds	✓	✓	• Change in Habitat • Change in Movement • Change in Mortality Risk • Change in Biodiversity	• Pre-construction surveys will be conducted to identify wildlife features (e.g., nests, dens) and appropriate site-specific mitigation developed. • Vegetation removal will be avoided during the Restricted Activity Period (RAP) for nesting migratory birds and raptors. RAPs are primarily based on Environment and Climate Change Canada (ECCC) guidance to avoid risk of incidental take of migratory birds (ECCC 2016). ECCC direction to protect bird nests in the foothills parkland and prairie ecozone of Alberta, with consideration of migratory bird species at risk, is from April 15 to August 31 (Gregoire 2014 pers. comm.). The recommended RAP to avoid destruction and disturbance to raptor nests is from February 15 to August 15 (SRD 2011, ESRD 2013, Government of Alberta 2017b). Therefore, the combined RAP dates to avoid is from February 15 to August 31.	During construction, vegetation removal has potential to result in direct habitat loss, reduction, or alteration, which can cause displacement of wildlife into other, less suitable habitat. Construction activities also have potential to result in indirect effects due to sensory disturbance (e.g., noise and artificial light), which can reduce habitat effectiveness in the LAA. Construction activities associated with the development of project structures, access roads as well as road realignments have potential to create physical barriers or sensory disturbance that might hinder wildlife movement in the LAA. Although construction activities have potential to temporarily alter wildlife movement for SOMC in the short-term, longer term effects on wildlife movement (e.g., deer and elk) might occur during dry operations when permanent structures, fencing and new access roads are present. Construction activities might also result in animal-vehicle collisions (AVC) and increased wildlife-human conflict (e.g., bears).	A	L/M/H	LAA/ RAA	ST/LT	S/IR/C	R	D	S/R	With the application of mitigation and environmental protection measures, residual environmental effects on wildlife, including migratory birds, species at risk, biodiversity, and provisions to maintain ungulate movement which was recommended by Indigenous groups are predicted to be not significant. The residual effects on change in habitat, movement, and mortality risk are unlikely to pose a long-term threat to the persistence or viability of a wildlife species including migratory birds and species at risk in the RAA.

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Wildlife and Biodiversity (con't)					• If vegetation removal is scheduled to occur within the RAP for migratory birds and raptors, a qualified wildlife biologist would inspect the site for active nests within seven days of the start of the proposed construction activity (e.g., vegetation removal, blasting). • If an active nest or den is found, it will be subject to a provincial or federal disturbance setback buffer and site-specific mitigation. (Volume 3A, Section 11), provide setback distances for SOMC with potential to occur in the PDA.	During construction, the Project has potential to change biodiversity due to changes in species, community, and landscape diversity. Landscape diversity can be affected through habitat fragmentation, patch isolation and edge effects.									

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Wildlife and Biodiversity (con't)					• Where possible, construction activities during the RAP for the KWBZ identified along the Elbow River (December 15 to April 30) will be avoided or reduced. This would limit potential sensory disturbance to wintering ungulates (ESRD 2015a, Government of Alberta 2017b). If construction activities must occur during this time period, a wildlife mitigation and monitoring plan will be developed in consultation with regulators, which would include monitoring ungulate habitat use and response to human disturbance. • Where possible, lights will be focused internally to the work site to reduce potential sensory disturbance to wildlife in the surrounding habitat. • Temporary work spaces will be reclaimed using native species that are compatible with pre-construction site conditions, as outlined in the reclamation plan.									

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Wildlife and Biodiversity (con't)					• Construction activities will be avoided during the RAP for the KWBZ identified along the Elbow River (December 15 to April 30). This would reduce potential effects on wildlife movement and wintering ungulates (ESRD 2015a). If construction during the RAP cannot be avoided, site-specific mitigation will be developed in consultation with AEP. • The side slopes and bottom of the diversion channel will be vegetated, except under the proposed bridges and at Pirmez Creek. Vegetated areas would provide a more conducive wildlife passage across the channel. • The diversion channel will be built with 3H:1V side slopes, which is within the range that most large mammals (e.g., elk,) are known to traverse (McCorquodale 2003; Frair et al. 2005; Mao et al. 2005; The Bow Corridor Ecosystem Advisory Group 2012).									

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Wildlife and Biodiversity (con't)					• To maintain ungulate movement within the KWBZ, the floodplain berm will be revegetated with materials conducive for ungulate movement. The section of reinforced concrete (~250 m) closest to the Elbow River will be covered with top soil and seeded with native grasses. The central portion of the floodplain berm includes approximately 550 m of exposed riprap, where sections will be filled with substrate finer than riprap, such as sand, gravel and vegetation to allow for more walkable sections (Austin and Garland 2001; Huijser et al. 2008; Clevenger 2011). The south portion, furthest from the Elbow River, will be a 450 m earthen embankment vegetated with native grasses. • Where fencing is proposed to restrict livestock access to project structures (e.g., diversion channel), wildlife-friendly fencing will be installed to allow ungulate passage.										

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Land Use and Management	✓ 5(2)(a) - current use of lands and resources for traditional purposes lands	✓	✓	• change in land use • change in parks and protected areas and unique sites or special features	• Residents, businesses, and recreation organizations who experience direct loss of private land in the PDA will be compensated for their land and improvements. • Alberta Transportation will consult with adjacent landowners and disposition holders in the LAA and notify them of Project construction activities and schedule. Adequate warning will be provided to landowners to allow for management of livestock and other farming operations. • Fences and gates (e.g., Texas gate) will be installed where required. • Harassment of livestock and other wildlife will be prohibited by Project workers. • Workers will be prohibited from carrying firearms. • Food waste will be secured in appropriate facilities or vehicles. • Construction activities will follow mitigation measures and guidelines outlined in the Project's ECO Plan to reduce noise, light, and air contaminant emissions in proximity to the Project.	Land use in the PDA would be affected by construction of the Project, including permanent removal of private property and agricultural lands and changes to industrial development infrastructure. Property owners would be compensated for the acquisition of their lands by Alberta Transportation. Other land uses in the PDA including consumptive recreation and livelihood and non-consumptive recreation, would be affected by construction; however, these land uses would be able to continue at or near current levels elsewhere in the LAA during dry operations. Land users in the LAA may be affected by temporary changes to access and nuisance noise, light, and air emissions during construction. However, these effects are limited to the construction phase or shorter and land users in the LAA are not anticipated to be affected during dry operations.	A/N	H/M/L	PDA/ LAA	LT/ MT/ ST	S/C	I/R	R	N/A	With the application of mitigation and environmental protection measures, residual environmental effects on land use during construction, dry operations, flood and post-flood operations are predicted to be not significant.

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Land Use and Management (con't)					• Alberta Transportation is in consultation with operators of utilities in the PDA to discuss retrofitting and relocation of utilities. Alberta Transportation will develop crossing agreements with operators of utilities in the PDA. Alberta Transportation will continue to consult with utility operators in the PDA and LAA regarding rerouting and realignment of utilities on a case by case basis. • Alberta Transportation will implement access management plans, which includes gating approaches to Project access roads to restrict public access to the Project footprint. • Access roads to the Project, including emergency access roads, will remain in place for the life of the Project. • AEP will develop a management plan for the PDA that may allow for recreation in Area A during dry operations. Area A will be naturalized and access will not be restricted, although development of recreation infrastructure is not planned.	Our Lady of Peace cairn and monument plaque would not be substantially or irreversibly compromised because of construction or dry operations. Access to this site would be temporarily disrupted and land users may experience nuisance noise, light, and air emissions during construction. However, these effects are short-term and would not affect access to or quality of the unique site during dry operations. Land ownership in the PDA would not change in the event of a flood; however, recreation would be suspended. Additionally, grazing in the area north of Springbank road would be suspended during 1:100 year and design floods. Access to areas in the PDA and to the LAA would be affected by 1:100 year and design floods because Springbank Road is anticipated to be flooded by these events. Post-flood operation includes repair of Springbank road and cleanup and repair, as necessary, in the PDA.									

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Historical Resources	✓ 5(1)(c)(ii) 5(1)(c)(iv) - physical and cultural heritage; any structure, site or thing that is of historical, archaeological, paleontological or architectural significance	✓		• Loss of or alteration to historical resource site contents or sites context	• Standard mitigation measures will be determined by ACT based on their review of the HRIA (Porter 2017). • As required under provincial legislation, should an unexpected find of a significant historical resource occur during construction, ACT will be notified and will determine the appropriate mitigation.	• Project-specific environmental effects on historical resources are mitigated to the standards established by ACT. After implementation of the required mitigation measures, and Aboriginal consultation, there are no residual effects on historical resources.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N /A	With the application of regulatory standards (including application of chance find protocols required by ACT during construction), the Project effects on historical resources are assessed as being not significant.
Traditional Land and Resource Use	✓ 5(1)(c)(iii) 5(2)(b) – current use of lands and resources for traditional purposes lands	✓	✓	• Change in Availability of Traditional Resources for Current Use • Change in Access to Traditional Resources for Current Use • Change in Current Use Sites or Areas • Change in Indigenous Commercial Activities	• Permanent project disturbances would result in the permanent clearing of vegetation and wetlands. During the construction phase, areas of temporary disturbance would only have above ground vegetation clearing, leaving the soils intact, though there are some areas of soil disturbance; wetlands would be recontoured and seeded with an approved custom native wetland seed mix. Construction and dry operation of the Project would result in the loss of 31 ha of wetland area in the PDA. However, permanent disturbance of wetland area will be replaced or compensated for in accordance with the	The Project has the potential to affect the availability of traditional resources during construction and dry operation. Increased mortality of traditionally harvested wildlife may occur as a result of animal-vehicle collisions during construction, and to a lesser extent, during dry operation, but mortality risk is expected to be relatively low because the Project will not create additional primary or secondary roads. Sensory disturbance associated with construction activities can affect nest site selection, particularly for raptors such as bald eagle, which have been shown to have higher rates of nest abandonment and nest failure if human activity occurs near to active nests; however, pre-construction surveys and	A	L/M/H	PDA/ LAA	ST/LT	C	I/R	D	T/S/R	This assessment recognizes that some landowners in the PDA have granted access to Indigenous groups, however, the significance determination considers a number of other factors, including that the Project is predominately situated on private land that has been used for ranching and agriculture since the late 1800s and, therefore, the ability to conduct TLRU activities on the PDA is already substantially constrained compared to unoccupied Crown land. In addition, the effects of the Project on TLRU will not result in the long-term loss of availability of traditional use resources or access to lands currently relied on for traditional use practices or the permanent loss of traditional use sites and areas in the RAA. As a result, overall effects on TLRU are not significant.

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Traditional Land and Resource Use (con't)					Alberta Wetland Policy (see Volume 3A, Section 10.1.1). • Accordingly, with application of mitigation recommended in the Vegetation and Wetlands section (see Volume 3A, Section 10), no additional mitigation is needed. • At the end of construction, areas disturbed by construction that are not required for operation and maintenance will be topsoiled and seeded to meet Alberta Environment and Parks reclamation requirements (see Volume 1). • Herbicides will not be applied within 30 m of plant species or ecological communities of management concern, wetland or waterbody. Spot spraying, wicking, mowing, or hand picking will be acceptable measures for control of regulated weeds in this area.	adherence to RAPs for nesting migratory birds and raptors will mitigate effects to mortality risk. Construction and operation of the Project has the potential to hinder the movement of traditionally harvested animals within the LAA due to physical barriers (i.e., permanent structures, access roads, and road realignments) and sensory disturbance. Although the specific degree to which the PDA is being accessed for traditional purposes is unknown, given that the majority of the land is private, the residual effects of the Project on access to traditional resources, current use sites or locations are anticipated to be high in magnitude because of the loss of access to Areas B, C, and D. The permanent portage may marginally affect the use of Elbow River for transportation, including the use of waterways for recreational purposes by Indigenous groups, by forcing users to avoid the in-stream water intake components.								Given that the residual effects for the Project on TLRU are predicted to be not significant, no effects on potential or established Aboriginal or Treaty rights are expected to occur as a result of the Project. Alberta Transportation recognizes the importance of cultural transmission and the spiritual connection to ancestors as components of TLRU, as explained by Kainai First Nation, Piikani Nation, Siksika Nation, and Stoney Nakoda Nations in relation to the Project. Alberta Transportation is unable to determine the weight of these intangible components for this environmental assessment, as experiential values can only be meaningfully evaluated by individuals and communities experiencing them. These intangible components are presented as shared by Indigenous groups for consideration by the CEA Agency and NRCB in the larger context of the Project.

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Traditional Land and Resource Use (con't)					• Alberta Transportation will notify Indigenous groups regarding project activities and schedules, including provision of Project maps and design components, and discuss key traditional harvesting periods. • If an active nest or den is found, it will be subject to a provincial or federal disturbance setback buffer and site-specific mitigation. Where possible, construction activities during the Restricted Activity Period (RAP) for the KWBZ identified along Elbow River (December 15 to April 30) will be avoided or reduced. • The area along the Elbow River flood plain (Area A) will be accessible for some TLRU activities; this will be a conservation zone with public access and opportunities for low impact recreation.	Current use sites or areas located within the area of permanent structures and the reservoir will be permanently removed. Although some current use activities could be conducted elsewhere in the RAA, TLRU practices and related knowledge are often rooted in specific places that have important cultural and spiritual associations that are not readily transferrable to other locations. Overall, the residual effects of the Project on current use sites or areas outside the area of permanent structures will be moderate during construction and low for dry operations. It is anticipated that following construction, current use sites or areas would remain largely unchanged outside the PDA. The Project is located downstream from identified Indigenous commercial activities, including Redwood Meadows Golf and Country Club (see Volume 3B, Figure 18-3). Therefore, no interactions are anticipated to occur between the Project and Indigenous commercial activities during construction and dry operation.									

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Traditional Land and Resource Use (con't)					• Alberta Transportation will maintain access to identified current use sites (located outside of the designated construction and project site limits) during construction and operations, including for hunting and fishing and Alberta Transportation would advise Indigenous groups on post-construction access management. • The disposition of artifacts and provision of GPS coordinates are under the jurisdiction of Alberta Culture and Tourism and not Alberta Transportation. Alberta Transportation will limit disturbance of cultural and spiritual sites and subsurface impacts. Alberta Transportation will follow heritage resource protection methods as mandated by the Historical Resources Act. At the request of Indigenous groups, Alberta Transportation will participate in ceremonies (if invited) prior to the start of construction, including making offerings.										

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Traditional Land and Resource Use (con't)					• Alberta Transportation will commit to adhering to any conditions ACT applies to these sites. • The Project is located downstream from identified Indigenous commercial activities, including Redwood Meadows Golf and Country Club. Therefore, no interactions are anticipated to occur between the Project and Indigenous commercial activities during construction and dry operation. No mitigation measures have been identified.										

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Public Health	✓ 5(1)(c)(i) - health and socio-economic conditions	✓	✓	• Change to Human Health	• Project construction vehicles will be required to meet current emission control standards. • Engines and exhaust systems will be properly maintained. Do not operate equipment, including construction equipment, that shows excessive emissions of exhaust gases until corrective repairs or adjustments are made. • Suspend dust generating construction activities during periods of excessive winds whereby dust suppression measures are not working adequately. • During dry periods, water will be applied to haul roads and/or disturbed areas to mitigate dust emissions. The application of water will be limited to non-freezing temperatures to prevent icing that can present a safety hazard. Watering is most effective immediately after application, and repeated watering several times a day may be required, depending on surface and meteorological conditions.	Because mitigation measures are effective at reducing exposures, residual effects to public health from inhalation is medium- term for duration, moderate for magnitude, expected to extend to the LAA, and is reversible following construction During flood and post-flood operations for changes in drinking water quality, the surface water quality identifies potential increases in TSS and methylmercury in the water stored in the off-stream dam, which would be released back into the Elbow River when the reservoir is drained. With regards to methylmercury bioaccumulation and biomagnification in fish, the estimated high-estimate concentration of methylmercury when the reservoir is drained is 0.002 µg/L. This is less than the Canadian Council of Ministers of the Environment water quality guideline for the long-term protection of freshwater aquatic life of 0.004 µg/L. There is a low probability that methylmercury in the water drained from the reservoir could substantially change the existing concentrations of mercury in the aquatic	A	M/L	LAA/ RAA	MT/ ST	C/IR	R	R	S	The assessment of public health shows that the effects from air quality, water quality and country foods are not significant for the construction and dry operations phases. During flood and post-flood operations, phase the effects on public health is not significant. The conclusion is further supported by the short-term duration that the Project would alter the water quality during the flood phase. The short-term influx of less than 0.002 µg/L of methylmercury into the Elbow River from the drained reservoir would not influence the long-term viability of the drinking water supply.

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Public Health (con't)					• Chemical dust suppressants will be applied to haul roads as an alternative option to watering. While chemical dust suppressants can be more effective at controlling fugitive dust than watering; they are also more expensive. Therefore, chemical dust suppression will be applied on an as-needed basis during high wind conditions or if PM concentrations are in exceedance of the Alberta Air Quality Objectives and if an increase of watering is determined ineffective or unfeasible at the time. Examples of suppressants include chlorides, petroleum products, liquid polymer emulsions, and agglomerating chemicals. These suppressants, if required, will be applied, as per the manufacturer's recommendations, to preclude unintended environmental effects.	ecosystem to the extent that fish consumers would be at risk. Longer reservoir retention time appears to be associated with increased methylmercury concentrations in fish. In contrast, the filling and draining of the reservoir is a short-term source of methylmercury, which would not affect the long-term viability of fish resources.								

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Infrastructure and Services	✓ 5(1)(c)(ii) - health and socio-economic conditions	✓	✓	• Change in transportation infrastructure and services	• Alberta Transportation will consult regularly with Rocky View County to provide project updates, and to identify and address project-related traffic problems and other potential implications for services and infrastructure. • A project specific traffic accommodation strategy will be developed for the Project. • The details of day-to-day road construction management such as detours, signage, flag persons and timing of activities will be set out in traffic accommodation strategies (TAS) that will be developed by the contractor(s) and reviewed and approved by Alberta Transportation.	During construction, traffic along Springbank Road may be diverted to Range Road 40 and Township Road 250 or a temporary detour to Highway 22 may be constructed. This may create a longer travelling distance for residents of Rocky View County but would not create additional demands on Springbank Road. Range Road 40 and Township Road 250 have the capacity to handle additional traffic created by the detour. Because the modifications to Highway 22 would be constructed alongside and prior to closure of the existing road, access to the area would be uninterrupted and existing infrastructure would be able to accommodate Project-related traffic increases. During a design flood, 3.1 km of Springbank Road east of Highway 22 would be submerged and traffic would be rerouted to Range Road 40 and Township Road 250, potentially causing traffic disruptions and placing additional demands on transportation infrastructure and services.	A	L	RAA/ LAA	ST	C/S	R	HC	N/A	Construction of the Project would affect existing roadways and local traffic in the RAA because of road improvements and Project-related traffic, but residual adverse effects on transportation infrastructure and services are predicted to be not significant. Flood and post-flood operations during a design flood would affect existing roadways, but residual adverse effects on transportation infrastructure and services are predicted to be not significant.

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Infrastructure and Services (con't)						Once floodwaters have receded sufficiently, affected roadways and bridges would be inspected for damage. If repairs were necessary, Springbank Road would remain out of service until repairs were completed. Highway 22 might sustain minor wave damage to the roadway sideslopes, requiring single-lane closures during repairs.									
Employment and Economy	✓ 5(1)(c)(ii) - health and socio-economic conditions	✓	✓	• Change in Provincial Economy • Change in Regional Labour Force • Change in Regional Economy	• Alberta transportation will adhere to government procurement policies and procedure with respect to labour, and goods and services.	In determining effects of the Project on employment and economy, the assessment considers expected change in labour supply and demand, effects on commercial businesses from project spending (i.e., regional economy), and changes to the provincial economy. The Project would not materially affect labour supply and demand in the LAA during construction or dry operations because the available labour force greatly exceeds the workforce requirements. The Project is expected to have a largely beneficial effect on commercial businesses operating in the LAA because of opportunities associated with project spending. While there is potential for adverse effects due to competition for available labour and cost of	P/A	N-L	LAA	ST/LT	C/R	R	R	N/A	Construction and dry operation of the Project is predicted to have a generally positive effect on employment and economy in the LAA and Alberta. In terms of flood and post-flood operations, the Project would reduce the average annual damages of floods by $28 million. Over an assumed 100-year operating life, the Project's discounted benefits in terms of flood damage avoidance, exceed its costs; therefore, it would have a net economic benefit.

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
						labour supply, because of the large available workforce in the LAA, this effect is predicted to be negligible. The Project is predicted to have a beneficial effect on the provincial economy as a result of increased GDP and government revenue associated with construction expenditure.									
Federal Lands	5(1)(c)(iii) 5(2)(b) – current use of lands and resources for traditional purposes lands	✓	✓	• change in ambient air quality (including odour) • change in ambient light • change in greenhouse gases • change in carbon sequestration capacity • Change in acoustic environment • Change in groundwater quantity • Change in groundwater quality	• Mitigation measures for all VCs are provided in Volume 3A specific chapters, with key mitigation measures described above. No additional mitigation measures beyond those identified are required specifically for federal lands.	The potential effects of the Project during construction and dry operations, flood and post-flood operations on federal lands was included within the assessment, due to their proximity to the Project site, including Tsuut'ina Nation Reserve 145 and the Stoney Nakoda Nations Reserves 142, 143 and 144. The assessment draws upon the conclusions of the detailed assessments for each of the fifteen VCs in Volume 3A and 3B, as well as issues and concerns raised during the Indigenous Engagement and public consultation programs relating to federal lands can be found in Volume 1, Sections 6 and 7.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A - Although the PDA is adjacent to the Tsuut'ina Nation Reserve, none of the proposed Project facilities are located directly on the reserve lands. Therefore, a statement of significance is not made.

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Federal Lands (con't)				• Change in hydrological regime (water quantity) • Change in sediment transport • Change in surface water quality • permanent alteration of fish habitat • destruction of fish habitat • death of fish • change in terrain stability • change in soil quality and quantity • change in landscape diversity • change in community diversity • change in species diversity • change in wetland function • change in habitat		Although the PDA is adjacent to the Tsuut'ina Nation Reserve, none of the proposed Project facilities are located directly on the reserve lands. However, the LAAs and RAAs of several VCs overlap the Tsuut'ina Nation Reserve and Stoney Nakoda Nation Reserves.									

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Federal Lands (con't)				• change in movement • change in mortality risk • change in biodiversity • change in land use • change in parks and protected areas and unique sites or special features • Loss of or alteration to historical resource site contents or sites context • change in availability of traditional resources for current use • change in access to traditional resources or areas for current use • change in current use sites or areas										

Table 3-1 Summary of Environmental Effects Assessment

Valued Component (VC) Affected	Area of Federal Jurisdiction	Project Phase: Construction and Dry Operation	Project Phase: Flood and Post-Flood Operation	Potential Effects	Key Mitigation Measures	Residual Effect(s)	Direction*	Magnitude*	Geographic Extent*	Duration*	Frequency*	Reversibility*	Ecological and Socio-economic Context*	Timing	Significance of Residual Effect (s)
Federal Lands (con't)				• change in Indigenous commercial activities • Change to human health • Change in transportation infrastructure and services • change in provincial economy • change in regional labour force • Change in regional economy											

***KEY**
See individual chapters for detailed definitions

Direction:
P: Positive
A: Adverse
N: Neutral

Magnitude:
N: Negligible
L: Low
M: Moderate
H: High

Geographic Extent:
PDA: Project Development Area
LAA: Local Assessment Area
RAA: Regional Assessment Area

Duration:
ST: Short-term
LT: Long-term

Timing:
T: Time of Day
S: Seasonality
R: Regulatory

N/A: Not applicable

Frequency:
S: Single event
IR: Irregular event
R: Regular event
C: Continuous

Reversibility:
R: Reversible
I: Irreversible

Ecological/Socio-Economic Context:
U: Undisturbed
D: Disturbed