



DECISION NR 2021-01

NRCB Application No. 1701

Alberta Transportation

Springbank Off-Stream Reservoir Project in
Springbank, Alberta

June 22, 2021

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SECTION 1 OVERVIEW

1.1 Executive Summary

Based on the assessment of the evidence before it, the Board concludes that the Project is in the public interest. This opinion is founded upon the evidence supporting the public benefits of mitigating flood events downstream of the Project site and, in particular, on the City of Calgary. For the City of Calgary, the Project reduces the risk to public safety; provides significant damage avoidance to private residences, businesses, and public infrastructure; and reduces or eliminates business interruption. Also important is the significant social benefit to residents that are apprehensive about the risk of future flooding. The Board finds that the considerable positive social and economic effects outweigh the adverse economic, social, and environmental effects, convincing the Board that the Project is in the public interest. In making this decision the Board notes that, while adverse environmental effects exist, the conditions in the approval, together with Alberta Transportation’s commitments, will mitigate any material environmental effects associated with the Project.

Table 1-1 on the following pages provides an executive summary in table form summarizing the impacts the Board weighed and what it found to be the key considerations for each category. The purpose of the summary table is to provide a snapshot of the Board’s considerations for a reader’s ease of reference. For clarity, the summary table does not constitute the reasons of the Board. The reasons of the Board are found in each corresponding effect category section of this decision report. If there is a discrepancy between the information in this table and content in the rest of the decision report, the report will govern.

Table 1-1. Summary Table

Category Effect	Considerations
Indigenous Consultation	Duration – life of the Project, AT expects Project in place indefinitely Twelve of thirteen Indigenous communities have either agreed to continue consultation with AT outside of the Board’s review process or signed non-objection letters. AT is required to continue consultation, accommodation, and mitigation with all Indigenous groups as it moves through downstream approval processes including under the <i>Water Act</i> . AT is required, and committed to, continued consultation with the Stoney Nakoda Nations (SNN) in an effort to identify any Project impacts and mitigate or accommodate, as required. The GoA will determine adequacy of its consultation leading into downstream approvals. Overall, the Board finds that the discussions between Alberta Transportation and Indigenous communities illustrated a meaningful exchange of information to reach a mutual understanding of the Project and its impacts on Indigenous rights. The Board concludes that, notwithstanding the concerns of the Stoney Nakoda Nations, through mitigation measures and commitments, Alberta Transportation has largely addressed the concerns of affected Indigenous communities about impacts to their rights.

Category Effect	Considerations
Public Consultation	<p>The Board finds that the public consultation efforts of Alberta Transportation with local stakeholders was satisfactory. The Board notes that interveners expressed concerns regarding AT communications related to changing design details and cost estimates for the Project through the EIA process. As with any large and complex project, both the design details and costs evolved as AT continued to refine the engineering and work through the environmental impact assessment process.</p> <p>The Board acknowledges that the volume of information, and the changes associated with the Project details from the time the EIA terms of reference were issued, presented considerable demands on those whose job it was to remain current and informed. For stakeholders who were participating in the review process because of the Project's effects on them and their community, the demands presented by the public review process were more challenging to meet. The Board understands the frustration that concerned parties feel as they are expected to keep up with large amounts of new information. That said, Project changes that arise after the initiation of stakeholder consultation and the environmental impact assessment work are generally positive changes that reflect public input and a better understanding of the Project's effects. The Board is satisfied that the open houses and direct stakeholder meetings organized and hosted by AT throughout the application process were appropriate and effective in providing relevant Project information and capturing stakeholder concerns.</p>
Historical Resources	<p>During construction, AT expects limited residual effects on historical resources due to mitigation measures required by Alberta Culture, Multiculturalism and Status of Women (ACMSW). AT agreed to participate in discussions with ACMSW and Indigenous groups regarding further investigation of identified cultural and traditional sites located within the project development area (PDA). AT committed to working with SNN to identify, mitigate, and commemorate historical Indigenous resources identified during construction.</p> <p>AT also committed to working with the Springbank Historical Society to document and commemorate the history of the lands in the project development area.</p>
Land Use	<p>Duration – life of the Project</p> <p>The project development area (PDA) is approximately 1500 ha, most of which is private land that will be acquired through purchase or expropriation. Once purchased, the entire PDA will become Crown land. This land will be available for use by the public and Indigenous peoples, other than those portions that need to be secured for operations or blocked off for public safety. AT committed to working with Indigenous groups and the public in finalizing its <i>Draft Guiding Principles and Direction for Future Land Use</i>. AT intends to form a First Nations Land Use Advisory Committee to discuss the exercise of Aboriginal and treaty rights and traditional uses in the PDA. The Board requires that a Joint Land Use Advisory Committee, comprised of Indigenous and community representatives, be formed to draft a final Land Use Plan for the PDA, including use of firearms.</p> <p>The Project complies with the outcomes and strategic directions of the South Saskatchewan Regional Plan.</p>
Alternatives	<p>The Board finds that the selection process and the criteria used to select among project alternatives was sound and reasonable. The Board finds that AT conducted an adequate assessment of alternatives. In particular, the assessment of the MC1 alternative was thorough for the purposes of project selection. The Board acknowledges that while AT has stated that the MC1 project is feasible, it also stated that SR1 was selected as the preferred project based on a criteria-based selection process. Criteria used to assist in project selection included; catchment area, sedimentation, debris management, construction and operation risks, and environmental impacts.</p>

Category Effect	Considerations
Aquatic Ecology	<p>Duration – life of the Project, infrequent; during flood events of 1:10 year or greater</p> <p>The design of the Project leaves the Elbow River close to its native riverine state during non-flood years. The diversion spillway and related modifications to the river channel will allow fish passage under reduced flows and up to the 1:10 year flood. During flood events, the diversion structure will alter river flows by diverting flows in excess of 160 m³/s into the reservoir. During flow diversion fish will become entrained in the diversion channel and reservoir. Fish survival rates in the reservoir, total fish passage through the low-level outlet during reservoir draining, and efficacy of fish rescue post reservoir draining are uncertain. The Board acknowledges these uncertainties but finds that Project design features, combined with an early release option for draining the reservoir and a robust fish rescue program will increase fish survival rates. The Board also recognizes that the expected total entrainment of fish in a design flood is approximately one per cent of the total fish population between Elbow Falls and the Glenmore Reservoir. The Board finds that fish sustainability in the Elbow River is not jeopardized by the Project.</p>
Hydrology and Sediment Transport	<p>Duration – life of the Project, infrequent.</p> <p>The Project has the potential to affect hydrology by causing changes in the hydrological regime, suspended sediment transport, and channel morphology. The Project is expected to have limited interaction with hydrology during construction and dry operations. The Board acknowledges the purpose of the Project is to alter hydrology (i.e., mitigate floods) during flood and post-flood operations. The Board finds that the protection of property, infrastructure, and public safety will benefit by diverting peak discharges into the off-stream reservoir and releasing the water once the flood risk has subsided. An early-release scenario will be employed by Alberta Transportation for draining the off-stream reservoir after a flood. This scenario would reduce sediment accumulation in the off-stream reservoir. Realignment of the low-level outlet works, and armoring sections of the unnamed creek will contribute to reduced erosion in the creek and have benefits for surface water quality and aquatic ecology.</p>
Hydrogeology	<p>Duration – life of the Project, infrequent.</p> <p>Temporary groundwater quantity changes are anticipated during construction due to temporary dewatering required for the construction of Project components such as the diversion channel. Groundwater levels are also expected to rise in the diversion channel and off-stream reservoir areas during flood operations due to mounding effects. The Board acknowledges that the infiltration of flood-affected water has the potential to impact groundwater quality but the impact of infiltrating flood-affected water on groundwater quality is not expected to be significant due to the general low hydraulic conductivity of overburden materials, general high quality of the flood water, and limited time that water will be stored in the reservoir. Any impacts on groundwater quality or quantity are expected to be reversible when the flood passes, with the exception of portions of the diversion channel area where there is a permanent lowering of the water table. The Board is confident that implementation of mitigation measures and the monitoring proposed by Alberta Transportation are sufficient to deal with any expected Project impacts on groundwater quality and quantity.</p>

Category Effect	Considerations
Surface Water Quality	<p>Duration- life of the Project, infrequent.</p> <p>The Board finds that Alberta Transportation used reasonable methodology to assess Project impacts on surface water quality. The Board acknowledges that the intent of the Project is to divert water from the Elbow River and to temporarily store it in the off-stream reservoir until flood conditions abate. The Project is not intended or designed to affect water quality. It is understood by the Board that this diversion will affect Elbow River flows and any impacts on surface water quality will be temporary and manageable. The Board is confident that the draft surface water monitoring plan developed by Alberta Transportation in consultation with input from stakeholders, will be effective in identifying Project impacts on water quality, and that the information will be useful for validating modeling predictions, and for identifying appropriate mitigative action as required.</p>
Terrain and Soils	<p>Duration – life of the Project, infrequent but cumulative</p> <p>The Project will convert natural terrain features to project infrastructure including the diversion works, diversion channel, dam, and low-level outlet. Deposition of sediments over existing soils will occur during flood diversion events. Sediments will be at elevated risk of wind erosion and may result in fugitive dust emissions. The Operator will use tackifiers, cover crops, and other methods to stabilize sediments in the short-term until permanent vegetation can be re-established and the risk abated. Flood operations may also result in water erosion and changes in slope stability along drainage ways in the reservoir and low level outlet. Damaged areas will be repaired as required to re-establish stable slopes and restore drainage function. The Project will result in irreversible reductions in agricultural land capability ratings, but these reductions will not prevent re-vegetation following floods. While both construction and operations will have adverse and irreversible impacts on terrain and soils, the Board finds that these impacts are confined to the PDA, constitute a negligible portion of the local assessment area (LAA) and regional assessment area (RAA), and can be mitigated to an acceptable level.</p>
Vegetation	<p>Duration – life of the Project, infrequent</p> <p>Construction of Project infrastructure will remove vegetation and change land cover types. Submergence and sedimentation during flood events will result in loss of vegetation including plants of cultural importance to Indigenous communities. Over time the composition of upland plant communities will become less diverse with fewer trees and shrubs. More frequently inundated wetlands may fill in with sediment. Except for roads, buildings, and hard surfaces, vegetation will be established on infrastructure. Any wetlands destroyed during construction will be offset following the <i>Alberta Wetland Policy</i>. The remainder of the construction footprint will be reclaimed using native seed mixes developed in consultation with Indigenous groups. The Board notes that most of the land in the PDA has been previously disturbed by agriculture. Impacts on upland native plant communities and wetlands, while regrettable, are confined to the PDA and losses are negligible at the regional level. The Operator has committed to a comprehensive weed management program to mitigate potential risk of weed infestations. The Board finds that the loss of vegetation communities are relatively small in relation to the LAA.</p>

Category Effect	Considerations
Wildlife and Biodiversity	<p>Duration – life of the Project</p> <p>Project construction will result in loss of habitat and disruption of wildlife use due to sensory disturbance. Flood operations may interrupt habitat use, prevent animals moving through inundated portions of the reservoir, displace animals from home habitat, and result in increased animal mortality. Additional impacts include increased risk of wildlife-motor vehicle collisions during both construction and flood operations. Mitigation during construction includes avoiding active animal dens and nests, scheduling disruptive activities to periods when wildlife is less sensitive, traffic control, and reducing sensory disturbance. To facilitate passage of large ungulates, the Highway 22 bridge span over the diversion channel and the floor and sides of the channel have been designed to act as a wildlife underpass. The Board agrees that the underpass is an appropriate solution for facilitating safe wildlife passage. The Board agrees with AT's assessment that habitat loss will be confined to the PDA and negligible at the regional level. The Board further notes that AT has committed to the development of a comprehensive wildlife monitoring plan in cooperation with Indigenous groups and the local community. The Board finds that the Project poses no significant risk to the viability of wildlife populations or biodiversity within the region.</p>
Air Quality and Public Health	<p>Duration – life of the Project, infrequent</p> <p>Fine particulate matter (PM_{2.5}) levels may exceed ambient air quality standards outside of the project development area during the construction phase; however, these effects are expected to be short-term and reversible. Fugitive dust emissions are also expected with wind erosion of post-flood sediments that are deposited in the reservoir area; however, flooding events that result in sediment deposition in the reservoir are expected to be infrequent. Adaptive management strategy proposed by AT, informed by vigilant monitoring, and effective mitigation measures, will be essential for managing any air quality impacts of the Project on public health. With its condition, the Board is confident in the effectiveness of the draft air quality management plan developed by Alberta Transportation for the Project that details air quality, mitigation, and meteorological monitoring plans.</p>
Noise	<p>Duration – primarily during construction phase</p> <p>Noise impacts during construction are expected to be short-term and reversible. There may be some noise impacts associated with post-flood clean-up activities; however, these impacts are expected to be infrequent and short in duration.</p> <p>Noise impacts were not a focus of attention at the hearing.</p>
Dam and Public Safety	<p>Dam and public safety are of paramount importance to Albertans and indeed to this Board. The Board understands public concern regarding the novel approach the Project will use to manage flood water. However, the Board finds that the major Project components are all commonly used in Alberta and throughout the world. The Board does acknowledge that the use of these components in unison is somewhat unique; however, the Board does not accept that the design is radical or poses a risk to public safety. The Board notes that the proponent incorporated conservative features into the Project design. For example, the Elbow River diversion capacity was increased by 25 per cent from a design flood (i.e., from 480 m³/s for a design flood to 600 m³/s) and the capacity of the off-stream reservoir volume is designed to contain 10 per cent more water than that required to contain a design flood. The Board understands that the Canadian Dam Association safety guidelines apply to the Project, providing further protection against a dam breach or failure. Also, the Project must meet the <i>Alberta Canal and Dam Safety Directive</i> and will need to be approved by the director of dam safety, including requirements for emergency planning.</p>

Category Effect	Considerations
Socio-Economics and Project Need	<p>Duration – life of the Project</p> <p>Need for the flood control on the Elbow River was undisputed and confirmed by the Board. The 2013 flood caused devastating effects socially and economically, with the estimated total damages as a result of the flood at \$5 billion in southern Alberta.</p> <p>Should a flood of similar magnitude of 2013 occur, the Project will mitigate approximately \$1.5 billion in damages including business interruption costs in the City of Calgary. The annual average damages avoided due to the Project are \$28 million. The Project benefit-cost ratio is above 1.0, meaning Project benefits are greater than Project costs.</p> <p>Construction will generate employment income and indirect economic “spin-off” effects that were not part of Project benefits for the purposes of calculating the benefit-cost ratio. Public safety and damage avoidance were primary factors in support of Board approval of the Project.</p>

1.2 The Application

Alberta Transportation (AT) was required to apply for a Natural Resources Conservation Board (NRCB) approval as the Springbank Off-Stream Reservoir Project (the Project) is a water management project as defined in the *Natural Resources Conservation Board Act* (NRCBA). The purpose of the Project is to reduce the effects of extreme floods on infrastructure, watercourses, and people in the City of Calgary and other downstream communities. The Project is to be located approximately 15 kilometres (km) west of Calgary in Rocky View County (see Figure 1-1). AT applied to the Natural Resources Conservation Board on November 2, 2017 for approval to construct and operate the Project.

In order to promote an efficient process, the NRCB relies on the environmental impact assessment (EIA) terms of reference to serve as the NRCB application requirements. The *Environmental Protection and Enhancement Act* sets out the process for conducting an EIA, including establishing project-specific terms of reference. The NRCB reviews and comments on the draft EIA terms of reference to ensure they will satisfy the information requirements of the NRCB application process.

While the NRCB and Alberta Environment and Parks (AEP) conduct separate reviews of the EIA/NRCB application filing, they work together to develop combined requests for additional information required from the applicant. This coordination of process between AEP and the NRCB avoids duplication and delay. Once the NRCB determines that the application is sufficiently complete, the NRCB commences the public engagement review phase of its application process.

The NRCB issued a Notice of Pre-Hearing Conference on October 5, 2020. The purpose of the pre-hearing conference would be to hear from parties on the major issues to be examined at the

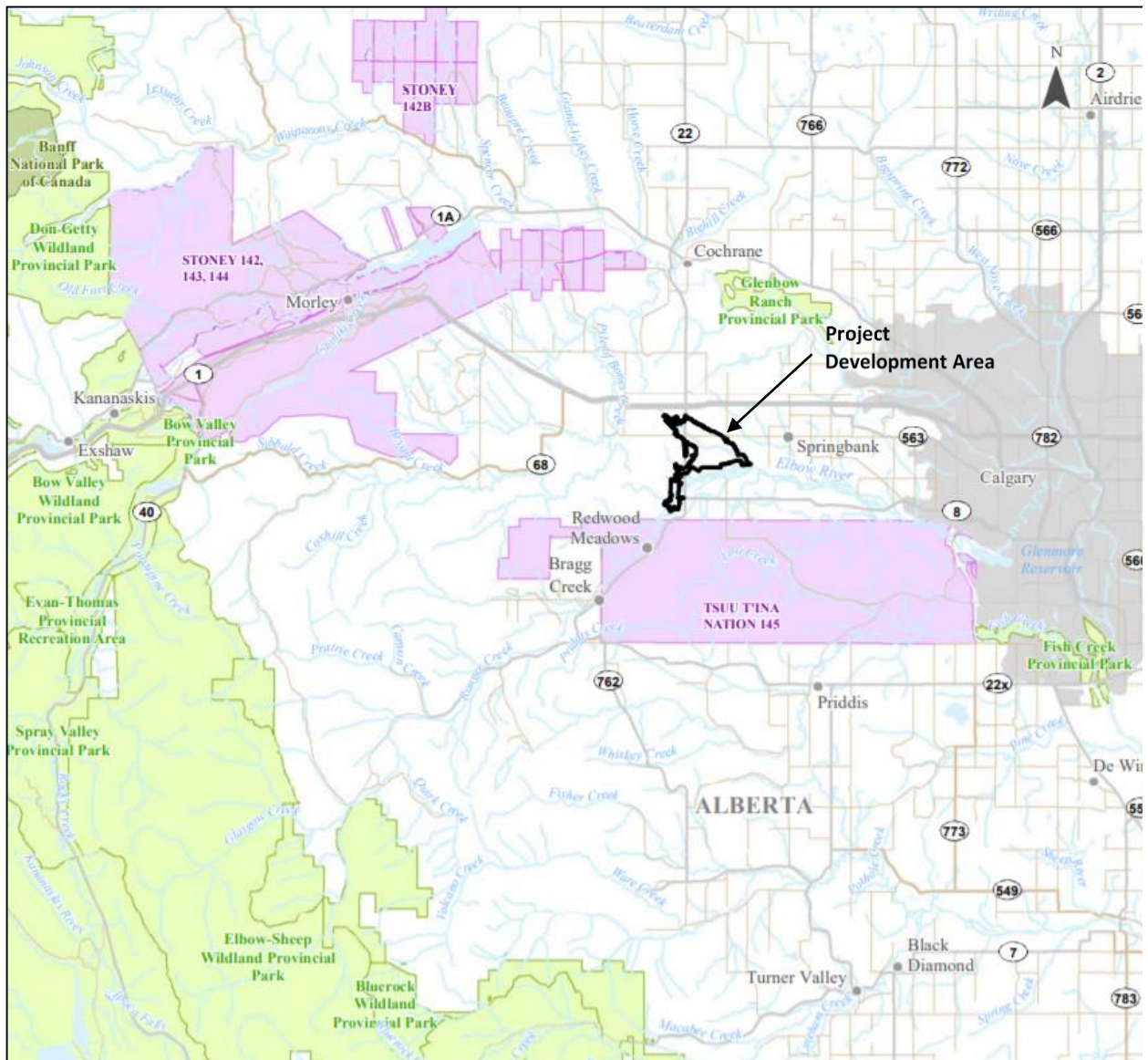


Figure 1-1. Project Location (modified from Figure 1-1 in the March 2018 Environmental Impact Statement report)

hearing, the appropriate scope and jurisdiction of the review, the hearing format, the appropriate timing of a hearing, the availability of advance intervener funding, and deadlines for filing hearing submissions.

The pre-hearing conference was conducted as a virtual oral hearing on December 2, 2020. The Board issued its Pre-Hearing Conference Decision Report on December 10, 2020.

The Pre-Hearing Conference Decision Report provided the Board’s direction and decision on the various procedural matters, including advance intervener funding, that contribute to the parties’ meaningful participation at the hearing and the NRCB’s public interest decision.

1.3 Key Dates

Key dates and events in the NRCB review of the Project include:

<u>Pre-Application</u>	
2014 July 14	Alberta Environment and Sustainable Resource Development (now AEP) advises Alberta Transportation that, pursuant to the <i>Environmental Protection and Enhancement Act</i> it must prepare an EIA. As a direct result of the determination that the Project was required to prepare an EIA, the Project met the definition of a reviewable project under the NRCBA.
2015 February 5	AEP issues final terms of reference for the Project’s EIA.
<u>Application Filed – Review for Completeness</u>	
2017 November 2	Alberta Transportation files the Project application with the NRCB (note that Project application was refiled March 26, 2018).
2017 November 6	NRCB and AEP issue Joint Notice of Filing of NRCB Application and EIA.
2018 March 26	Alberta Transportation submits revised Project application documents.
2018 July 28	AEP issues supplemental information request (SIR#1) to Alberta Transportation.

2019 November 18	AEP issues second supplemental information request (SIR#2) to Alberta Transportation.
2020 April 7	Alberta Transportation files partial response [questions 1 and 27] to SIR#2 with NRCB and AEP.
2020 May 15	Alberta Transportation files partial response to SIR#2 with NRCB and AEP.
2020 October 22	Alberta Transportation files partial response, including field work from summer 2020, to SIR#2 with NRCB and AEP.
2020 November 4	AEP issues third supplemental request (SIR#3) to Alberta Transportation
2020 December 16	Alberta Transportation files response to SIR#3 with NRCB and AEP
2021 February 3	AEP deems the EIA complete pursuant to Section 53 of the <i>Environmental Protection and Enhancement Act</i> .
<u>Pre-Hearing and Hearing</u>	
2020 September 24	NRCB establishes a division of the Board, consisting of Peter Woloshyn (Chair), Sandi Roberts, Walter Ceroici, and Daniel Heaney (the panel or the Board), to consider the application.
2020 October 5	NRCB issues Notice of Pre-Hearing Conference.
2020 November 20	Submission deadline for NRCB pre-hearing conference.
2020 December 2	NRCB pre-hearing conference.
2020 December 10	NRCB issues Pre-Hearing Conference Decision Report.
2020 December 21	NRCB issues Notice of Hearing.
2021 February 26	Submission deadline for NRCB hearing.
2021 March 22	NRCB hearing opens. Participants include the applicant (Alberta Transportation), the City of Calgary, the Calgary River Communities Action Group/Flood Free Calgary, the Stoney Nakoda Nations, the SR1 Concerned Landowners Group, Calalta Amusements Ltd./Calalta Waterworks Ltd., and Scott Wagner.
2021 April 7	NRCB hearing closes.

1.4 Basis of Decision

The Board must determine whether the prescribed reviewable project is in the public interest, having regard to the social and economic effects of the Project and the effect of the Project on the environment. In considering this application, the Board has the benefit of the application materials filed by AT and detailed hearing submissions filed by interested parties. In addition, the Applicant was required to prepare and submit an EIA to AEP for the Project. The scope of the EIA was established in the first instance by the final terms of reference issued by AEP on February 5, 2015. The NRCBA requires that the NRCB be satisfied that an application is complete prior to issuing a Notice of Hearing.

The Project application materials identify Alberta Transportation as the Government of Alberta department responsible for the design and construction of the Project. Once construction is completed, Alberta Transportation will transition the ongoing Project operation and maintenance responsibilities to Alberta Environment and Parks. While this Board decision refers to both Alberta Transportation and Alberta Environment and Parks specifically throughout the decision, some of those references may need to be read broadly given the anticipated changes in project responsibilities. References to “the Operator” in this report are intended to refer to either Alberta Transportation or Alberta Environment and Parks, in their respective roles as the department responsible for Project construction, operations and maintenance.

Section 9 of the NRCBA provides that the Board may grant an approval on any terms and conditions that it considers appropriate. The rationale for any terms and conditions is to be set out clearly in the Board’s decision. A review under the NRCBA differs from many statutory regulatory schemes in that the Board does not have an ongoing role in the regulation of the Project. As a result, the ongoing review and enforcement of conditions included in an NRCB approval under the NRCBA are normally delegated to a provincial department that has an ongoing regulatory function. The Board is careful to identify the appropriate delegate, most commonly AEP, to oversee the successful implementation of those conditions.

SECTION 2 PROJECT DESCRIPTION

The Project is intended to divert water from the Elbow River during flooding events to an off-stream reservoir located near Springbank Road. Flood water retained in the reservoir would be released in a controlled manner after peak flooding has subsided.

The off-stream reservoir is intended to work in tandem with the Glenmore Reservoir to limit flood flows through the City of Calgary below Glenmore Dam. According to Alberta Transportation, the Project has the capacity to divert up to 600 cubic metres per second (m^3/s) from the Elbow River to the off-stream reservoir during flood events. Flows in excess of 600 m^3/s would pass through the diversion structure in the Elbow River and be stored in the Glenmore Reservoir. AT contends that the off-stream reservoir and Glenmore Reservoir will have a total combined storage capacity of 87,771,000 m^3 , exceeding the amount of water that overtopped the Glenmore Dam during the 2013 flood and resulted in overland flooding.

2.1 Main Project Components

Flood waters diverted from the Elbow River will be temporarily contained in the off-stream reservoir located in a natural topographic depression. A clay-cored earth dam, to be designed in accordance with Canadian Dam Association requirements, and the *Alberta Dam and Canal Safety Directive*, will be constructed. The dam will be 3.3 km in length with a maximum height of 29 m.

Diversion Structure

A diversion inlet along the Elbow River is designed to work in tandem with service spillway gates to divert flood waters into a diversion channel when flows in the Elbow River exceed 160 m^3/s . According to Alberta Transportation, the maximum diversion rate will be 600 m^3/s . During flow diversion, 160 m^3/s of water will still be allowed downstream through the service spillway. A berm will be constructed in the Elbow River floodplain to prevent an “end run” of flood water around the diversion system and to direct water to the diversion inlet. An auxiliary spillway will be constructed in the floodplain berm to prevent overtopping of the berm during flooding events.

Alberta Transportation stated navigability of the reach of the Elbow River in the vicinity of the diversion system during non-flood periods was a concern identified by Indigenous¹ groups and stakeholders during consultations. In response to these concerns, AT has committed to place large boulders and boulder clusters in the Elbow River downstream of the service spillway to break up the river current and facilitate non-motorized watercraft passage during dry operations.

¹ In this decision report, the Board uses the term “Indigenous” to refer to all First Nations, Métis, Inuit, and other Indigenous peoples, recognizing that not all people self-identify using the term “Indigenous”. The Board uses the term “Aboriginal” when required for historical or legal reasons or when referencing programs, program area titles, and data sources that use “Aboriginal”.

Alberta Transportation also contends that the boulders may improve the performance of the fish passage structures by creating additional resting spots for fish (stilling pool). The addition of the boulders/boulder clusters will not affect project operations since the flow in the Elbow River will not be significantly impacted.

In response to concerns from Indigenous groups and the public about debris buildup in the diversion channel, and consequently, the reservoir during flood events, Alberta Transportation plans to construct a debris deflector on the north bank of the Elbow River that would divert debris from the diversion inlet and allow the debris to flow over the service spillway and down the Elbow River. The debris deflector would only be operational during flooding conditions. According to AT, the debris deflector will reduce the risk of project infrastructure damage and improve operating efficiency of project components (e.g., diversion inlet, diversion channel, off-stream reservoir).

Diversion Channel

The 4.7 kilometre (km long) diversion channel is intended to convey water from the diversion structure to the off-stream reservoir. The diversion channel will feature an emergency spillway to release water from the channel in situations when the off-stream reservoir is full and the diversion inlet gates cannot be closed. The emergency spillway allows for unregulated flow of excess flood waters overland back to the Elbow River.

In the March 2018 EIA, the diversion channel design included riprap along the bottom to reduce erosion in certain locations. To facilitate wildlife movement through the project development area, stretches of the riprap area will be infilled with finer material, covered with topsoil, and seeded with grasses. Alberta Transportation stated that based on additional information (e.g., wildlife camera and wildlife tracking data) and feedback from Indigenous groups, the length of the areas to be infilled in this way will be limited to areas under bridges and four other areas where wildlife crossings have been observed. Alberta Transportation committed to continue discussions with Indigenous groups on the location and design of wildlife crossings over the diversion channel.

Off-Stream Reservoir and Dam

Flood waters diverted from the Elbow River will be temporarily contained in the off-stream reservoir located in a natural topographic depression. A clay-cored earth dam, to be designed in accordance with Canadian Dam Association requirements, and the *Alberta Dam and Canal Safety Directive*, will be constructed.

The off-stream reservoir has a capacity of approximately 78,000,000 m³ and a maximum flooded area of approximately 800 hectares. Alberta Transportation indicated that the reservoir is designed to temporarily contain floodwaters from a flood equivalent to the 2013 flood (referred to as a “design flood”). Water will be released from the reservoir via a low-level outlet in the dam when the risk of flooding subsides. AT used modelling results presented in the March 2018 EIA to estimate residence time of flood waters in the reservoir and release times for one in ten (1:10)

year, 1:100 year, and the 2013 (design) flood scenarios. For a design flood, it was estimated that the residence time in the reservoir would be 20 days and followed by a release time of about 38 days.

Alberta Transportation revised the reservoir release modelling detailed in its 2018 EIA based on feedback from Fisheries and Oceans Canada and Alberta Environment and Parks, to assess the benefits of earlier reservoir water release, when the water is relatively still cool and oxygenated, and water in the Elbow River is still turbid due to flood conditions. It was AT's view that this earlier release would reduce sedimentation in the reservoir and that the earlier release of water from the reservoir is expected to have less impact on fish and aquatic life in the Elbow River. As a result of the modelling, Alberta Transportation introduced a new operation rule for releasing reservoir water earlier. Water would be released when Elbow River flows are below 160 m³/s (after the peak of the flood flow). AT stated that this flow coincides with the Glenmore Reservoir's lower elevation outlet capacity and would not require the Glenmore Reservoir to use its remaining flood storage.

Low-Level Outlet

Flood water contained in the off-stream reservoir will be released in a controlled manner using a low-level outlet (gated concrete structure) in the dam embankment to an unnamed creek that flows into the Elbow River. The outlet location described in the March 2018 EIA was near the east end of the dam. As a result of feedback from provincial and federal regulators, Indigenous groups, and other stakeholders, Alberta Transportation made several design changes to the outlet system, including:

- moving the low-level outlet location in the dam about 190 metres (m) southwest of the original location to an area with better foundation conditions that AT states will reduce the risk of settling during construction; this move will require the construction of a new channel (in the reservoir area) to convey water from the unnamed creek to the outlet; water released from the new outlet location would flow into a new constructed channel that joins the unnamed creek about 700 m downstream of where it was located in the original design;
- adding a second backup gate to the outlet to improve operation reliability;
- implementing erosion control measures along the entire length of the unnamed creek to reduce sediment transport to the Elbow River; and
- increasing the construction area footprint downstream of the outlet to accommodate work on the constructed channel and unnamed creek (Alberta Transportation stated that the construction area will still be within the project development area).

Access Roads

Alberta Transportation stated that some existing roadways in the project development area will have to be modified as a result of the Project:

- Highway 22 will be raised above the reservoir design flood level and suitably sized culverts will be installed to allow for filling and draining of the reservoir during a flood event.
- The existing road alignment of Township Road 242 will be maintained, but a bridge crossing will be required over the diversion channel.
- Several design alternatives were considered for Township Road 244/Springbank Road. The chosen design maintains the existing Springbank Road but requires raising the grade of the road at a new intersection with Highway 22. The raised intersection would permit access to Township Road 244, even during a design flood.
- Range Road 40 will be upgraded from a gravel road to a county collector roadway. During design flooding events, a portion of Springbank Road will be submerged and traffic would be detoured north on Range Road 40 to Township Road 250 and then back to Highway 22.
- Some property accesses to privately owned land (e.g., residences, or land used for agricultural activity) may require replacement or modifications if the original access is impacted by the Project. The number of private accesses that will need to be replaced or modified will be confirmed once the land required for the project has been acquired by AT.

Alberta Transportation stated that permanent access roads will be required to allow access for operation and maintenance of the Project (Figure 2-1). Locking swing gates will be installed on roads to limit access.

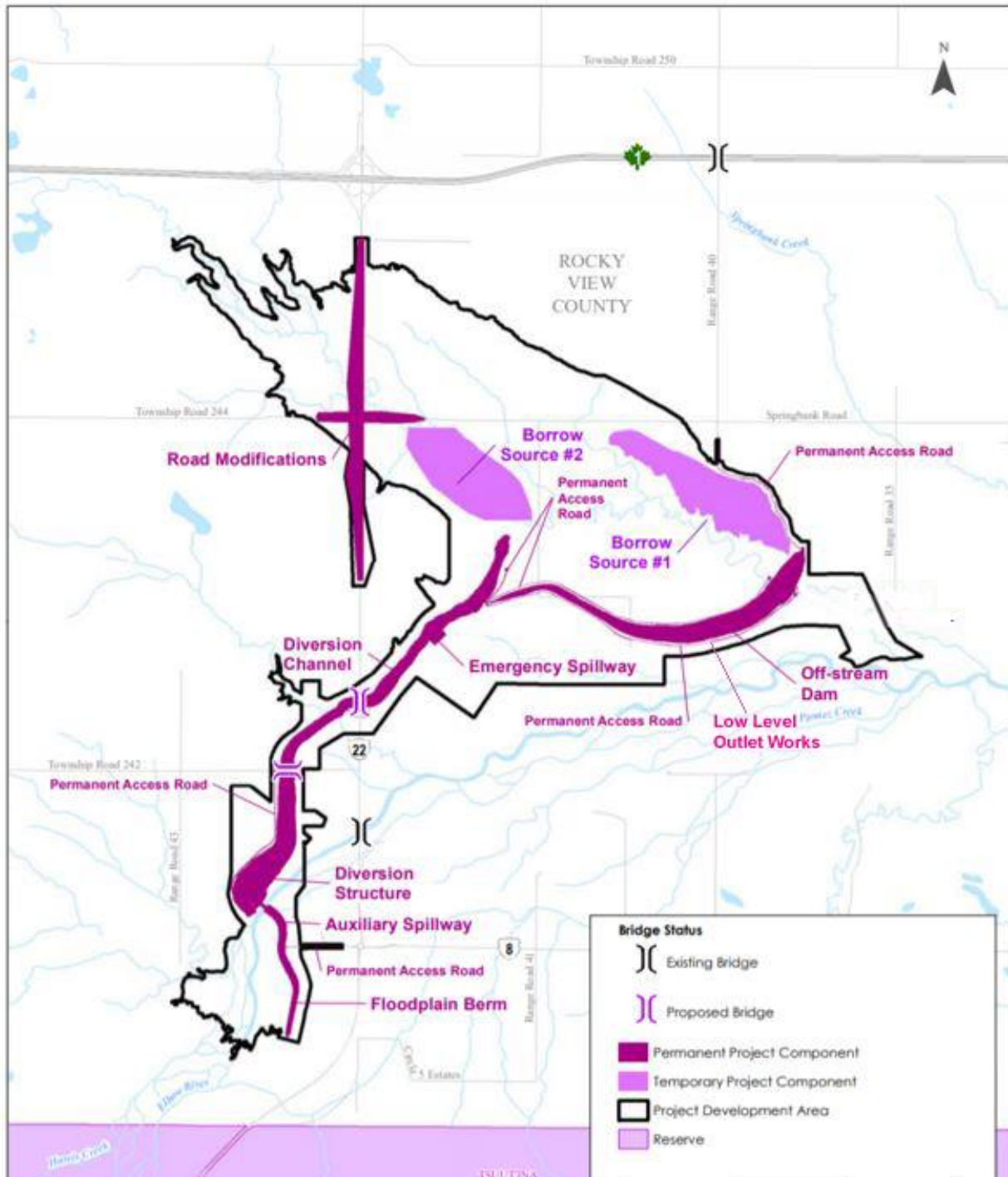


Figure 2-1. Main Project Components (modified from Figure 3-1 in the March 2018 Environmental Impact Statement report)

SECTION 3 ALTERNATIVES CONSIDERED

3.1 Summary of the Application (EIA)

The final terms of reference from Alberta Environment and Parks (AEP) and guidelines from the Canadian Environmental Assessment Agency (now the Impact Assessment Agency of Canada) for the Springbank Off-Stream Reservoir (SR1) application both required Alberta Transportation (AT) to evaluate alternatives to the Project. Early stages of the Government of Alberta's post 2013 flood analysis were led by AEP.

3.1.1 Identification of Alternatives

The Government of Alberta (GoA) created the Southern Alberta Flood Recovery Task Force following the 2013 flood and commissioned it to identify flood mitigation options for the Oldman, Bow, and Elbow river basins. The task force report identified several potential reservoir and diversion locations for flood mitigation in the Elbow River watershed:

- Quirk Creek
- Canyon Creek
- Ford Creek
- Priddis Creek
- McLean Creek
- Springbank

The Quirk Creek site was rejected due to concerns with slope stability. The Canyon Creek site was dismissed because the storage volume was too small relative to the flood mitigation required to protect Calgary. The Ford Creek site was dismissed because it offered no apparent advantages over the McLean Creek site, and it would have controlled a smaller portion of the watershed. The Priddis Creek diversion was dismissed because of its potential to cause damage to Priddis and Fish Creek, and concern that it would increase flood risk for properties already at risk. It was recommended that the Springbank Off-Stream Reservoir and McLean Creek dam assessments be progressed until one became the preferred option.

At the same time, the City of Calgary carried out studies on a diversion that would convey water from the Elbow River during floods past the Glenmore Reservoir to the Bow River via an underground tunnel.

Based on these recommendations, AEP determined that three options warranted further study which could conceptually protect the City of Calgary from a future flood event equivalent to 2013 and had the potential to be cost effective. These options were:

- Springbank Off-Stream Reservoir (SR1): an off-stream dam and reservoir between Springbank Road and the Elbow River downstream of Redwood Meadows;

- McLean Creek Dam (MC1): a dam on the Elbow River main channel (spanning the Elbow River valley) near the confluence with McLean Creek; and
- Glenmore Reservoir Tunnel: an underground diversion tunnel running east from the Glenmore Reservoir, discharging into the Bow River.

Benefit-cost analyses (BCAs) were completed on these three flood mitigation options using the same present value of flood mitigation benefits. The benefits were based on the amount of damages mitigated within the City of Calgary with flood protection in place. Therefore, the BCA results are driven by the relative costs of each. High and low damage scenarios were compared using one in one hundred (1:100) and one in two hundred (1:200) year flood events and the associated avoidance in damages (Table 3-1).

Table 3-1. Benefit-Cost Ratio of Alternative Elbow River Flood Mitigation Projects for Varying Scenarios and Flood Return Periods (2015)
(modified from Table 2-1 in the EIA, Volume 1, Section 2, Exhibit 20)

	High Damage Scenario		Low Damage Scenario	
	1:100	1:200	1:100	1:200
Springbank Off-Stream Reservoir	1.87	2.07	1.32	1.32
McLean Creek Dam	1.43	1.65	1.01	1.05
Glenmore Reservoir Tunnel	1.21	1.20	0.81	0.83

In all scenarios, the Glenmore Reservoir Tunnel had the lowest benefit-cost ratio and was therefore removed from further consideration.

3.1.2 Alternatives Narrowed to SR1 and MC1

The Springbank Off-Stream Reservoir and McLean Creek Dam options received further assessment to determine the preferred flood mitigation project based on technical feasibility and merit. Figure 3-1 shows the relative locations of the two projects along the Elbow River.

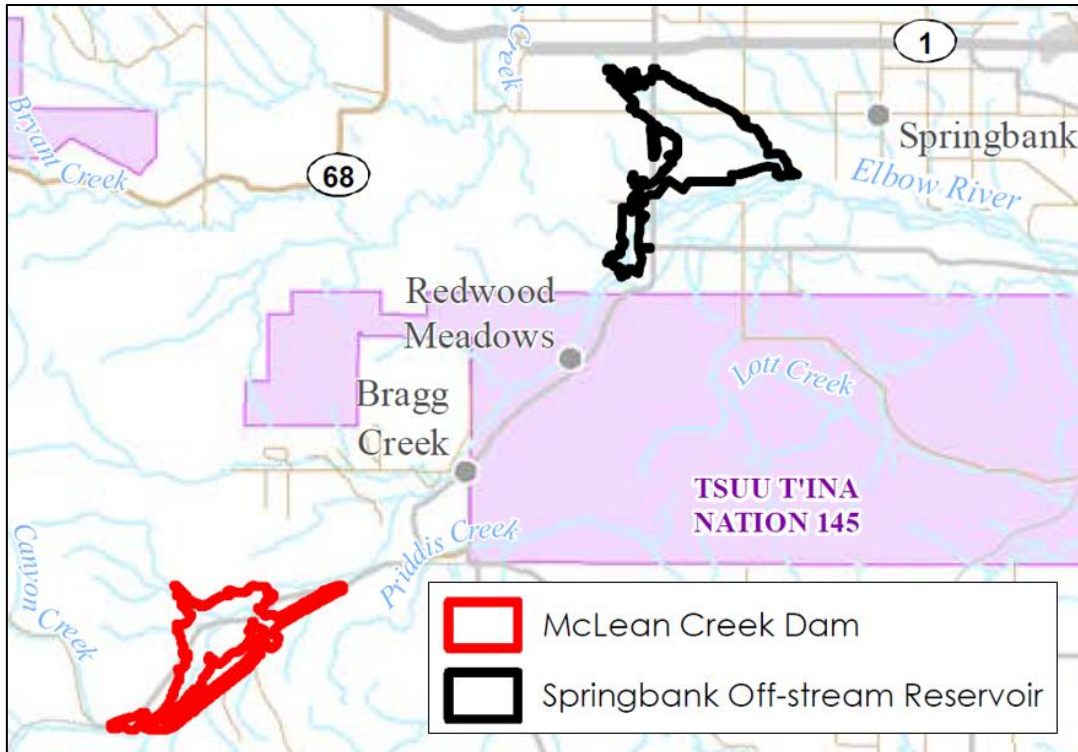


Figure 3-1. Springbank Off-Stream Reservoir and McLean Creek Dam Project Locations along the Elbow River
 (modified from Figure 2-1 in the EIA, Volume 1, Section 2, Exhibit 20)

McLean Creek

The MC1 would be located in-stream on the Elbow River, approximately 10 km upstream of Bragg Creek, and immediately upstream of the confluence with McLean Creek. The site is a deeply incised portion of the Elbow River with a naturally occurring river valley suitable for a dam and reservoir.

The tallest portion of the earth fill dam would be approximately 50 m in height and 350 m in length. The entire length of the dam would be approximately 2,300 m including the left (north) and right (south) abutment dykes. A permanent pond approximately 180 acres in size and 15 m deep, with a proposed volume of 3,500,000 cubic metres (m³), was planned for water, debris and bedload management. The 35 m available between the top of the permanent pond and the top of the dam would provide a total of 70,000,000 m³ of flood storage.

Two gated tunnels, each six metres in diameter, would control river flow downstream during regular operations. These two tunnels would also provide flood passage up to and including the 1:1000 year floods, thereby easily accommodating a flood equivalent to the 2013 flood. Floods larger than a 1:1000 year would activate the concrete service spillway (left abutment) and possibly the auxiliary spillway (right abutment). According to Alberta Transportation (AT), the MC1 design would safely pass the probable maximum flood levels using the tunnels and two

spillways. During regular non-flood flows, a short tunnel through the dam would provide fish passage.

The MC1 site is located entirely on land administered by the Government of Alberta (GoA) — Crown land, park land, and river/creek bed and shore. Existing infrastructure within the MC1 footprint that would require relocation includes:

- the Elbow River ranger station and water/wastewater facilities;
- approximately 10 km of Highway 66, as well as the bridge over the Elbow River;
- the McLean Creek campground store;
- McLean Creek wastewater lift stations;
- 19 camping stalls at the McLean Creek campground; and
- various power and communication lines.

Criteria Based Comparison: SR1 and MC1

A comparison of the two projects was undertaken by Alberta Environment and Parks (AEP) in October of 2015 using the following criteria:

- project effectiveness including sedimentation, debris, accessibility, catchment area;
- environmental impacts;
- construction and operation risks;
- social and recreational value;
- commercial and tourism values;
- construction cost estimates; and
- construction timelines.

To evaluate these criteria for each project, quantitative data was used where possible and supplemented with qualitative assessments by professional specialists.

Benefit-Cost Analyses

Benefit-cost analyses for the SR1 and MC1 options were conducted in 2017 and 2019. Both analyses used the same benefit stream (annual average damage avoidance). The 2017 benefit-cost analysis found a ratio of 1.68 for SR1 and 1.44 for MC1.

The 2019 benefit-cost analysis reflected changes to some of the assumptions used to compare the SR1 and MC1. Key changes included:

- The benefit stream associated with the MC1 option would begin four years later than SR1 benefits since MC1 was further behind in the regulatory process at that time.
- The MC1 analysis included an additional benefit of \$180,000 to reflect the flood protection that MC1 would provide for Bragg Creek and Redwood Meadows.
- Construction costs were updated for both options, but were not directly comparable as the SR1 proposal had been advanced much further compared to MC1. The MC1 alternative remained at a conceptual design phase.

- Up to 2019, \$47.4 million was estimated to have been spent on SR1. Previous benefit-cost analysis did not include costs to date.
- Costs to acquire private land for SR1 were increased from \$80 million to \$140 million, reflecting updated estimates of land acquisition.

Two scenarios were provided for comparing the projects. The first scenario attributed all costs incurred between 2014 and 2019 to the SR1 project (Table 3-2). Costs of constructing and operating each project from 2019 into the future were attributed to the specific project.

Table 3-2. Benefit-Cost Ratios for Springbank Off-Stream Reservoir (SR1) and McLean Creek Dam (MC1) Projects - From 2014 to 2019, Including All Costs to Date Attributed to SR1 (modified from Exhibit 2.3 in Appendix IR6-1, AT SIR to NRCB, Exhibit 100)

	SR1	MC1
Benefit-Cost Ratio	1.24	1.41

The second scenario compared detailed benefits and costs from 2019 into the future, allowing comparison of the two options from the same point in time forward (Table 3-3). In this scenario, funds spent to date (between 2014 and 2019) were considered common to both flood mitigation options, and were disregarded.

Table 3-3. Benefit-Cost Ratios for Springbank Off-Stream Reservoir (SR1) and McLean Creek Dam (MC1) Projects - From 2019 into the future, Projected Costs Only (modified from Exhibit 2.4 in Appendix IR6-1, AT SIR to NRCB, Exhibit 100)

	SR1	MC1
Benefit-Cost Ratio	1.37	1.41

The benefit-cost ratio for MC1 was 1.41 for both scenarios because neither scenario had pre-2019 costs assigned to McLean Creek. A cost for public land use at MC1 was not included in the total costs for the 2019 BCA. Crown land costs associated with the MC1 alternative were estimated at \$57.75 million, and if assigned to MC1 as suggested by Alberta Transportation, the benefit-cost ratio for MC1 would be reduced to 1.23.

In the second scenario (benefit-cost ratios from 2019 into the future) the benefit-cost ratio for SR1 would be reduced to 1.28, if estimated Bragg Creek costs of \$32.8 million and annual benefits of \$180,000 are both added to SR1.

Project Selection

Based on comparator criteria, and the benefit-cost analysis, AEP reached the conclusion that the Springbank Off-Stream Reservoir (combined with local flood mitigation at Bragg Creek and Redwood Meadows) was the preferred option from cost, environmental, and risk perspectives.

AEP concluded that, compared to MC1, the SR1 would:

- be less expensive;
- be more environmentally friendly;
- potentially be delivered on a shorter timeline;
- present less risk during construction compared to an in-stream dam;
- capture runoff from a larger area of the basin, offering better protection for the City of Calgary; and
- handle sedimentation better.

Alberta Transportation subsequently proceeded to undertake extensive design work, including computer and physical modelling in order to provide sufficient design information, for completion of the environmental impact assessment (EIA).

3.2 Views of the Interveners

Stoney Nakoda Nations

The Stoney Nakoda Nations (SNN) stated that AT should have conducted regional flood mitigation studies to prioritize and assess projects on the Bow River and the Elbow River in the same application process.

The SNN submitted that the Board's public interest test must include the costs and benefits of all proposed flood control projects to protect the City of Calgary from another 2013 equivalent sized flood. In addition, the public interest test must consider communities upstream of Calgary—including riparian rights, upstream rural populations, and Indigenous peoples.

The Stoney Nakoda Nations proposed that "Alberta Transportation should have come before this Board with a comprehensive solution for both the Elbow and the Bow Rivers, providing various alternatives for each of the rivers and letting the NRCB choose the best solution for each river from an overall perspective." The SNN further proposed that such a review should have included the costs and benefits of various projects and considered floods, climate change, drought, fire protection, recreation, and water supply. This review should also include the rights of upstream riparian residents, the ecological values of rural landscapes, and costs and benefits to rural communities.

SR1 Concerned Landowners Group

The SR1 Concerned Landowners Group (SCLG) objected to Project selection on the basis that:

- Alberta Transportation effectively muted opposition to SR1;
- The project selection process was rushed and inadequate; and
- MC1 should have been selected over SR1.

SCLG Concerns that Alberta Transportation Effectively Muted Opposition to the Project

The SCLG asserted that Rocky View County and Tsuut'ina First Nation would have continued to oppose the Project and would have participated in the hearing if not for AT's financial deals with those parties.

The SCLG also questioned whether Alberta Transportation had entered into a financial agreement with the Kainai and Ermineskin First Nations, and if so, whether AT would disclose those arrangements.

Without these financial arrangements between the GoA and a number of interveners, the SCLG felt that substantially more opposition to the Project would have existed, and that more parties opposed to the Project would have participated in the hearing.

SCLG Concerns with Project Selection Process

The SCLG raised concerns about the selection process used by Alberta Environment and Parks that resulted in the choice of SR1 over MC1, including concerns about the lack of consultation with those potentially affected by the decision. The SCLG acknowledged that AEP met with affected landowners in July of 2014. However, in their view, SR1 had already been selected as the preferred project at that point, even though AEP indicated the MC1 and Glenmore Reservoir Tunnel projects were still being studied as potential alternatives while SR1 was being advanced to the design phase.

By way of example, the SCLG pointed to the timing of the announcement by the GoA in September 2014 of SR1 as one of two approved flood mitigation projects. The announcement occurred well before the completion of a report completed in February 2015 comparing alternatives and the issuance of an AEP report in October of 2015 selecting SR1.

The SCLG emphasized that the GoA should have consulted with the public residing in Springbank and the Elbow River valley, and in particular, landowners affected by SR1, during the selection process and prior to choosing between SR1 and MC1. In their view, local residents would have provided additional information regarding the project selection process, including benefits of MC1 over SR1.

The SCLG also expressed concerns that Alberta Environment and Parks used subjective criteria to support the selection process. The SR1 Concerned Landowners Group stated that AEP should have conducted further and more detailed study on the relative efficacy of other options, specifically MC1, for flood mitigation on the Elbow River prior to selecting SR1.

SCLG Position that MC1 Should Have Been Selected Over SR1

The SCLG outlined a number of factors that should have made MC1 the preferred project:

- It would provide flood mitigation benefits for all Elbow River communities, not just City of Calgary communities downstream of Glenmore Reservoir. Flood mitigation benefits of MC1 include reduced peak flows at Bragg Creek and Redwood Meadows, as well as downstream of the SR1 location to Glenmore Reservoir.
- MC1 could capture larger peak flows and larger volumes of water than SR1. The SCLG stated that the MC1 reservoir intake would be higher than the SR1 diversion rate.
- MC1 would be completely situated on Crown land. Private property would not need to be purchased or expropriated.
- MC1 would have potential for secondary uses including recreation, water supply for firefighting, and drought protection.
- An in-stream dam at MC1 would have greater operational flexibility for mitigating a flood than SR1 with its fixed maximum diversion rate.
- SR1 costs are higher than stated in the EIA, especially if the costs of Bragg Creek and Redwood Meadow berms and the payouts to Rocky View County and Tsuut'ina First Nation were included. The SCLG believes that these higher costs incurred by SR1 mean that MC1 would be a lower cost option than SR1.
- The 2019 comparison shows MC1 to have a better benefit-cost ratio than SR1. Furthermore, the SCLG believes that when the additional costs of berms and payouts are added, the benefit-cost ratio for MC1 further improves over SR1.
- SR1 involves an experimental/radical innovation approach to diversion and water storage relative to a more common conventional in-stream dam design. There are a number of in-stream dams in the Alberta foothills similar to the MC1 design, but no comparable projects to SR1 in Alberta. The SCLG expressed concern that SR1 might not work as planned.

Calalta Amusements Ltd. and Calalta Waterworks Ltd.

While not opposed to flood mitigation on the Elbow River, Calalta Amusements Ltd. and Calalta Waterworks Ltd. (Calalta) indicated that many dams around the world have a permanent water body in the reservoir that benefit recreation and tourism whereas SR1 is a dry reservoir system.

City of Calgary

The City of Calgary (the City) supports the SR1 project. The City maintained that significant damage avoidance from future floods would be achieved with SR1. While interveners had indicated that water supply should have also been an objective of SR1, the City maintained that the Bow River is superior to the Elbow River for water supply since the Bow watershed is larger and much of the watershed is located at higher elevation with associated permanent snow pack and glaciers. The City also explained that water storage on the Elbow River is now optimized with the completion of the Glenmore Reservoir gate improvement project which provides improved water supply security. The City emphasized that the SR1 catchment area is 28 per

cent larger than the MC1 catchment area and that SR1 provides the protection required for property and public safety in the City of Calgary.

Calgary River Communities Action Group/Flood Free Calgary

The Calgary River Communities Action Group/Flood Free Calgary (CRCAG/FFC) supported the construction and operation of SR1. CRCAG/FFC agreed with the criteria used by Alberta Transportation for assessing alternatives and supported AT's conclusion that the MC1 option has a significant number of adverse effects compared to SR1. CRCAG/FFC felt that AT's analysis of alternatives and selection of SR1 was appropriate. In particular, CRCAG/FFC agreed that SR1:

- is less sensitive to impacts from sediment and debris, because it is an off-stream dam;
- is closer to operational response teams and access roads;
- has less environmental impact;
- keeps the Elbow River in a more natural state;
- is less vulnerable to damage during extreme weather; and
- has less impact on social, recreational, tourism, and commercial values.

In addition, CRCAG/FFC pointed out that, at this time, SR1 is years closer to completion compared to MC1.

3.3 Views of Alberta Transportation

Alberta Transportation agreed with the Board's pre-hearing decision that outlined direction to parties regarding submissions and examination of alternatives at the hearing (see 3.4 Views of the Board). Alberta Transportation reiterated that SR1 is the only project being advanced and the only project under review, therefore:

Alberta Transportation did not engage in any debate during the hearing in response to the comments and conjecture about MC1, for which there is no fulsome record of review before this Board, which review would include hearing from parties who might be opposed to constructing an in-stream dam on the Elbow River in a popular recreation area in Kananaskis County [sic].²

Alberta Transportation summarized the Project's 2015 selection process during the hearing:

in the selection process, even though it was identified there was potential challenges with construction, maybe the geology tied to MC1, there was never a point where it was said that MC1 was not a feasible project. It just wasn't the selected project. SR1 had a number of advantages that made it the front runner out of those two.³

Alberta Transportation reminded interveners and the Board of its strongly held view that SR1 is the right project for Elbow River flood mitigation for the following reasons:

² AT SUB to NRCB hearing – Final Argument, Exhibit 409, par 10b

³ Transcript – Exhibit 357, page 309 (line 21) to page 310 (line 2)

- It is an off-stream dam and less sensitive than an in-stream dam to impacts from sediment or debris.
- It will capture more flood water due to its location further downstream.
- It is closer to operation response teams and access roads.
- It has less environmental impact.
- It leaves the Elbow River in a more natural state.
- It is less vulnerable to damage during extreme weather, including catastrophic failure during construction.
- It has less impact on social/recreational values.
- It has less impact on commercial/tourism values.
- It has a positive economic impact.
- It is years closer to being built than any alternative project.

In response to concerns that SR1 does not provide flood protection to Bragg Creek and Redwood Meadows, AT stated that both communities are currently undergoing flood mitigation projects, largely with the installation of berms. Alberta Transportation views the cost of berms at Bragg Creek and Redwood Meadows as separate from SR1 (and under the authority of other levels of government), so has not included the costs of these berms in the SR1 project.

In response to intervener evidence in support of MC1, Alberta Transportation offered the following response:

- The permanent pond associated with MC1 has a primary purpose of sediment and debris management, not recreation.
- The conceptual analysis of MC1 focused on flood mitigation and not on other ancillary objectives; similar to the approach taken with SR1.
- Any argument that MC1 could provide other benefits (recreation, drought management, and a water source for firefighting) is incorrect because the conceptual design of MC1 did not include those potential benefits.
- SR1 costs are based on a more advanced design phase necessary for the EIA, as opposed to MC1 costs which are based on a conceptual design. Because the designs for the two projects are at different stages, it is not appropriate to directly compare the costs between MC1 and SR1.

3.4 Views of the Board

In its December 10, 2020 pre-hearing conference report, the Board stated:

The Board acknowledges that various parties are advocates for Elbow River basin flood control alternatives to SR1. In particular, McLean Creek has received significant attention by stakeholders and the applicant. The Board's mandate is limited to determining whether the reviewable project, in this case SR1, is in the public interest. While a general understanding of the relative merits associated with project alternatives may contribute some contextual relevance to a determination of the public interest

decision on SR1, the NRCB focus must be on the social, economic, and environmental effects associated with the reviewable project. The Board will entertain submissions on how the proponent's consideration of alternatives is relevant to a public interest determination of SR1. However, the Board does not find merit in the expenditure of significant time and resources assessing projects that are not a reviewable project under the NRCBA.⁴

The Board acknowledges the importance that the SNN and the SCLG placed on the Project selection process and eventual selection of SR1. Given the time limits instituted by the Board and agreed to by parties, the Board gave deference to parties to decide how they wanted to use their allocated time. In some cases, parties chose to spend considerable time providing direct evidence and cross examination on the topic of alternatives.

The Stoney Nakoda Nations focused much of its attention on Project alternatives, stating that a broader analysis and strategy for flood mitigation on the Bow and Elbow rivers should have been in front of the Board. It is not the mandate or jurisdiction of the NRCBA to have the Board conduct a forum for policy discussion and outcomes or project selection by the GoA. The Project squarely falls under the NRCBA as a reviewable project on its own merit, and the Board does not have the mandate or jurisdiction to broaden its review beyond determining whether SR1 is in the public interest.

The Board notes that the SR1 Concerned Landowners Group and Alberta Transportation agreed on a number of benefits of the MC1 option. It is undisputed that MC1 would protect communities along the Elbow River upstream of the SR1 location. It is also undisputed that MC1 could capture larger peak flows compared to SR1, and that MC1 would be completely located on Crown land. The Board also acknowledges that MC1 was never contemplated as a water storage project for drought, fire-fighting, or recreation purposes. The Board further notes that while more recent analysis indicated benefit-cost ratios for SR1 have decreased, closer to or slightly less than that of MC1, BCA ratios were similar for both projects. The Board notes that this still indicates that the benefits of both projects would outweigh the costs. The Board agrees with Alberta Transportation that the more recent BCA comparisons for MC1 are based on conceptual design while SR1 estimates are based on cost estimates of a project much more advanced in the design phase.

The Board finds that the selection process and the criteria used to select between alternatives was sound and reasonable.

3.4.1 Alberta Transportation's Review of MC1 as an Alternative

The Board heard from some interveners that the MC1 option received little detailed study and was dismissed on largely qualitative opinion. The Board respectfully disagrees. In the Board's experience, this application has dealt with alternatives in a much more robust manner than is typically the case with projects submitted under the NRCBA.

⁴ NRCB Pre-Hearing Conference Decision Report NRCB Application No. 1701 Alberta Transportation Springbank Off-Stream Reservoir Project in Springbank, Alberta, p. 4

The MC1 alternative has received significant attention and assessment since the terms of reference were finalized, and indeed during the hearing. The Board notes that AT commissioned an Environmental Impact Screening Report that described the potential environmental impacts of MC1. The Board understands that this report was used by Alberta Transportation to support the alternatives assessment required in the final terms of reference. Alberta Transportation assessed three development scenarios (Baseline, Application, and Planned Development) for MC1 using environmental impact assessment screening methodology, including conducting a review of available literature and field studies. The Board notes that a total of 23 valued components were assessed for the physical, biophysical, and human environments in this process. The Board further notes the extensiveness of the five volume Environmental Impact Screening Report, including 12 sections, an executive summary, and appendices.

The Board accepts that the 23 valued components assessed for MC1 by Alberta Transportation broadly covered the same valued components assessed in the EIA for SR1. In the Board's view, Alberta Transportation conducted extensive work in assessing the MC1 alternative.

The Board finds that AT conducted an adequate assessment of project alternatives, specifically MC1, for the purposes of project selection. The Board acknowledges that while Alberta Transportation has stated that the MC1 project is feasible, it also stated that SR1 was selected as the preferred project based on the multi-faceted selection criteria.

3.4.2 Other Observations

In each NRCBA application before the NRCB, the Board assesses the proponent's project selection and has regard for alternative means of carrying out the project. However, in most cases, the application is submitted by a private company and does not require acquisition of, or has already secured, private land. In these cases, the Board considers alternatives, but typically the alternatives are focused on methods of accomplishing the project within the same relative footprint as opposed to different projects at different locations.

In this case, the Board recognizes the impact of this Project on people who reside closest to the project development area, and in particular, landowners who must sell their property. The Board acknowledges that impacted landowners felt the decision to build SR1 was made too quickly and without proper public consultation.

The Board recognizes that following the 2013 flood, the GoA was under extreme pressure to act, and to act quickly. In doing so, Alberta Environment and Parks proceeded to evaluate alternative flood mitigation options on the Elbow River. Once the alternatives were narrowed to three options (SR1, MC1, and Glenmore Reservoir Tunnel), with SR1 the front runner, AEP met with affected landowners. The Board appreciates that while SR1 was then selected to move forward to preliminary design phase, landowners were told that MC1 and the Glenmore Reservoir Tunnel projects would continue to be evaluated.

It is apparent to the Board that landowners were surprised that SR1 was quickly chosen as the most likely flood mitigation candidate. It is also apparent that in mid-2014 to early 2015,

landowners may have felt not only that MC1 was a feasible option, but that it was also an option the GoA might select.

The Board recognizes the challenge that the GoA faced in moving forward in selecting a project and at the same time consulting with the public and Indigenous communities. The Board believes that it is unreasonable to assume that proponents can move two or more alternatives through the EIA process in order to have better information to assist in project selection. The costs and the time required to do so is not justified. The Board acknowledges that AEP (and afterwards AT) developed a screening process and employed experts so that it could make the best decision possible with the best information available at the time.

The Board does note that despite the challenges faced by the GoA, more could have been done to ensure the public fully understood the project selection process. At an early stage it would have been beneficial to clearly identify:

- what the project selection process entailed, including who was involved, and with whom the final decision rested;
- whether public input on project selection was being sought, and if so, the details regarding how the public input would be gathered and acted upon; and
- the final decision document indicating which project was selected, including who authorized the decision.

While the Board recognizes the decision to proceed with SR1 would not likely have changed with these additions, what might have changed is the public awareness and understanding of how the decision was reached and who ultimately made that decision.

SECTION 4 CONSIDERATION OF ABORIGINAL AND TREATY RIGHTS

4.1 Introduction

The application for approval to construct the Springbank Off-Stream Reservoir (the Project) is for a Government of Alberta (GoA) project. In this case the Project proponent, Alberta Transportation (AT), is also a representative of the Crown. As such, Alberta Transportation has several roles including advocating for the Project, leading consultation with Indigenous peoples, and in part, fulfilling the Crown's duty to consult.

As a statutory decision maker under the *Natural Resources Conservation Board Act* (NRCBA), and given the location of Aboriginal and treaty interests in the Project area, the Board must consider potential impacts of the Project on these rights, including hunting, trapping, gathering and fishing, and traditional land uses. The effect on treaty and Aboriginal rights is a key part of the public interest determination by the Board pursuant to the NRCBA. Also, as a quasi-judicial tribunal, the Board must perform its duties and exercise its powers in accordance with s.35 of the *Constitution Act, 1982*. Thus, the Board's mandate in this case includes considering whether Alberta Transportation's consultation regarding the Project has been adequate and whether mitigation and accommodation of treaty rights and impacts is required. The Board notes the Alberta Aboriginal Consultation Office's (ACO's) advice to the Board that the GoA (the Crown in right of Alberta) "may" rely on the NRCB process to satisfy "any duty that may be owed by the Crown on potential Project adverse impacts on Section 35 rights ..." and that "consultation on the project is ongoing." Given this direction by the ACO, the Board finds that its mandate on consultation and accommodation is narrowed to reviewing Alberta Transportation's consultation activities up to and including April 7, 2021 (the last day of the NRCB's public interest hearing).

4.2 The Crown Duty to Consult and Accommodate

Pursuant to s. 35(1) of the *Constitution Act, 1982*, the existing Aboriginal and treaty rights of Aboriginal peoples are recognized and affirmed. The duty to consult and accommodate flows from this constitutional provision and from the honour of the Crown. In relation to decisions that may infringe on Aboriginal and treaty rights, the duty to consult and accommodate has evolved through the common law, as various cases involving Aboriginal and treaty rights have received adjudication. Most recently, the Supreme Court of Canada reviewed the principles of consultation and accommodation in the context of tribunal adjudication by the former National Energy Board, in the cases of *Chippewas of the Thames First Nation v. Enbridge Pipelines Inc.* 2017 SCC 41 and *Clyde River (Hamlet) v. Petroleum Geo-Services Inc.* 2017 SCC 40. In both cases, the Supreme Court of Canada acknowledged that the Crown may rely upon a tribunal's regulatory assessment process to partially or completely fulfill the Crown's duty to consult and accommodate. The Supreme Court of Canada has also noted in these cases that the duty to consult "gives rise to a specific public interest that supersedes other concerns typically considered by tribunals tasked with assessing the public interest" (*Clyde River* at para. 40).

In this case, the Government of Alberta has advised that it “may” rely in part on the NRCB review process and decision to satisfy any duty to consult that the GoA may owe as the Crown.

Further, section 9 of the NRCBA requires that the Lieutenant Governor in Council (LGIC) authorize any approval before the Board can grant it. Between the NRCB’s public interest determination and the LGIC authorization, the LGIC may prescribe additional terms and conditions that it requires to satisfy Indigenous consultation and accommodation.

The Board notes, that in the evolution of the jurisprudence, the Supreme Court of Canada acknowledged that the following principles are associated with the duty to consult and accommodate in the regulatory context:

- The duty to consult and accommodate is meant to address adverse impacts flowing from the specific Crown proposal at issue; the subject of consultation is the impact on the claimed rights of the current decision under consideration.
- The duty to consult and accommodate involves procedural and substantive elements. Procedurally, if infringement of constitutional rights is to occur, Indigenous people must have the opportunity to have their views heard and considered (i.e., a meaningful consultation process that is carried out in good faith, including notice to ensure participation and an adequate opportunity to participate in the decision-making process). Substantively, Indigenous peoples must also have their rights accommodated through mitigation of impacts, minimal impairment, consideration of compensation or other negotiated solutions, mitigation of risks to rights through imposition of conditions, and written reasons showing the Indigenous concerns and the impact the concerns had on the decision.
- A decision by a regulatory tribunal would trigger the Crown’s duty to consult when the Crown has knowledge, real or constructive, of a potential or recognized Aboriginal or treaty right that may be adversely affected by the tribunal’s decision.
- The Crown may rely upon a regulatory tribunal to fulfil its duty to consult and accommodate, so long as the tribunal possesses the statutory powers to do what the duty to consult and accommodate requires in the particular circumstances.

It should be noted that the Project lands are within the boundaries of Treaty 7 territory. Pursuant to Treaty 7, adhered to on September 22, 1877, the Blackfoot, Blood, Peigan, Sarcee, Stoney, and other First Nations inhabiting Treaty 7 territory were promised that “they shall have the right to pursue their vocation of hunting through the Tract surrendered ... subject to regulations as may, from time to time, be made by the Government ... and excepting such Tracts as may be required or taken up from time to time....”

Hunting rights under Treaty 7 have also been modified by paragraph 12 of the Alberta Natural Resources Transfer Agreement (NRTA), entered into in 1930 by the Province of Alberta and the federal government. Paragraph 12 of the NRTA expands the geographical areas in which “the Indians of the Province” may hunt, trap, and fish in Alberta to “... all unoccupied Crown lands and on any other lands to which the said Indians may have a right of access,” recognizing some regulation (though no seasonal restrictions), but extinguishing the commercial right to hunt, trap,

or fish. It follows that in considering the Project impact on these treaty rights, the Board must review and weigh all of the evidence provided by the affected First Nations parties, including AT's consultation and accommodation initiatives, and any evidence and submissions provided during the Board's hearing process, to determine whether the Project is in the public interest.

The Board notes that much of the Project development area (PDA) consists of privately held land. In this somewhat unique case, the Project will convert private land to Crown land, thus adding to the amount of public land available to Indigenous groups to exercise their constitutional treaty and Aboriginal rights. It is unnecessary for the Board to rule whether some or all of the PDA becomes "unoccupied" Crown land, since the Government of Alberta through Alberta Transportation has already modified its Draft Land Use Plan for the PDA to prioritize use by Indigenous peoples to exercise constitutional treaty and Aboriginal rights and non-treaty activities.

4.2.1 Consultation with Indigenous Peoples

Initially, Alberta Transportation focused its consultation with all Treaty 7 First Nations (all of whom hold reserves in and beyond the surrounding area and are listed below), to explore how the Project could affect First Nations' rights, including treaty rights involving hunting, trapping, fishing, and other traditional uses.

Alberta Transportation's *Indigenous Engagement Program* for SR1 sought to follow federal and provincial guidelines, in addition to taking direction from Alberta's Aboriginal Consultation Office and the Impact Assessment Agency of Canada (IAAC). In 2014, AT began engaging with five Treaty 7 First Nations:

- Stoney Nakoda First Nations (consisting of three First Nations of Bears paw, Chiniki, and Wesley);
- Blood Tribe/Kainai First Nation (Blackfoot);
- Piikani Nation (Peigan/Blackfoot);
- Siksika Nation (Blackfoot); and
- Tsuut'ina Nation (Sarcee/Dene).

In June 2016, AT began engagement activities with an additional eight Indigenous groups including:

- Ermineskin Cree Nation (Treaty 6);
- Montana First Nation (Treaty 6);
- Samson Cree Nation (Treaty 6);
- Louis Bull Tribe (Treaty 6);
- Foothills Ojibway First Nation;
- Ktunaxa Nation;
- Métis Nation of Alberta-Region 3; and
- Métis Nation British Columbia-Region 4.

The majority of the Indigenous groups withdrew their objections to the Project or IAAC determined that further consultation was not required. The only directly affected groups who participated in the hearing were the Stoney Nakoda Nations, who made a submission and

participated fully at the hearing, and the Louis Bull Tribe, who made a written submission.

4.3 The Board's Review Process

The Springbank Off-Stream Reservoir Project was envisioned not long after the flood of 2013. By February 5, 2015 Alberta Transportation was advised it was required to prepare an environmental impact assessment (EIA) in accordance with the *Environmental Protection and Enhancement Act*.

Preparation of the EIA, public consultation, and Indigenous consultation occurred simultaneously. In this case, preparation of the EIA began in 2015, and was first filed in November 2017 then refiled, to meet requirements of the Canadian Environmental Assessment Agency (now the Impact Assessment Agency of Canada) in March of 2018. Several rounds of supplemental information requests took place that included questions based on filings from Indigenous groups and questions to AT regarding status of consultations with Indigenous groups. The EIA was deemed complete by Alberta Environment and Parks in February 2021. Evidence filed by AT and Indigenous groups suggests that consultations took place between 2014 and the hearing in March 2021.

The NRCB needs to ensure that it can make a binding decision whether the Project is in the public interest. In February 2021, the Board requested the Aboriginal Consultation Office identify any procedural considerations that the NRCB could incorporate that would further complement the consultation process being conducted by the Government of Alberta. The ACO indicated that it may rely on the NRCB's review process, including the public hearing, in making its own determination regarding the adequacy of Crown consultation. However, the ACO did not advise the Board as to the stage of consultation between Alberta Transportation and Indigenous groups.

As detailed in Section 4.4.1, AT began engaging five Treaty 7 First Nations in 2014. An additional eight First Nations and Métis groups were engaged in 2016. Alberta Transportation advised that consultation and accommodation with Indigenous peoples will continue through the Project's completion and operations.

Alberta Transportation devoted substantial effort and resources to engaging with Indigenous peoples between 2014 and late 2020. During the fall of 2020, the Board reviewed filings regarding consultation which included: thousands of consultation log entries detailing meetings, site visits, funding for traditional land use assessments (TLUA), and correspondence.

On October 5, 2020 the NRCB issued a notice of pre-hearing conference to be held on December 2, 2020. The Board notes that its notice was widely distributed through local and regional newspapers including the *Alberta Native News*. Notices of both the pre-hearing and hearing were also emailed directly to interested parties, including all Indigenous groups identified in the consultation records.

Between the Board's October notice and its December 2, 2020 pre-hearing conference, there were no submissions, objections, or response correspondences received or provided to the NRCB by any of the Indigenous groups, regarding the adequacy of consultation, mitigation, or accommodation measures, or about impacts of the Project on treaty rights or Aboriginal rights

under s. 35 of the Constitution, or on traditional land uses. The Ermineskin and Blood/Kainai First Nations participated in the pre-hearing conference, requesting directly affected standing and advance funding, both of which the Board granted in its December 10, 2020 pre-hearing decision report. The Board notes that in March of 2021, the Ermineskin and Blood/Kainai First Nations withdrew their objections to the Project and subsequently did not participate in the hearing.

On December 21, 2020, when the Board issued its Notice of Hearing, the Board was satisfied that consultation had sufficiently advanced to accommodate participation by Indigenous groups for a hearing to be set for March 2021.

On January 20, 2021, the Stoney Nakoda Nations (SNN) applied for directly affected standing, advance funding, and an adjournment of the hearing. The Board responded and convened a virtual hearing on February 4, 2021 to hear evidence and submissions on the SNN's application. In a written decision issued on February 9, 2021, the Board agreed that the Bearspaw, Chiniki, and Wesley First Nations as well as Woste Igic Nabi Ltd. (collectively the Stoney Nakoda Nations) were directly affected parties and approved an advance of intervener funding. The Board declined the request for adjournment.

Leading up to the hearing that began on March 22, 2021, parties (including not directly affected parties) had the opportunity to make written submissions to the Board. The SNN and the Louis Bull Tribe both made written submissions. The Stoney Nakoda Nations participated fully in the oral hearing.

The Board is satisfied that the NRCB review process, including notices of application, pre-hearing conference, and hearing, combined with Alberta Transportation's consultation efforts beginning in 2014, provided all affected Indigenous parties with Project information and background, as well as ample time and opportunity, to engage and have their views heard if they so wished. The NRCB process, and in particular the hearing, provided a forum—at arms' length from the GoA—in which the Crown and Indigenous peoples could engage in meaningful dialogue.

4.4 Views of Alberta Transportation

Alberta Transportation noted that they strove to respect each Indigenous group's specific consultation protocols and submitted that they are in compliance with the requirements for meaningful consultation and accommodation contemplated by the Supreme Court of Canada in the *Clyde River* decision. As part of the consultation process, AT confirmed that it provided project notification letters, information packages, and notifications related to the EIA process to all identified Indigenous groups (including Métis Nations). AT also conducted specific and extensive consultation meetings, including traditional land use (TLU) site visits. Information from the meetings, correspondence, and TLU site visits with each First Nation were documented in consultation logs, filed as part of the EIA process, and are publicly available.

Alberta Transportation described its consultation process in general as obtaining a traditional land use study from each Indigenous group, responding to each group with meaningful replies to comments and concerns, and identifying potential mitigation to avoid or reduce Project effects. The consultation logs were kept to track the type and timing of all engagements with

Indigenous peoples including meetings, site visits, identification of concerns, response to those concerns, and all correspondence. Alberta Transportation also generated Specific Concern Response Tables (SCRTs) for the five Treaty 7 First Nations. The SCRTs are thematically organized records of concerns expressed by the First Nations, and the responses and mitigation measures provided by Alberta Transportation.

Alberta Transportation submitted that its consultation with Indigenous peoples from mid-2014 and continuing through to the NRCB hearing has been meaningful and successful. AT stated that once it informs the ACO that it is closing consultation, the ACO will conduct a consultation adequacy assessment to confirm whether consultation was adequate, including recommendations it may make to Alberta Environment and Parks with respect to approvals under the *Water Act* and the *Public Lands Act*.

Examples of mitigation proposed by Alberta Transportation to address Indigenous concerns included: improved fish passage measures, a fish rescue program, improved wildlife passage, and addition of the debris deflector at the diversion inlet. AT indicated that the most notable change to the Project as a result of First Nations concerns was the development of an Updated Land Use Guiding Principles and Direction for Future Land Use (Land Use Plan) document. The Project is predominantly situated on private land that has been used for agriculture since the late 1800s. AT submitted that the Project would create a somewhat unique circumstance where long-held private land would be converted to Crown land and become available for use by Indigenous peoples and the public. It is the intent of AT and AEP to ensure that the final Land Use Plan is developed with meaningful consideration of input from Indigenous peoples and the public. This input will, in part, be gathered from the First Nations Land Use Advisory Committee proposed by AT.

Alberta Transportation indicated that its commitment to meaningful consultation, in part, is reflected by the fact that only one Indigenous group (the SNN) chose to intervene in the oral part of the NRCB hearing process.

4.4.1 Alberta Transportation Consultation with the Stoney Nakoda Nations

From Alberta Transportation's perspective, there was a significant amount of resources and commitment on behalf of AT staff and its consultation team, to engage and consult with the Stoney Nakoda Nations. AT submitted that they have maintained consistent and ongoing consultation with the SNN since August 2014 and have replied meaningfully to their questions and requests throughout this process.

Alberta Transportation stated that during October and November of 2016 they conducted 11 field visits with SNN representatives and in June of 2018 offered SNN opportunity for additional site visits.

AT stated that concerns raised by the Stoney Nakoda Nations at the hearing regarding site visits conducted in fall 2016 came as a surprise and are not documented in the Record of Consultation logs. The SNN expressed concerns that they did not have the freedom to visit locations during the site visit, and that Elders participating in the field visit felt disrespected. AT noted that, to some extent, the circumstances surrounding the site visit were unique due to the

requirement of access agreements from private landowners. There were locations that were not available for access and therefore restricted.

Alberta Transportation felt it was unfortunate that the SNN did not bring their concerns about the fall 2016 site visit to the attention of AT sooner. Had they done so, AT stated that they would have attempted to immediately address the concerns. Alberta Transportation indicated that should additional site visits be required, AT will endeavour to ensure they are conducted in a manner that is respectful of SNN protocols.

Should the Project proceed, AT stated that they will continue to work with Indigenous groups, including the SNN, to ensure that concerns are addressed. Alberta Transportation noted that they have committed to continuing to provide the opportunity for Indigenous input on mitigation plans for the project, including the wildlife mitigation and monitoring plan, groundwater monitoring plan, surface water monitoring plan, vegetation and wetlands mitigation monitoring and revegetation plan, the fish rescue and fish health monitoring and mitigation programs, as well as the air quality and management program.

During the hearing, AT committed to provide funding to SNN for completion of a traditional land use assessment, and to incorporate the findings of the final TLUA into the Project. AT indicated that mitigation and accommodation would also be made based on the findings of the final TLUA and further consultations. Alberta Transportation also agreed to take SNN's request under consideration for funding to support its consultation on SR1.

4.4.2 Assessing Project Impacts on Stoney Nakoda Nations' Treaty Rights and Traditional Land Use

Alberta Transportation noted that the consideration of effects on treaty rights and traditional uses are in alignment with the Government of Alberta's guidelines and policy on consultation with First Nations. In addition, AT adopted a conservative approach in undertaking this assessment and assumed that traditional use could occur in the area even if specific information was not provided. AT stated that treaty rights and traditional uses in the project development area were reasonably assessed and reflected in the EIA.

AT noted that the EIA assessed relevant valued components and considered how traditional use and cultural features will interact with each valued component. AT incorporated traditional use and cultural features information provided by Indigenous groups; in some cases, this information was provided after the EIA was published but the effects were considered through the supplementary information request process.

The interim TLUA of the Stoney Nakoda Nations dated February 2021 was received by AT (and the NRCB) on March 4, 2021. Given this timing, consultation with the SNN on the report had not occurred, and Alberta Transportation had not prepared a detailed response as it had done for completed TLUAs received from other First Nations.

However, based on review of the interim traditional land use assessment, AT concluded that the information provided by the Stoney Nakoda Nations as part of the TLUA confirms earlier

assumptions about the nature and extent of SNN's traditional use in the project development area. AT stated that no new pathways or potential effects to SNN treaty rights or traditional uses were identified that had not already been considered in the EIA.

Alberta Transportation anticipated that many of the SNN concerns will be largely addressed through the eventual Land Use Plan and the First Nations Land Use Advisory Committee. AT indicated that the (Draft Land Use Plan) and the role of the land use advisory committee were modified in response to feedback received from Indigenous groups. AT noted that the conversion of private land to Crown land enhances opportunities for First Nations to exercise treaty rights and traditional uses. Alberta Transportation committed to maintaining access to identified current use sites during construction and operations. However, AT noted that the Stoney Nakoda Nations may be restricted in terms of which rights and traditional uses they could practice and at what times they could practice those rights and uses, as the foremost concern is safety.

With respect to the SNN's request for a traditional knowledge monitoring committee, AT suggested that this request be deferred until the Stoney Nakoda Nations submit their final traditional land use assessment. Alberta Transportation also noted that AEP will establish an SR1 Implementation Team and welcomed the SNN to participate in subcommittee work, as appropriate.

Alberta Transportation indicated that within the Project footprint, construction activities will impact traditional and medicinal plants of importance to Indigenous groups. However, AT committed to notifying Indigenous groups regarding Project activities and schedules, and maintaining access to identified Indigenous sites of current for harvesting or relocating medicinal and ceremonial plants, prior to construction. AT committed to conducting field visits with Indigenous Elders to identify priority areas for traditional and medicinal plants to accommodate harvest plans.

4.5 Views of the Stoney Nakoda Nations

4.5.1 Consultation

The Stoney Nakoda Nations indicated that Alberta Transportation had not engaged in meaningful dialogue and consultation with their representatives. Elders reminded the Board that Indigenous peoples evaluate impacts on water and the land in their own way, and are not directed solely by university educated or “book smart” people. Elder Henry Holloway stated that his people understand wildlife and the environment providing this in testimony:

Even the little -- even the little animals that run around on the grass, sometimes we never seen them, but they're there. They're the -- they keep the earthly balance. They clean the earth. The little creatures that run around on the bottom of the grass, on the bottom of the river, or the bottom of the creek, and you go there, you see all these little

insects in there, all kinds of -- they're the ones that keep the earth clean, and we have to respect that, and we have to honour that.⁵

The Stoney Nakoda Nations expressed concern that Project consultation representatives are not fully aware or understand the SNN culture, history, and traditions. The SNN also expressed concern that past Government of Alberta failings with respect to consultation, such as the Bighorn dam project consultations, may be repeated with the SR1 Project. Further concerns were expressed regarding the difficulty in engaging AT in meaningful discussions about Project effects on the SNN and the need to assess flood mitigation requirements on the Bow River prior to proceeding with projects on the Elbow River. Further, the Stoney Nakoda Nations indicated that AT's consultation process was somewhat haphazard, especially under the limitations created by COVID-19.

The most notable concern raised by the Stoney Nakoda Nations in relation to consultation was their assertion of disrespectful treatment of Elders and SNN consultation officers by Alberta Transportation representatives during site visits over 11 days in October and November 2016. The Elders felt rushed and some of the discussion and questions from AT representatives were viewed as intrusive and made some of the Elders uncomfortable. Examples of behaviour the SNN viewed as disrespectful included: SNN representatives were not allowed to travel outside of the project development area, and not all lands that the SNN wanted to inspect were accessible.

During the hearing, the SNN were asked if they raised these concerns with AT's senior management. In response, the Stoney Nakoda Nations stated that normally the SNN would approach government officials with concerns over consultation. However, because AT is both the proponent and representative of the government, the SNN felt there was no pathway to resolution. The SNN also noted that there was no guidance under the current GoA First Nations consultation policy for resolving these types of situations.

The Stoney Nakoda Nations indicated that after the site visits, SNN members were reluctant to continue engagement with AT. As a result, further consultations, site visits, and communication with Alberta Transportation were either discontinued or significantly reduced.

4.5.2 Project Impacts on Aboriginal and Treaty Rights and Traditional Land Use

The major areas of concern of the Stoney Nakoda Nations were wildlife connectivity, wildlife migration, and habitat fragmentation. The SNN stated that a wildlife overpass would improve wildlife movement through the PDA compared to the proposed underpass beneath Highway 22. Other concerns were raised regarding potential Project impacts on traditional uses due to preferences and avoidance behaviour. These impacts are discussed in more detail in the relevant sections later in this report.

The Stoney Nakoda Nations outlined a number of areas where they felt AT had not properly (or fully) assessed Project impacts on SNN's treaty rights, Aboriginal rights, or traditional land use.

⁵ Transcript – Exhibit 368, page 896 (lines 2 to 11)

In summary, the SNN expressed the following concerns regarding Alberta Transportation's assessment approach and methodology:

- SR1 will negatively impact SNN's cultural practices, and use of the proposed Project area, lands, and resources. The SNN noted that where adverse effects to treaty or constitutional rights occur, mitigation or accommodation is required.
- Construction could alter habitat for traditionally used plants. The SNN indicated that it is unclear how potential impacts to culturally significant plants will be mitigated. The SNN requested clarification on the amount of notification they will be given and the amount of time they will have to harvest culturally significant plants within the project area.
- The SNN believed that the future Land Use Plan will result in reduced opportunities for them to exercise their treaty rights, especially as the SNN have existing relationships with the current private landowners.
- The historical work in the EIA should have involved traditional, social, and cultural assessments, and traditional studies of the Bow Valley respecting Stoney sacred places, artifacts, burial sites, prayer sites, and harvesting sites.
- The SNN were not fully involved in the assessment of potential impacts to their section 35 rights, nor in the development of mitigation measures to address any impacts. In addition, the process for determination of significance currently includes gaps. The rationale used to identify a lack of significance does not correlate to the exercise of SNN treaty rights.
- Impacts to the SNN's section 35 rights were not considered in relation to non-biophysical and preference-based impacts. This could result in avoidance behaviours and because these behaviours were not contemplated, mitigation for these impacts were not developed.
- The EIA dismisses the importance of specific sites in the exercise of harvesting rights, as well as the current levels of development which exist within the regional assessment area.
- The EIA did not address the Project impact on traditional land use sites; the increasing limitations placed on the SNN when accessing areas within their traditional territories to exercise their section 35 rights; the destruction of ceremonial, spiritual and harvesting sites; the impact of the Project on traditional trails and corridors of human movement; and the loss of continued and unimpeded access to landscapes continuously used for harvesting, hunting, and fishing.
- While an interim TLUA has been completed, a wildlife and fish assessment and oral histories and Elder consultation on the Project require more work.

The SNN requested, among other things, that Alberta Transportation:

- provide funding to the SNN to support its consultation activities;
- provide SNN cultural awareness training prior to construction and any further field work, to employees and contractors
- offer reasonable capacity to the SNN to conduct site visits and undertake ceremonies at these archaeological and historical sites
- meet with the SNN after review of the TLUA to discuss outstanding issues, mitigation, and accommodation measures where required;
- revise the EIA to ensure that SNN traditional use, traditional knowledge, and valued components are incorporated as part of the assessment, and requested that AT explain how these were incorporated;
- contract an independent Indigenous Monitor as part of field work activities for the SNN traditional land use assessment;
- provide reasonable capacity for the development and operation of a SNN Traditional Knowledge Monitoring Committee; this committee should be engaged in a variety of activities during all phases of the Project;
- provide reasonable capacity for engagement with the SNN in the development of a regulation for the repatriation of sacred ceremonial objects under the *First Nations Sacred and Ceremonial Objects Repatriation Act* (Alberta);
- provide continued and unimpeded access to the Project area for hunting, fishing, plant collecting and harvesting, travel, ceremony, camping, and traditional land use;
- assess impacts to SNN section 35 rights by calculating lands impacted (through legal mechanism, safety restrictions or preference-based avoidance behaviours) by the Project and the application of an appropriate condition of approval to offset the loss of land;
- mandate that the SNN is included in meetings with Alberta Environment and Parks for the management of the Project; and
- provide clarity regarding the specific consultation details on the mitigation measures required by Alberta Culture, Multiculturalism and Status of Women for Historic Resources that will be impacted by the proposed Project.

4.6 The Board's View on Adequacy of Alberta Transportation's Consultation, Accommodation, and Assessment of Project Impacts on Indigenous Rights

As stated earlier, the Board acknowledges that it is the Crown that makes a final determination regarding the adequacy of consultation. However, in order to conclude whether the Project is in the public interest, the Board recognizes that it must determine whether consultation between the proponent and Indigenous peoples has adequately identified potential Project impacts on established or asserted Aboriginal and Treaty rights and, if so, whether those impacts have been properly accommodated.

Because the Board's public hearing is not the last procedural step within the NRCBA's approval provision, it follows that the Board may only determine the adequacy of Alberta Transportation's consultation and accommodation, to the extent that the consultation record and its results are provided in the evidence before the Board, and to the point in time of closure of the NRCB hearing record.

The Board acknowledges that it is established that Treaty 7 First Nations hold treaty rights in the PDA. These rights may be impacted by the Project. The Board notes that Indigenous groups will be entitled to exercise their treaty and Aboriginal rights on newly created public lands once the PDA is fully converted to Crown lands. It is also established that other Indigenous groups have constitutional rights to hunt, trap, gather, and fish in the PDA. In the context of the Treaty 7 and unoccupied Crown land, the Project's footprint is relatively small. As described in other sections of this decision, the Project is expected to have a low to negligible impact on wildlife and vegetation in the area. The Board therefore infers that the Project's impact on hunting, fishing, gathering or trapping rights is similarly low to negligible. Also, the Board finds that access to newly-created public land of the PDA, as outlined in the updated Draft Land Use Plan, will likely increase opportunity for First Nations and other Indigenous communities to exercise their Aboriginal and treaty rights and traditional practices.

The Board has not been privy to all of Alberta Transportation's consultation interactions with Indigenous groups. The Board understands that AT provided consultation records to the ACO and all participating Indigenous parties. The Board is not aware of concerns raised by any Indigenous groups regarding the consultation record. Indigenous groups identified as directly affected by the Project (with the exception of the SNN) raised no concerns with the Board regarding AT's consultation, accommodations, or commitments made through the EIA.

The Board commends Alberta Transportation on their rigorous consultation plan and commitment to engagement with Indigenous peoples. Twelve of thirteen Indigenous groups have provided letters of non-objection; continue to consult and seek accommodation with AT outside of the NRCB review process; or decided after consultation with AT that the Project does not significantly impact their rights. In order for Alberta Transportation to reach this level of collaboration with Indigenous groups, the Board notes that AT undertook many meetings, workshops, site visits, funding for traditional land use studies, and correspondence—all documented in the thousands of entries in the consultation logs.

Where significant concerns were raised about Project impacts, AT proposed various mitigation or accommodation strategies. One strategy focused on the Updated Draft Land Use Plan. The final Land Use Plan for the PDA will come to fruition with participation from Indigenous peoples, and the proposed First Nations Land Use Advisory Committee will assist in that participation. The document recognizes that existing private land will be converted to Crown land that will be accessible to Indigenous people and the public. Other mitigation or accommodation strategies include improved fish passage measures, a fish rescue program, improved wildlife passage (e.g. enhancements to the underpass; wildlife-friendly fencing), and addition of the debris deflector.

The Board acknowledges the historical and current importance of medicinal and traditional plants to Indigenous peoples. As such, the Board requires as a condition of approval that Alberta Transportation provide Indigenous groups 30 days advance notice of commencing construction to allow them to harvest and transplant traditional and medicinal plants and to conduct ceremonies within the project development area and provide access (while ensuring public safety) to Indigenous groups to conduct pre and post-construction site visits to observe proposed mitigation measures and provide feedback to the Operator based on their observations.

Consultation and accommodation relating to potential Project impacts on the SNN are discussed below. Based on its review of the evidence before it, and for the purposes of its public interest determination on this Project, the Board is of the view that the AT's consultation and accommodation with the other Indigenous groups has been adequate. Any potential impacts on the treaty or Aboriginal rights of the Indigenous peoples consulted and engaged, are not likely to be significant and have been effectively addressed through mitigation strategies, commitments, and conditions referenced in this decision.

In making this conclusion, the Board recognizes that the federal government and the GoA must arrive at their own conclusions regarding the duty to consult and accommodate. Further, the Board recognizes that the Lieutenant Governor in Council may determine that additional conditions to accommodate adverse impacts to Aboriginal or treaty rights and traditional land uses may need to be imposed under the Project, as part of the GoA's ongoing consultation obligations.

4.6.1 Consultation, Accommodation of Project Impacts: Stoney Nakoda Nations

Specific Project impacts on the Stoney Nakoda Nations, as raised during the hearing, and accommodations or conditions required by the Board to mitigate those impacts, are described in more detail later in this report. The Board notes that the SNN have provided an interim traditional land use assessment. The Board understands that other Indigenous groups may have provided traditional land use studies to AT, not all of which have been made public.

The Board understands that the Stoney Nakoda Nations want proponents, governments, and indeed this Board to understand their culture and rich history on Treaty 7 lands. The book written by Chief John Snow titled *These Mountains are our Sacred Places: The Story of the Stoney People* was submitted to the Board as part of the SNN's filings and formed part of the direct evidence heard in testimony from William Snow and from Elder John Snow Jr., Chief John

Snow's son. The Board recognizes that the Stoney Nakoda Nations are deeply attached to the region and in particular the water and the mountains. The book written by Chief John Snow speaks to this deep connection and provides a historical backdrop of the Stoney people.

The Board heard from the SNN regarding the importance of grizzly bears to its culture. Testimony from William Snow referred to a 2016 SNN study titled "Enhancing Grizzly Bear Management Programs Through the Inclusion of Cultural Monitoring and Traditional Ecological Knowledge". Mr. Snow indicated that the understanding of grizzly bear behaviour and habitat was advanced in this study through traditional knowledge and oral history. He further indicated that this type of study would be beneficial to the proponent in assessing potential Project impacts.

The testimony also referenced the trail system in the Springbank area that was used by the SNN. The trails were used by its members to gather berries and medicines. Stories told at the hearing emphasize the historical importance of trails to the people of the Stoney Nakoda Nations. These stories have been passed from generation to generation and include the story about a woman named Chews Her Braids and a pregnant woman that gave birth to a baby boy along the trail. There are also stories of graves along these trails travelled by the people of the SNN.

The Board notes SNN's view that consultation by Alberta Transportation requires more work. The Stoney Nakoda Nations largely disengaged from consultation efforts following the site visits with SNN Elders and consultation officers in the fall of 2016. SNN Elders indicated that they were treated disrespectfully and not given the opportunity to conduct the field visit according to their established process.

Alberta Transportation was unaware of this incident until it was identified in the SNN submission to this proceeding. AT noted that part of the SNN concerns may be based on the lack of access to some lands for assessment, where some of the private land owners had not provided right of access at the time of the field visits. However, AT indicated that it was unfortunate that SNN did not raise these concerns shortly after the incident as they would have followed up and addressed the concerns.

In the Board's view, AT was indeed caught off-guard about the feelings of disrespect the Stoney Nakoda Nations expressed at the hearing regarding field visits in the fall of 2016 and responded at the hearing respectfully and in a genuine manner. The Board agrees with AT that the SNN should have brought their concerns regarding the field visits to AT's attention at the time. Recognizing the SNN's reluctance to address the government, it is the Board's view that the SNN would have been heard by government officials at the highest levels and their concerns would have been addressed.

It is unfortunate that consultation activities essentially stalled after the October and November 2016 field visits. The Board recognizes that more needs to be done to advance consultation between Alberta Transportation and the Stoney Nakoda Nations. The Board notes that the NRCB review and hearing process has provided a mechanism to identify concerns, and in this case, reopen communication between AT and SNN. The Board trusts that the process will provide a path forward to meaningful consultation and accommodation. From the Board's perspective, the review and hearing process has demonstrated its utility, and the process

succeeds best with parties who are openly committed to engaging and resolving outstanding issues.

Alberta Transportation made specific commitments to advancing consultation with the SNN. These included reference to commitments made in AT's opening statement on Topic 2 to address the recommendations made by the SNN in their interim traditional land use assessment. The Board acknowledges and expects these commitments, now on the public record, be fulfilled by Alberta Transportation.

The Board acknowledges the request made by SNN in its final argument to impose various conditions on Alberta Transportation. While the Board has determined it will not impose all of the requested conditions, the Board is confident that the commitments made by AT, and the ongoing consultations that are required, together with the Board imposed conditions will contribute to the resolution of SNN's concerns.

Having regard for all submissions, the Board requires as a condition of approval that Alberta Transportation employees and contractors that are likely to be in close contact with the Stoney Nakoda Nations' members for the purposes of carrying out the Project receive cultural awareness training. The Board further requires that Alberta Transportation retain an independent Indigenous Monitor to monitor all field work activities undertaken as part of the completion of the Stoney Nakoda Traditional Land Use Assessment (SNN TLUA). The Indigenous Monitor shall be retained by Alberta Transportation throughout the construction phase of the Project to ensure requirements of the SNN TLUA are met, including the management of archeological and heritage finds of significance.

The Board encourages the Stoney Nakoda Nations to continue dialogue, consultation, and meaningful discussions with AT in the coming months. In order for Alberta Transportation to fully assess Project effects on SNN's rights and traditional uses, the Stoney Nakoda Nations must remain engaged and responsive in the consultation process.

The Board would like to acknowledge and thank Elders Jackson Wesley, Henry Holloway, and John Snow Jr. for their prayers and participation at the hearing. The testimony provided by the Elders in particular, was heartfelt and genuine. The Board was grateful to hear the stories told by Elder John Snow Jr., Elder Henry Holloway, and by Larry Daniels.

4.7 CONDITIONS

1. The Operator shall:
 - a) provide Indigenous groups 30 days advance notice of commencing construction to allow them to harvest and transplant traditional and medicinal plants and to conduct ceremonies within the Project Development Area, and
 - b) provide access (while ensuring public safety) to Indigenous groups to conduct pre and post construction site visits to observe proposed mitigation measures and provide feedback to the Operator based on their observations, to the satisfaction of Alberta Indigenous Relations.

2. The Operator, in consultation with the Stoney Nakoda Nations, shall:
 - a) ensure that the Operator's employees and contractors that are likely to be in close contact with the Stoney Nakoda Nations' members for the purposes of carrying out the Project receive cultural awareness training, and
 - b) retain an independent Indigenous Monitor to monitor all field work activities undertaken as part of the completion of the Stoney Nakoda Traditional Land Use Assessment (SNN TLUA). The Indigenous Monitor shall be retained by the Operator throughout the construction phase of the Project to ensure requirements of the SNN TLUA are met, including the management of archeological and heritage finds of significance.

SECTION 5 HISTORICAL RESOURCES

5.1 Summary from the Application (EIA)

Alberta Transportation (AT) completed Historical Resources Impact Assessments (HRIAs) to determine the impact of the Project on historic, archeological, and paleontological resources. Existing data indicate that the Project area has good historical resource potential. Under Alberta's *Historical Resources Act*, land parcels are assigned a Historic Resource Value (HRV) ranging from 1 to 5, with HRV 1 lands afforded the highest level of protection. For archeology, AT outlined that all lands within the local assessment area (LAA) at minimum have an HRV 5 (meaning it is believed to contain a historic resource), but relatively few previously recorded archeological sites exist. Existing paleontological data showed no previously recorded fossil sites and no lands with HRV for paleontology.

Field surveys for the paleontology and archeology HRIAs included 262 shovel tests and 698 surface exposure inspections. AT assessed 11 precontact period sites and 11 historic period sites, and documented and recorded three paleontological sites, consisting of shell beds and microvertebrate material. The specific locations of the identified historical resources are provided in the HRIAs submitted to Alberta Culture, Multiculturalism and Status of Women (ACMSW).

Results of the archeology HRIA indicated that the project development area (PDA) contains some sites of moderate to high heritage value that would require mitigation. AT predicted that the likelihood of encountering paleontological sites of high heritage value during excavation is high. As Project effects for historical resources are mitigated prior to, or during construction, as set out in standards established by ACMSW, Alberta Transportation expected that no residual effects on historical resources will occur during construction and dry operations. AT concluded that the Project effects on historical resources are assessed as not significant.

Similarly, due to mitigation activities during construction, AT concluded that no additional or residual effects are expected during flood and post-flood operations and adverse effects are not considered significant. Flood and post-flood operations may potentially affect sites of high heritage value downstream of the PDA. However, since AT did not assess historical resources downstream of the PDA, the significance of these potential effects is unknown.

Because of the potential of Project adverse effects on historical resources, standard mitigation measures will be determined by ACMSW, based on their review of the HRIAs. This process is legislated under the *Historical Resources Act*, which is separate from the NRCB public interest decision process. Alberta Transportation has outlined that they will reduce the Project impact on historical resources by:

- following heritage resource protection methods as mandated by the *Historical Resources Act*;

- adhering to any conditions that ACMSW applies to these sites; and
- following current industry best practices and complying with all provincial and federal legislation.

5.2 Views of the Interveners

Stoney Nakoda Nations

The Stoney Nakoda Nations (SNN) indicated that AT's conclusion regarding the significance of residual impact of the Project on historical resources was made prematurely. The SNN stated that gap areas exist within the PDA that require a Historical Resources Impact Assessment, and that additional archeological testing is still required. The Stoney Nakoda Nations also outlined several concerns related to the methodology of the HRIAs and expressed concerns surrounding the identification of historical resources during site visits conducted with SNN. As there is still work to be undertaken by Alberta Transportation, the SNN believe it is impossible to accurately assess Project impacts on historical resources.

The SNN expressed concern that they were unable to confirm existing gravesites within the PDA and that no protection is in place for Indigenous gravesites. The Stoney Nakoda Nations noted that the PDA intersects ceremonial areas, camping areas, sacred sites, a family camp, and a burial ground in the southwestern portion of the PDA. The SNN indicated that they need to be appropriately informed of the historical resources within the Project area and how the Project will impact these resources.

The Stoney Nakoda Nations outlined that AT's proposed mitigation measures, as determined by the *Historic Resources Act*, do not reflect the SNN's perspectives and protocols for the preservation of heritage sites. They requested that AT:

- provide support for cultural monitoring during Project construction, and as part of historical resource investigations and mitigations;
- meet with the SNN to discuss appropriate mitigation or accommodation measures for identified impacts;
- develop an SNN traditional knowledge monitoring committee that will be engaged on Project operation activities related to historical resources, including those listed under the *Historic Resources Act*;
- develop an SNN archeological and heritage management plan; and
- provide the SNN with all information and reports regarding previously recorded historical resources in the project area.

SR1 Concerned Landowners Group

The SR1 Concerned Landowners Group (SCLG) expressed that AT did not adequately consider the homesteading and ranching cultural history of the PDA. The SCLG stated the need for a historical inventory of the homesteading and ranching sites that would be impacted by the Project and requested that AT commit to working with the Springbank Historical Society to document the homesteading and ranching history of the lands within the PDA.

Scott Wagner

Mr. Wagner expressed concerns related to the methodology of the archeology HRIA and the actions of the Alberta Transportation consultants who completed the assessment. He noted the contractual agreement implied that six small holes would be dug by shovel on his property. Instead, a backhoe excavated a large hole in a location that was unlikely to contain items of historical significance, according to Mr. Wagner. Additionally, the excavation was not properly remediated, which Mr. Wagner stated was required as part of the contract.

Other Indigenous Groups

Several Indigenous groups expressed concerns through the EIA process regarding Project impacts on historical resources before withdrawing objections to the Project or ceasing participation in the NRCB process.

The Tsuut'ina Nation raised concerns about burial sites, tipi sites, and portions of medicine wheels and cairns that would be destroyed during flood operations, and indicated that a ceremony may be required to properly respect the people who were laid to rest in tree burials in the area.

The Siksika Nation raised concerns about the impact to Blackfoot ceremonial locations and cultural sites and the Project's potential impact on Blackfoot artifacts, as well as ceremonial and medicinal plants.

Kainai First Nation Elders raised concerns similar to the Tsuut'ina Nation and the Siksika Nation. During inspections, the Kainai First Nations expressed concerns about potential tipi rings adjacent to the Project outfall along the unnamed creek.

The Piikani Nation also raised concerns that a full HRIA is not available for review and that baseline data collection is not complete.

Both the Piikani Nation and Kainai First Nation Elders noted concerns that archeological data had not been shared.

The Métis Nation of Alberta Region 3 expressed that more research and information was needed to discover and document the past use of the area by the Métis. They also outlined that the Project may disrupt potential homesteads, cart trails, historic use areas, and/or buried Métis sites. They raised concerns that artifacts, cart trails, and other cultural sites might be identified and then reburied and not identified as Métis.

5.3 Views of Alberta Transportation

AT stated that Alberta Culture, Multiculturalism and Status of Women has issued a *Historical Resources Act* Approval with conditions for the Project, and that further assessment is required. Alberta Transportation noted that the Historical Resource Impact Assessments are ongoing and that some conditions remain to be met before Project construction proceeds.

In response to concerns raised by the Stoney Nakoda Nations, AT proposed facilitating additional site visits with the SNN before construction. Alberta Transportation also proposed reviewing historical resources identified in the SNN interim Traditional Land Use Assessment (TLUA) with representatives from Alberta Culture, Multiculturalism and Status of Women. This would confirm whether the areas identified by the SNN are reportable under the *Historical Resources Act*.

Alberta Transportation outlined that no burial sites were identified in the PDA as part of the Historical Resources Impact Assessments. AT asserted that a map provided by the SNN on February 26, 2021 as a hearing exhibit, shows no anticipated burials within the project development area. However, should gravesites be encountered, AT stated that they will follow required provincial mitigation measures. Alberta Transportation indicated that they are prepared to contact and inform the SNN should the potential for Project impacts to gravesites and other archeological resources be realized.

AT highlighted that due to the nature of excavation, historical sites are typically not mitigated until after projects are approved. Alberta Transportation would welcome engagement with the SNN with respect to the development of a mitigation plan, and in the undertaking of cultural monitoring during construction. AT outlined that they will work with the Stoney Nakoda Nations to record, mitigate, and commemorate sites that are not identified as historical resources under the *Historical Resources Act*. For resources that are reportable under the *Historical Resources Act*, Alberta Transportation will follow mitigation measures, as determined by ACMSW.

Alberta Transportation committed to provide funding to finish the SNN Traditional Land Use Assessment. AT stated that they will provide a written response to the final report, and that they are open to discussing the response and proposed mitigation measures with the Stoney Nakoda Nations.

AT emphasized that information and reports regarding previously recorded historical resources in the Project area have already been provided to the SNN, to the extent possible under the restrictions and provisions of the *Historical Resources Act*. They noted that Alberta Culture, Multiculturalism and Status of Women is the intended audience for the Historical Resources Impact Assessments.

With respect to the request by the Stoney Nakoda Nations that Alberta Transportation develop a SNN traditional knowledge monitoring committee, AT indicated that they have made commitments to undertake a variety of monitoring and suggested that this request be deferred until after the SNN submits the final Traditional Land Use Assessment. In response to the SNN

request for the development of an archeological and heritage management plan, AT noted that they have committed to providing the opportunity for the SNN to participate in additional historical resources work within the project development area.

AT is prepared to work with the Springbank Historical Society to document the history of the lands in the PDA, and to develop appropriate plaques or signage to commemorate the Indigenous and settler history in the area.

Alberta Transportation acknowledged that miscommunication occurred regarding the excavation on Mr. Wagner's property. AT has discussed this situation with Mr. Wagner and has proposed a resolution for his consideration.

5.4 Views of the Board

The Board finds that the methods used in the development of the Historical Resource Impact Assessments are consistent with the requirements under Alberta's *Historical Resources Act*. Given that Project-related disturbance of historical resources outside the project development area is unlikely, the Board agrees with AT that a regional assessment area for the HRIAs is not required.

The Board understands that further work is required by Alberta Culture, Multiculturalism and Status of Women as part of the Project's regulatory approval, and that construction will not begin until this work has been completed to the satisfaction of ACMSW. The Board notes that Alberta Transportation received the Stoney Nakoda Nations' interim TLUA after submission of the EIA, and that a formal review of this information is still required. The Board appreciates that AT has offered to meet with the SNN to discuss potential concerns and impacts related to information contained within the Traditional Land Use Assessment, and that AT has committed to facilitating site visits with the Stoney Nakoda Nations to review TLUA findings. While the Board understands that the HRIA and TLUA reports may only provide cursory assessments, the Board believes that Alberta Transportation's assessment is a reasonable evaluation of the potential Project impacts on historical resources. With the information available, the Board accepts AT's assessment of residual effects to historical resources.

The Board finds that a requirement exists for monitoring, mitigation, and commemoration of historical resources identified under the *Historical Resources Act* and those resources identified by Indigenous groups. The Board understands that any potential historical resources identified during construction will be investigated and that this investigation will determine whether additional consultation, assessment, mitigation, or avoidance is required. AT has committed to ongoing monitoring during construction and will seek advice and approval from ACMSW on the appropriate action if a historical resource is encountered.

The Board notes that conditions put forth by SNN include a request to provide reasonable capacity for the development of a Stoney Nakoda Traditional Knowledge Monitoring Committee and for the development of an archaeological and heritage management plan. AT responded that they have committed to provide funding to finish the SNN Traditional Land Use Assessment, will provide a written response to the final report, and are open discussing the response and proposed mitigation measures with the Stoney Nakoda Nations. AT suggested that the SNN request to develop the committee should be deferred until after the final TLUA is

submitted. The Board finds that the process suggested by AT is sensible. The Board agrees with SNN that an archaeological and heritage management plan would be valuable. Therefore, as a condition of approval, the Board requires the Operator to develop an archaeological and heritage management plan in consultation with the Stoney Nakoda Nations for any structures, sites, or things of historical, archaeological, or architectural significance or physical or cultural heritage resources within the project development area, including but not limited to sites and things subject to the *Historical Resources Act*; the plan shall be completed to the satisfaction of Alberta Culture, Multiculturalism and Status of Women.

Alberta Transportation has committed to working with the Stoney Nakoda Nations, and the Board believes that communication with the SNN is necessary should Indigenous historical resources be encountered. The Board acknowledges that AT has committed to engage with the SNN regarding mitigation plan development and cultural monitoring during construction. The Board expects that, when developing mitigation measures, AT will have due regard for the protocols and perspectives identified by the Stoney Nakoda Nations.

The SNN requested that Alberta Transportation provide Project-specific information on historical resources as well as the HRIAs. It is the Board's view that since AT does not have the right to share the material in these reports, information has been provided to the Stoney Nakoda Nations to the extent that is reasonably possible. Any requests for information contained within the HRIAs should be directed to Alberta Culture, Multiculturalism and Status of Women.

The Board acknowledges the potential for the Project to impact historical resources, and that these effects may be considered significant by Indigenous groups if there is a disturbance or destruction that is not authorized by ACMSW. It is the Board's view that the mitigation activities outlined by AT will reduce the likelihood of these effects. The Board accepts that effects on historical resources downstream of the Project were not assessed and are unknown.

Having regard for the requests that the proponent work with the Springbank Historical Society, and AT's stated willingness to do so, the Board will require that the Operator work with the Springbank Historical Society to document the history of the lands in the PDA and to cooperate with the GOA to develop appropriate plaques or signage.

5.5 Conditions

The Operator shall:

- work with the Springbank Historical Society to document the history of the lands in the PDA and to cooperate with the GOA to develop appropriate plaques or signage.
- develop an archaeological and heritage management plan in consultation with the Stoney Nakoda Nations for any structures, sites, or things of historical, archaeological, or architectural significance or physical or cultural heritage resources within the Project Development Area, including but not limited to sites and things subject to the *Historical Resources Act*; the plan shall be completed to the satisfaction of Alberta Culture, Multiculturalism and Status of Women.

SECTION 6 PUBLIC CONSULTATION PROCESS

6.1 Summary from the Application (EIA)

Alberta Transportation (AT) initiated consultation with affected landowners and the public at large early in the Project development phase. Alberta Environment and Parks (AEP) held meetings with affected landowners beginning in July 2014.

AT stated that it made extensive efforts through its public consultation process to identify and resolve concerns expressed by stakeholders. It identified the primary elements of its public consultation program as direct engagement, open houses, community information sessions, the Project website, emails, direct mail, mail drops, telephone calls, newsletters, and Project updates.

The Project impacts a number of utilities and infrastructure including: powerlines, roads, pipelines, and communications. Alberta Transportation consulted on numerous occasions with utility companies in an effort to confirm impacts and mitigation strategies.

The public consultation process, primarily delivered through direct mail drops and open houses, began in November of 2014. As of 2018, AT had conducted more than 40 meetings with affected landowners, Rocky View County representatives, and organized stakeholder groups, including the Bow River Basin Council, Elbow River Watershed Partnership, Alberta Environment and Parks Water Collaborative, the Calgary River Communities Action Group, Calgary Regional Partnership, the Western Irrigation District, and affected industry and utilities. AT also held a total of 12 open houses that were attended by hundreds of people.

6.2 Views of the Interveners

SR1 Concerned Landowners Group

The SR1 Concerned Landowners Group (SCLG) stated that AT's consultation with the public, especially the directly impacted landowners, was inadequate, having regard for the impact on these landowners and the Springbank community. The SCLG described the landowner experience as one in which Alberta Transportation told them about the Project but did not listen to their concerns. The SCLG described the open house proceedings as events where display boards with some Project information were set up, and attendees could write comments on provided forms with limited opportunity for dialogue.

Both Scott Wagner and the SCLG stated they were not consulted during the project selection process. Mr. Wagner shared that landowners were shocked by the SR1 project announcement in the *Calgary Herald*, and that it took nearly six months after the news release for Alberta Transportation to accept an initial meeting request. The SCLG further submitted that consulting

with the public at the initial stages of project selection process may have resulted in AT addressing the issues that have been raised by interveners through design changes and could have resulted in a deeper look at alternatives before the selection of SR1 as the preferred project.

The SR1 Concerned Landowners Group provided the following as an example of flaws in AT's public consultation process:

Regarding the October 2020 email sent by Mr. Hebert to Ms. Hunter pertaining to the draft Land Use Plan, the Plan was already submitted to the NRCB and was created following consultation with First Nations. There was no engagement with the Springbank community in advance of the Plan. How does the Proponent justify putting the onus on a volunteer, not an elected official, to meet to discuss a Plan that was already submitted to regulators? Mr. Kruhlak asks for a courtesy of engagement when one was not given in the first place. Comments on the Land Use Plan were provided by the Springbank Community Association to CEAA and the NRCB and Mr. Hebert had access to those submissions, which would be appropriately considered engagement. This type of "consultation" is a pattern, where AT makes decisions, changes the project, grows the footprint, doubles the size all without any engagement with the affected community and then attempts to redirect blame for the Proponent's inadequate process.⁶

Other Intervenors

Calalta Amusements Ltd. and Calalta Waterworks Ltd. (Calalta) and the Calgary River Communities Action Group and Flood Free Calgary provided limited commentary on the consultation process. The few comments that were included were supportive of AT's efforts to work with affected parties and identify appropriate mitigation measures.

6.3 Views of Alberta Transportation

Alberta Transportation acknowledged that not all landowners whose lands will be required for the Project were consulted before SR1 was identified as the preferred option. AT stated not all landowners were consulted at that time because the Project was at the concept stage and the precise amount of lands required were not known with certainty. AT acknowledged that, as a major project, SR1 will have impacts. AT stated that it has worked to recognize Project effects, consulted with affected parties to address effects and, where possible, mitigated those effects.

In response to claims from the SCLG that the public consultation process did not engage with stakeholders early in the process, Alberta Transportation submitted that it met with a number of local landowners in July 2014 and again in March 2015. At the first of those meetings AT advised that SR1 had been selected for detailed engineering, and that the McLean Creek and Glenmore Reservoir diversion tunnel options were moving forward for continued study. Alberta

⁶ SCLG SUB to NRCB hearing – Final Argument, Exhibit 414, par. 185

Environment and Parks issued the final terms of reference for the SR1 project on February 5, 2015.

Alberta Transportation hosted 12 open houses, the earliest in March 2015. Notification for the open houses occurred through a variety of methods, including emails to parties who had provided contact information, unaddressed Canada Post admail, local newspapers, road signs, and announcements on the Government of Alberta website.

Alberta Transportation described the open house process as follows:

At the Open Houses, display boards were positioned around the perimeter of the room, and project representatives were stationed near the boards to speak directly with attendees and provide information and answer questions. Representatives also recorded issues, questions and comments expressed by attendees. An exit survey was also provided for those attendees who wished to provide additional feedback. The exit surveys, as well as the recorded comments from the SR1 team members, also known as a Records of Contact (ROC), were then submitted to Communications Public Affairs' Stakeholder Information Management team to record. Each ROC and survey was recorded verbatim and cross checked as part of a thorough quality control auditing process to ensure every comment was accurately captured.⁷

In response to assertions made by interveners critical of the proponent's consultation process, AT provided evidence that detailed various direct communications with individual stakeholders through meetings, telephone conversations, and emails.

6.4 Views of the Board

The Board expects applicants to identify and communicate directly with potentially affected parties throughout the application process. Proponents should identify individuals and groups who are likely to have an interest in the project at an early stage in project planning. An effective communication plan will provide parties with sufficient information for them to be able to contribute meaningfully to project design and operation, and to effectively participate in the NRCB's public review process.

The Board finds that the public consultation efforts of Alberta Transportation with local stakeholders was satisfactory. The Board notes that interveners expressed concerns regarding AT communications related to changing design details and cost estimates for the Project through the EIA process. As with any large and complex project, both the design details and costs evolved as AT continued to refine the engineering and work through the environmental impact assessment process.

The Board acknowledges that the volume of information, and the changes associated with the Project details from the time the EIA terms of reference were issued, presented considerable demands on those whose job it was to remain current and informed. For stakeholders who were participating in the review process because of the Project's effects on them and their

⁷ 20180326 AT EIA to NRCB re Vol 4 App B, Exhibit 64, pdf page 62

community, the demands presented by the public review process were more challenging to meet. The Board understands the frustration that concerned parties feel as they are expected to keep up with large amounts of new information. That said, project changes that arise after the initiation of stakeholder consultation and the environmental impact assessment work are generally positive changes that reflect public input and a better understanding of the Project's effects. The Board is satisfied that the open houses and direct stakeholder meetings organized and hosted by AT throughout the application process were appropriate and effective in providing relevant Project information and capturing stakeholder concerns.

During the course of the hearing, the Board heard direct evidence from a number of interveners referring to Alberta Transportation's efforts to respond to various emails and telephone calls. The Board acknowledges that AT made reasonable efforts to reach out proactively and respond to stakeholders in a timely fashion throughout the application process. Having regard for all the submissions related to the public consultation process, the Board finds that Alberta Transportation was well-organized, candid, and responsive in both these one-on-one direct interactions and in the multi-stakeholder public consultation and engagement activities.

SECTION 7 LAND USE AND MANAGEMENT

7.1 Summary from the Application (EIA)

Alberta Transportation (AT) assessed the potential Project effects on land use and management by examining existing information collected from relevant literature, websites, Project engagement and consultation, and field surveys.

7.1.1 Regulatory Documents

The project development area (PDA), local assessment area (LAA) and regional assessment area (RAA) are situated in a portion of Rocky View County where various land use policies and resource management initiatives apply. (Maps showing assessment areas are included in Appendix C.) These include provincial regulatory requirements established under Alberta's Land-Use Framework, the South Saskatchewan Regional Plan (SSRP), the *Wildlife Act*, and the *Fisheries (Alberta) Act*. Municipal requirements are defined under Rocky View County's Municipal Development Plan (MDP).

Rocky View County's MDP vision for the future emphasizes a balance between agriculture and diverse recreational, residential, and business opportunities. Its land use bylaw (LUB) establishes several land use districts in and near the PDA. Land use districts within the assessment areas include ranch and farm, agricultural holdings, farmstead, residential, public services, and direct control. According to AT, the Project is not consistent with the purpose and intent of Rocky View County's MDP and LUB, as the basis of these documents is the protection of agricultural land use in the region. However, AT highlighted that the *Municipal Government Act* allows authorizations granted by the Natural Resources Conservation Board to prevail over Rocky View County's municipal requirements. AT outlined that use of the land for the Project complies with the outcomes and strategic directions in the SSRP.

7.1.2 Current Use of Private Land

Land within the assessment areas is primarily privately owned, and the majority is used for agricultural purposes. Within the PDA, AT identified 24 individuals and four businesses that own land. No urban or residential communities are located within the PDA. Within the LAA are the Tsuut'ina Nation no. 145, 32 additional residential receptors, five additional businesses, two summer camps, several public land dispositions, and public transportation infrastructure including various highways, township roads, and range roads. Ten additional receptors are located within the RAA, including the Community of Springbank and the Townsite of Redwood Meadows. Approximately 4,942 hectares (ha) portion of the Stoney Nakoda Nations reserves (142, 143, 144) are within the RAA.

Other land uses within the assessment areas include oil and gas development, electricity infrastructure, aggregate development, and communication towers and cables. The assessment areas do not overlap with any provincial grazing reserves administered by AEP.

7.1.3 Recreation, Parks, and Protected Areas

The assessment areas overlap with the Foothills Wildlife and Parkland Hunting zones, Wildlife Management Units 121 and 312, Fur Management Zone 8, and Fish Management Zone 1. In addition, non-consumptive recreational activities (e.g. rafting, walking, and hiking) occur within the assessment areas.

AT indicated that two trap lines are located west of Bragg Creek but that no active trap lines exist within the PDA.

There are no provincial parks, federal parks, protected areas, or heritage rivers within the land use assessment areas.

7.1.4 Purchase of Private Land and Conversion to Public Land

Alberta Transportation stated that 24 individuals, four businesses, and the Kiwanis Club of Calgary would be directly affected through loss of privately owned land required for the Project. Land acquisition would be carried out by AT, preferably through voluntary agreement with the landowners.

Land acquired by the Government of Alberta (GoA) will be converted from private land to Crown land. The Land Use Plan, which is not yet finalized, could allow Indigenous groups and the public access to lands that they currently cannot enter without permission. These lands will be managed by AEP for the lifespan of the Project.

7.1.5 Guiding Principles and Direction for Future Land Use

AT provided an updated Draft Land Use Plan for the proposed new Crown land. The draft lists 12 guiding principles, emphasizing that the primary use of Crown land within the Project land use area is for flood mitigation. Access to certain areas of the Project will be restricted to reduce risks to public safety. The principles state that use of the lands by Indigenous groups will be a priority outside of flood and post-flood recovery periods, and that the aim is to support exercise of treaty rights by Indigenous groups, including hunting, as well as other traditional Indigenous activities. Other principles include:

- Non-motorized recreational access (e.g. hiking, biking) will be permitted in some areas.
- Grazing will be used as a tool to manage and maintain the grassland landscape.
- Non-flood related permanent or temporary infrastructure will not be permitted.

- The final Land Use Plan will be developed with meaningful consideration of input received from Indigenous groups.
- The GoA will work with Indigenous groups to develop a First Nations Land Use Advisory Committee to guide and facilitate the implementation of the principles of the Land Use Plan and support the exercise of treaty rights and traditional uses in the land use area.

The direction for land use planning section of the draft guiding principles document:

- states that the GoA is interested in using an iterative and collaborative approach in the development of the Land Use Plan;
- reiterates that primary use is for flood mitigation; and
- states that the overriding factor in permitting secondary uses is public safety.

The GoA has committed to work with Indigenous communities to identify a portion of land that can be used as a staging area or for activities such as cultural ceremonies. Other uses and activities will be considered where they align and are compatible with flood mitigation, traditional land use, and the guiding land use principles. In general, only uses and activities that have a minimal impact on the land will be allowed.

Alberta Transportation will continue to explore opportunities and desired uses of the land through meetings with Indigenous groups, local landowners, and other stakeholders during the engagement process. AEP will lead the land use planning process and will engage in further consultation to finalize and implement the Land Use Plan consistent with commitments made in the updated Draft Land Use Plan.

AT expects residual effects to current land use and management from the Project. Conversion of private property to Crown land, permanent removal of land from agricultural production, and changes to industrial development infrastructure such as pipelines are expected.

7.2 Views of the Interveners

Stoney Nakoda Nations

The Stoney Nakoda Nations (SNN) stated that AT's land use assessment does not accurately represent or acknowledge impacts on the SNN. They commented that the Draft Land Use Plan includes a multitude of restrictions and competing uses to the exercise of Aboriginal and treaty rights.

Although much of the land is currently privately owned, the Stoney Nakoda Nations stated that they have been able to make access arrangements with some of the landowners. The SNN raised concerns related to future land use and continued access to exercise treaty rights such as hunting and other traditional activities. They also commented on the First Nations Land Use Advisory Committee—specifically its lack of decision-making authority and influence to offer

meaningful input on the siting of the Indigenous staging area, and in prioritization of cultural practices. The SNN requested, as a condition of approval, that a Stoney Nakoda member be appointed as chair of the advisory committee.

In addition, the SNN stated that the Project does not comply with or support the strategic direction outlined in the SSRP or other land use plans, and that the Project is in direct violation of the intent and proposed outcomes of the plans.

The Stoney Nakoda Nations requested that AT develop a Crown land offset measures plan that identifies areas where right of access is no longer available for traditional use as a result of Project activities, and provide this plan to the SNN with a list of compensation measures.

SR1 Concerned Landowners Group

The SR1 Concerned Landowners Group (SCLG) stated that current landowners who will no longer be able to continue ranching, farming, residing, and enjoying recreational activities in the area will be the individuals impacted most by this Project. They stated that although some have reached agreement with AT about selling their property, most have not, and many do not want their land expropriated for this Project. The SCLG expressed concern about the simple “table top” approach AT is using to assess their land value, and commented that even if they are fairly compensated for their land, there is no affordable land for them to purchase near Calgary to re-establish themselves.

The SR1 Concerned Landowners Group believes that Crown land should be available for public use, and are concerned that the Draft Land Use Plan gives priority to Indigenous groups. They noted that AT has provided limited clarity on future land use, and stated that stakeholders from their community were not engaged in the development of the draft principles for future land use. The group outlined that there is uncertainty regarding conflicting land uses and how this issue will be addressed. In addition, the group raised concerns regarding the future use of Camp Kiwanis, potential fire hazards, hunting near residences outside of the land use area, trespassing onto adjacent private land, grazing areas, and fragmentation of land due to land acquisition.

The SCLG requested that the Project not be named the Springbank Off-Stream Reservoir. The group finds the use of the word “Springbank” in the project name to be offensive.

The SCLG suggested several conditions of approval related to land use. In order to mitigate the concerns that were raised, they requested that Alberta Transportation:

- install a berm around the project development area;
- plant trees around the land use area;
- allow community stakeholders to participate in the First Nations Land Use Advisory Committee;
- install a boat launch on the Elbow River;
- construct a pathway along the outside perimeter of the land use area;
- prohibit the use of firearms within the land use area;

- set up community workshops to review the Land Use Plan;
- provide a budget for public amenities; and
- provide a budget for surveillance to control trespassing over the life of the Project.

Calalta Amusements Ltd. and Calalta Waterworks Ltd.

Calalta Amusements Ltd. and Calalta Waterworks Ltd. (Calalta) stated that it has an exclusive water utility franchise agreement with Rocky View County that includes 14 quarter sections of land within the Project area. Development of the agreement began in 2009 and was finalized in 2020. Calalta is concerned that the Project will lead to a loss of their revenue due to sterilization of the 14 quarter sections of land. Calalta indicated that they have had conversations with AT regarding compensation, but the issue has not yet been resolved to Calalta's satisfaction.

Calalta requested a condition of approval requiring AT to work in good faith with Calalta Waterworks Ltd. to negotiate compensation for the lost revenue associated with the permanent loss of access to the 14 quarter sections of land.

Scott Wagner

Mr. Wagner raised concerns regarding grazing leases to reduce grass fire potential, as well as hunting and firearm risk in the area that will become Crown land. He requested that Alberta Transportation consider prohibiting hunting in the land use area.

7.3 Views of Alberta Transportation

7.3.1 Future Land Use Plan

Alberta Transportation stated that the final Land Use Plan will be consistent with commitments made in the updated Draft Land Use Plan. They noted that these principles were developed through engagement with Indigenous groups and from feedback provided by the community and stakeholders during open houses. AT indicated that they are open to discussions with all interested stakeholders regarding potential uses of the new Crown land, and has committed to meaningful consideration of input received. To reconcile any conflicting land uses that may arise, Alberta Transportation intends to continue engaging with Indigenous groups and the public, however specific details on the engagement process have not been finalized. In response to an SR1 Concerned Landowners Group concern, AT agreed to reconsider whether the name of the Project should be the Springbank Off-Stream Reservoir.

AT stated that they will use short-term grazing permits rather than long-term grazing leases for suitable lands within the PDA. The areas available for grazing will be determined by AEP with consideration of input received from the First Nations Land Use Advisory Committee.

Alberta Transportation acknowledged that firearm safety is a concern to the community, and stated that hunting will be discussed further during the development of the final Land Use Plan. Indigenous groups currently have permission from some private landowners to hunt within the

proposed project area. AT stated that hunting will continue in the land use area if the Land Use Plan allows the practice of treaty rights. Alberta Transportation noted that individuals who hunt will have to comply with applicable provincial legislation; for the discharge of firearms, this includes adhering to setbacks from residences and roadways. AT commented that considerations relative to the extent of hunting that will be permitted in the land use area are best addressed through the conservation practices employed by AEP.

AT stated that the land use area is not being designed as a park but will be accessible to the public as a secondary use. Its current design does not include a public parking lot, public washrooms, or public camping facilities. Campfires will be prohibited. Construction of a pathway around the perimeter will be considered when finalizing the Land Use Plan.

Alberta Transportation is open to considering requests from local landowners directly adjacent to the project development area regarding localized berming, but explained that they are not able to construct a berm around the perimeter of the project development area as it would impede natural surface water flow. They are open to considering requests regarding the planting of trees or a shelter belt.

AT noted that a boat launch on the Elbow River is not required during Project construction or operation. If a boat launch is required in the future for emergency management and preparedness, this issue will be discussed with Rocky View County.

Alberta Transportation indicated that surveillance will not be used to control trespassing. However, fencing will be used to provide access control and to define the land use area. Feedback will be considered from local landowners, Rocky View County, community stakeholders, and Indigenous groups regarding the esthetics of the wildlife-friendly fencing.

To address issues arising with land use, Alberta Transportation has committed to appoint a community liaison to serve as a point of contact with stakeholders.

7.3.2 ***First Nations Land Use Advisory Committee***

Alberta Transportation reiterated their commitment to creating a First Nations Land Use Advisory Committee. They noted that the committee, consisting of interested members from the Treaty 7 First Nations and Treaty 6 First Nations that were engaged, will make recommendations to support the exercise of treaty rights and traditional uses in the land use area. AT outlined that the position of chair for the First Nations Land Use Advisory Committee would be best discussed among interested Indigenous members.

7.3.3 ***Impacts to Stoney Nakoda Nations***

Alberta Transportation noted that integrating Indigenous and community knowledge into Project planning is an iterative process. AT asserted that it has provided numerous opportunities to the SNN to provide input and share perspectives on how the Project impacts traditional activities and treaty rights. Alberta Transportation noted that the Stoney Nakoda Nations have submitted

an Interim Traditional Land Use Assessment, that this report is currently under review, and AT is willing to discuss the findings of the assessment with the SNN.

In response to concerns regarding continued access to exercise treaty rights, Alberta Transportation indicated that a certain amount of the land surrounding the Project's infrastructure, would not be accessible by any users. However, AT has specified areas that directly intersect Project infrastructure that could be accessible to Indigenous groups upon arrangement. AT further asserted that the Project represents a novel opportunity whereby lands that are currently private, become Crown land. As such, Alberta Transportation stated that the Project is anticipated to increase opportunities for Indigenous groups to exercise treaty rights and traditional uses.

AT outlined that the Stoney Nakoda Nations' request for the development of a Crown land offset measures plan is more suitable for projects constructed on Crown land. As the Project is largely on private land, Alberta Transportation viewed an offset plan as unnecessary.

7.3.4 Land Acquisition and Fragmentation of Lands

Alberta Transportation committed to engage respectfully with local landowners during land acquisition. AT has documented a Land Acquisition Program, which outlines principles regarding the purchase of lands. It is AT's preference to acquire land voluntarily and only resort to expropriation when voluntary acquisition is not possible. An accredited and independent appraisal firm will carry out site-specific appraisals to determine fair market value as well as damages and any other compensation to which a landowner may be entitled under the *Expropriation Act*. Additionally, landowners may also retain their own accredited appraiser, and the cost will be borne by Alberta Transportation. To avoid land fragmentation, AT explained that they will consider purchasing entire parcels upon landowner request.

7.3.5 South Saskatchewan Regional Plan

Alberta Transportation disagreed with assertions that the Project contravenes the *South Saskatchewan Regional Plan*. AT acknowledged that the SSRP focuses on the value of intact native grassland, sustainability, conservation, and non-renewable resource production. However, AT highlighted that the SSRP also recognizes the importance of flood mitigation and the need for a balance between social, biological, and economic objectives. While Alberta Transportation outlined that the Project cannot completely avoid disturbing intact native grassland, the *South Saskatchewan Regional Plan* makes specific reference to the need for flood mitigation. In addition, the Project mainly intersects lands modified by human use. AT explained that any areas of native grassland that are disturbed within the land use area will be reclaimed. Alberta Transportation further asserted that the sections of the SSRP noted by the SR1 Concerned Landowners Group are valuable from a planning perspective but that they are not legally binding, and are therefore not required to be considered as part of the decision-making process.

7.4 Views of the Board

7.4.1 Consistency with Regulatory Documents

The Board is aware that the SR1 Concerned Landowners Group and the Stoney Nakoda Nations believe that the Project does not meet the objectives of the *South Saskatchewan Regional Plan* and Rocky View County's MDP and LUB. The SCLG and the SNN argued that because the Project will destroy native grasses, it is inconsistent with the SSRP which prioritizes the maintenance of intact native grasslands. The Board understands that this statement is included in the Biodiversity and Ecosystem Implementation Plan section of the SSRP. However, the Board believes that it is important to read and interpret the SSRP as a whole and, as directed under the *Natural Resources Conservation Board Act*, the Board must ensure that applications are consistent with regional plans under the *Alberta Land Stewardship Act (ALSA)*. The Board notes that the following sections of the SSRP are relevant to the Project and the Board's consideration:

- Section 4 Implementation Plan: "Appropriate flood management contributes to long-term community sustainability and resiliency. Mitigating impacts from flooding reduces risk to public safety, developments and infrastructure, provides environmental benefits and results in savings in tax dollars for post-flood recovery costs."
- Strategy 4.12: "Support flood management planning and preparedness including ... flood hazard mapping in communities that are at risk of flooding" and "municipal flood hazard mitigation plans to mitigate the threat from flooding to communities in the region."
- Strategy 8.23: "Municipalities are expected to ... utilize or incorporate measures which minimize or mitigate possible negative impacts on important water resources or risks to health, public safety and loss to property damage due to hazards associated with water, such as flooding [emphasis added], erosion and subsidence due to bank stability issues, etc., within the scope of their jurisdiction."

The Board finds that the Project is an appropriate use of land to mitigate future floods, but, as identified by the SCLG and the SNN, creates conflicting land uses between the avoidance of disturbing native grassland and the need for flood mitigation. The Board understands that maintaining intact native grasslands is considered a high priority in the SSRP, though this provision is not considered mandatory. Furthermore, the Board highlights that approximately 2640 ha of the total 4860 ha of the land use area has already been modified by human uses. As a mitigation measure, AT has committed to reclaiming any area of native grassland that is disturbed. The Board believes this is a good compromise that will allow for both native grasses and the significant public benefit of the proposed flood mitigation Project. The Board has reviewed the Project in the context of consistency with the objectives of the *South Saskatchewan Regional Plan*, and finds that the Project is consistent with the SSRP long-term vision for the region to balance economic, environmental, and social goals.

The SCLG asserted that Rocky View County's municipal development plan and land use bylaw designate land in this area for primarily agricultural use, and therefore the Project cannot proceed as it does not meet this criteria. In its submission, AT stated that the *Municipal*

Government Act (MGA) allows authorizations granted by the Natural Resources Conservation Board (NRCB) and AEP to prevail over Rocky View County's municipal requirements. The Board agrees with Alberta Transportation's interpretation of the MGA, and while the Board may have regard for municipal development plans, notes that Rocky View County's MDP and LUB do not prevent approval of the Project.

7.4.2 Future Land Use

Detailed land use plans have not yet been finalized, but the updated Draft Land Use Plan sheds light on the proposed land use in the PDA after construction. The Board agrees that first and foremost, the land is to be used for flood mitigation—the purpose of the Project. The Board also agrees that public safety should be a determining factor for establishing secondary uses. AT stated that if the project is approved, AEP will lead the land-use planning process and will engage in further consultation with Indigenous groups and stakeholders to finalize and implement the Land Use Plan, according to commitments made in the updated Draft Land Use Plan. The Board understands that because this will become Crown land, final approval of the Land Use Plan will be completed by the GoA.

A First Nations Land Use Advisory Committee will be created to guide and facilitate implementation of the principles of the Land Use Plan, and make recommendations to support the exercise of treaty rights and traditional uses in the land use area. The SR1 Concerned Landowners Group requested that they be permitted to participate in the First Nations Land Use Advisory Committee. The Board believes that the SCLG's representation on the Committee would be inappropriate, as the committee's purpose is to focus on the exercise of Aboriginal and treaty rights and traditional land uses.

The SCLG requested that community workshops be set up to review the Land Use Plan. They also raised concerns that the draft guiding principles seem to prioritize Indigenous groups. The Board acknowledges AT's commitment to engage the local community as it works towards finalizing the Land Use Plan. It is the Board's view that a process to ensure all parties have an equal opportunity to express their thoughts and listen to others' opinions is important and that this will aid in mitigating the potential for land use conflicts. To facilitate a common understanding, the Board recommends that joint meetings be held that include all interested parties. A condition of approval requires that a Joint Land Use Advisory Committee consisting of members of Indigenous groups and the local community be formed to discuss potential land uses for the Project, to be included in a draft future Land Use Plan. Having observed the sensitivity expressed by the SCLG regarding the name of the Project, the Board also requires that the Joint Land Use Advisory Committee consider the SCLG request to rename the Project.

The Stoney Nakoda Nations expressed concerns regarding continued access to exercise treaty rights such as hunting and other traditional activities, and requested a Crown land offset measures plan that identifies areas where right of access is no longer available for traditional use as a result of Project activities. In contrast, the Board notes that guiding principle #7 of the updated Draft Land Use Plan states "Use of the lands by First Nations will be a priority outside of flood and post-flood recovery periods in order to support First Nations' exercise of Treaty rights such as hunting, as well as First Nation's traditional activities." The Board finds that a significant amount of privately held land will be converted to Crown land and available for Indigenous people to exercise their treaty and Aboriginal rights and traditional land use. Therefore, the Board is not convinced that a Crown land offset measure plan is required.

A number of requests were made for construction of amenities including public parking, washrooms, pathways, camping facilities, and a boat launch that could be used for emergency rescue. The Board finds that it is too early in the planning process to know which amenities will be consistent with the final Land Use Plan, and trusts that Alberta Transportation/Alberta Environment and Parks will implement reasonable measures to address input from the Joint Land Use Advisory Committee on these issues.

Mr. Wagner made several requests of Alberta Transportation that the use of firearms be prohibited within the PDA to protect public safety. The Board acknowledges that the discharge of firearms is currently allowed in much of the project development area. However, the Board also appreciates that the newly created Crown land, which will be in close proximity to several communities, including the City of Calgary, has the potential to increase the use of firearms in the PDA. Given the proximity of roads and houses and the increase in public access to the project development area, the Board understands that the public could be at an elevated risk from the use of firearms. The Board, as a condition of approval, requires that AT/AEP ensure that the use of firearms and potential impact on public safety be a matter of consultation with the First Nations Land Use Advisory Committee and the Joint Land Use Advisory Committee. The Board expects that the GoA will incorporate the input from the two aforementioned land use committees and resolve the future use of firearms in the PDA.

7.4.3 *Concerns of Adjacent Landowners*

The Board recognizes that several requests were made by adjacent landowners to address concerns related to potential negative impacts from increased public access. The Board believes that these concerns were adequately addressed, given commitments made by AT to install wildlife friendly fencing around the perimeter of the PDA and that AT is open to discussing localized berming and planting trees and shelter belts with landowners. Wildfires and fire safety were also concerns of adjacent landowners. This issue is discussed in more detail in Section 17, Public Safety. The Board expects that the Joint Land Use Advisory Committee will serve as a forum for discussing these concerns.

7.4.4 *Calalta Franchise Agreement*

The Board understands that the Project has the potential to impact Calalta's future revenues from its water utility franchise agreement with Rocky View County, as 14 quarter sections of land in the agreement area will not be available for future private development.

Calalta should have been aware of the Project when it became public in 2014. Further, the details of the Project, including disclosure about which lands would be impacted, was made available in the 2018 public notice that invited comment about the EIA. The Board accepts that AT's public disclosures about the Project were well publicized and should have been known to Calalta. Calalta's subsequent negotiations with Rocky View County were not completed until 2020. The Board submits that Calalta had ample opportunity to incorporate information regarding the Project in those negotiations, and declines Calalta's request for a condition to negotiate compensation with Alberta Transportation.

7.4.5 Land Acquisition and Expropriation

Alberta Transportation has committed to engage respectfully with local landowners during land acquisition. They reiterated that their preference is to obtain land voluntarily rather than through expropriation, and advised that some lands have already been acquired voluntarily. The SCLG is concerned that assessed values for properties will be simple “table top exercises”, and will not accurately reflect the value of their properties. The Board has reviewed AT’s Land Acquisition Program and observed that it includes a thorough explanation of the land acquisition process, including assessment, and allows landowners to hire their own assessor to appraise properties at Alberta Transportation’s expense, as long as the assessor is accredited. The Board is satisfied that AT’s Land Acquisition Program provides for respectful acquisition and fair assessment, including an independent second opinion. The Board also notes that Alberta Transportation is bound by the requirements of the *Expropriation Act*.

Landowners provided the Board with videos and photos of their properties, and descriptions of the multi-generational ranching families and the agricultural heritage within the land use area. They explained how they have been stewards of the land and expressed the feelings of loss they will experience if the Project is approved and they must sell their private property to the GoA. The Board thanks the landowners for sharing these personal accounts and wishes to express respect for them and the love they have for their land, as well as empathy for the situation.

7.5 Conditions

3. The Operator shall:
 - a) strike a Joint Land Use Advisory Committee consisting of members of Indigenous groups and the local community. The Board is hopeful that members of the committee will reach consensus recommendations about potential land uses and naming of the Project that may be included in a draft future Land Use Plan. The committee will be dissolved when the GoA finalizes the Land Use Plan for the Project or later at the discretion of the Operator;
 - b) ensure that the use of firearms in the PDA and its potential impact on public safety be a matter of consultation with both the First Nations Land Use Advisory Committee and the Joint Land Use Advisory Committee.

SECTION 8 AQUATIC ECOLOGY

8.1 Summary from the Application (EIA)

For the assessment of aquatic ecology, the local assessment area (LAA) included the main channel of the Elbow River from Elbow Falls to the Glenmore Reservoir, as well as the project development area (PDA) and the watersheds of several Elbow River tributaries that run through the PDA. (Maps showing assessment areas are included in Appendix C.) The flow of these tributaries will be redirected during all phases of the Project.

Baseline requirements under the terms of reference for the environmental impact assessment (EIA) were to provide an assessment of aquatic resources that may be impacted by the Project. This included species composition, distribution and movement, abundance, habitat use, habitat quality, and life history parameters of fish populations that reside within the LAA. Assessment of benthic invertebrate populations was also a requirement.

The baseline assessment was based on a review of pre-2014 population studies on the Elbow River and field work conducted during the 2014 to 2018 period and an additional population study using electrofishing techniques in the summer of 2020. Baseline assessment elements have been documented in the environmental impact assessment and further expanded in subsequent supplemental information requests.

8.1.1 Fish Populations

Quantitative fish population abundances between Elbow Falls and Glenmore Reservoir were estimated using pre-existing Fisheries and Wildlife Management Information System (FWMIS) data and surveys conducted as part of the EIA. An additional electrofishing survey was completed in August 2020 in response to a supplemental information request. Alberta Transportation (AT) asserted that this approach adequately characterizes the community in the manner needed to plan mitigation measures, adequately assess Project residual effects, and supports a *Fisheries Act* (Canada) application and offsetting plan.

The EIA identified 19 species of fish that are known to occur in the Elbow River watershed. Field data included captures or observations of 16 of the 19 species. The other three species may also occur but in such low numbers that they are hard to detect. Alberta Transportation indicated that the 2020 fieldwork supports, and is consistent with, the original EIA assessment.

The 2020 survey and original EIA assessments of the fish population led to the following conclusions:

- The number of adult fish in the Elbow River ranges between 4,185 and 5,860. The total population (including adult, juvenile, and fry) ranges from 139,495 to 1,172,000.

- Relative abundance values from summer 2020 fieldwork generally align with the values presented in the EIA.
- Exceptions included longnose dace which were found in larger relative abundance in 2020 compared to values reported in the EIA. This lowered the relative abundance values of other species. Mountain whitefish and bull trout were lower in 2020 compared to abundance values reported in the EIA.
- Based on relative abundance, brook trout, brown trout, and bull trout comprise about 70 per cent of the fish community in the Elbow River
- Bull trout presence and abundance in the Elbow River downstream of Bragg Creek is low, as demonstrated by 2020 fieldwork and FWMIS records and data.
- The relative abundance values for bull trout derived from Project fieldwork were lower than those derived from historical/desktop data. It is unknown if these low capture rates reflect a long-term trend, a temporary fluctuation in the population, or sampling bias.

8.1.2 Fish Distribution and Seasonal Movement

Fish species distribution was developed by assessing populations within three sections of the Elbow River. The location of fish species during different biologically sensitive periods was predicted using available FWMIS data for the Elbow River. Barriers do not exist between Elbow Falls and Glenmore Reservoir; therefore, resident fish species can potentially be found anywhere within this reach. The distribution provides information on where resident species can be found at different times of the year and it can be inferred that fish move between the areas in which they were identified throughout the year. Resident fish are generally distributed in the downstream reaches in the spring and move upstream in the summer. It is unclear where species overwinter, likely in downstream reaches.

Fieldwork to survey resident fish populations was conducted between August 3 and 13, 2020 during the second half of biologically significant period 2 (June 16 to September 25). Major life cycle events for bull trout occur during this period, including migration, spawning, and egg incubation. Other salmonids also go through critical life stages in biologically significant period 2. Data from fieldwork was generally consistent with information presented in the EIA for this period. Bull trout were not captured or observed downstream of the Project; brown trout were captured further upstream than expected.

During the summer 2020 field work, bull trout were predominantly found within the upper reaches of the local assessment area (Bragg Creek to Elbow Falls). This differs from historical records which indicate a more uniform distribution between Elbow Falls and the inlet to Glenmore Reservoir. This could indicate that bull trout presence downstream of the Project is limited or spawning movement upstream began in early August.

Bull trout may move downstream of the Project site to find overwintering habitat during the fall; and migrate upstream past the proposed Project site in summer to spawn in the upper reaches of the LAA below Elbow Falls.

8.1.3 Fish Passage through Service Spillway

An assessment of fish passage mitigation measures was undertaken for fish sizes of 25 millimetres (mm), 250 mm, and 1000 mm, and for all fish species found in the Elbow River grouped by their swimming ability. Based on the assessment, fish passage will be maintained during dry and post-flood operations for all species and sizes where passage is possible under existing (baseline) conditions.

Project features that facilitate fish passage include the design of the service spillway and the stilling pool. The service spillway gates, when in their lowered position during dry operations, have a very broad, flat profile. When flows are lower than 4 cubic metres per second (m³/s), it is possible that the water depth above the lowered gates will be too shallow for fish to pass. During periods of low flow, the river right (south) gate can be raised to ensure all flow passes through the left gate. Manipulating the gates during low stream flows will maintain aquatic connectivity by providing depth for passage through the reach. Shaping of the stilling pool below the spillway gates and addition of in-stream structures to provide fish resting areas will assist upstream fish passage during the spring freshet and other high flow events up to the one in ten (1:10) year flood. The fish passage structures will improve passage during dry and post-flood operations under flow conditions that are both below and above normal. Limitations on upstream fish passage are not predicted for any species or size class during dry operations. Hindrances to downstream migration of fish during dry operations are not predicted.

Conditions and engineering criteria for fish passage are well understood. However, a good understanding will not, in itself, ensure fish passage. Fish passage conditions will be monitored during construction and operation.

Fish passage during construction will be maintained by constructing coffer dams and stream diversions in a manner that achieves required depth and volume of flow. Further mitigation includes performing in-stream work during periods of reduced fish migration.

The planned mitigation and in-stream structure design improve the hydraulic conditions for fish passage through this reach compared to existing conditions. For this reason, impacts to fish populations as a result of fish passage limitations are not predicted. Monitoring will continue following construction to evaluate and confirm that fish passage criteria have been met.

8.1.4 Fish Habitat/Sedimentation

Suspended sediment will have an acute effect on fish health and survival, whereas sediment deposition throughout the Elbow River could affect fish habitat. Operation of the off-stream reservoir will alter the hydrological regime of the Elbow River downstream of the Project site, though this change is not expected to alter channel forming flows.

Fish habitat was characterized within representative reaches throughout the Elbow River during development of the EIA. Fish habitat in the Elbow River was surveyed and mapped between late October and early December 2019. Habitat quality and presumed habitat use was assessed using habitat suitability index ratings for different life stages of resident fish populations including bull trout, mountain whitefish, rainbow trout, and brown trout.

Predicted changes vary considerably within the LAA. The Project results in increases in habitat suitability for specific reaches and decreases for others. Statistically significant differences in habitat suitability were identified for the 1:10 year flood, including for the brown trout fry life stage, bull trout juvenile and fry life stages, and rainbow trout fry life stage (all related to decreases in total wetted surface areas).

Sediment deposition upstream of the service spillway is not expected to alter the channel gradient throughout the stilling pool and fish passage structures, which have been designed to allow sediment to pass downstream. In addition to these design considerations, post-flood operations will include visual inspection of the fish passage structures, stilling pool, service spillway, and diversion structure backwater area for deposition that can affect aquatic connectivity and fish passage. Accumulated sediment will be removed if necessary.

Modelling predicted that the Project would result in a quantifiable change in available habitat areas and decreased habitat quality in some areas of the Elbow River for juvenile and fry life stages. Habitat degradation will be mitigated through offsetting and an offsetting plan that will be developed with Fisheries and Oceans Canada. AT is committed to offsetting habitat loss through efforts that will enhance existing habitat, or the creation of new habitats through the *Fisheries Act* process. With the implementation of offsetting measures, it is expected that the productive capacity of fish species in the Elbow River will not decline due to the Project. The Project is expected to operate infrequently, and the loss of habitat that would be experienced during operation is not expected to result in a significant residual effect on fish habitat.

In order to more fully understand Project effects on habitat, sediment loads, and fish health in the river, Alberta Transportation compared scenarios for the 1:10 year, 1:100 year, and design floods with and without the Project in place. Without the Project in place (essentially existing or baseline conditions), juvenile and adult salmonids are predicted to experience sublethal effects during a 1:10 year and 1:100 year flood and lethal to para-lethal effects during a design flood. Predicted sublethal effects included reduction in feed rates, physiological stress, and disruption of home habitat. Para-lethal effects were mainly expressed through interruption of breeding cycles. Lethal effects would include stranding in above bank pools as well as mortality related to changes in water quality. Non-salmonid adults are predicted to experience sublethal effects during the 1:10 year and lethal and para-lethal effects for flood events of 1:100 year or greater.

With the Project in place, the model predicted sedimentation patterns would change, but the 1:100 year and design floods would still produce lethal and para-lethal effects on juvenile and adult salmonids. However, effects on juvenile and adult fish during a 1:10 year flood are predicted to fall below the threshold for causing sublethal effects.

In all the scenarios modelled, eggs and larvae of all species are predicted to experience lethal and para-lethal effects regardless of the magnitude of the flood. With the Project in place, water released from the reservoir will contain suspended sediment but is not expected to contribute additional lethality on eggs and fry above that of unmitigated flood conditions.

Release scenarios were compared for the 1:100 year flood. All fish groups are predicted to experience lethal and para-lethal effects during early release but not for late release. The lethal and para-lethal effects during early release are expected to extend downstream and are not reduced significantly between the release point and the Glenmore Reservoir. Impact on fish during early release is largely attributable to suspended sediment concentration but these concentrations are similar to concentration in the river as flows decline post flood. In the late release scenario, reservoir water will be less turbid due to settling in the reservoir but will likely be lower in oxygen and at higher temperature than river water. The earlier release of water from the reservoir, while the water is still cool and relatively more oxygenated, and when the Elbow River is still turbid, is expected to have less of an impact on fish and aquatic plant and animal life compared to a later release, as the difference between the reservoir and river water concentrations will be less.

Entrainment of woody debris is not anticipated to reduce fish habitat and aquatic productivity downstream of the Project. The Project will operate infrequently, and entrainment of large woody debris is only associated with relatively higher magnitude floods.

Alberta Transportation will aim to offset the changes to fish habitat associated with limiting in-stream flows to 160 m³/s during flood events. Geomorphic and ecological components will be ranked and prioritized as part of the *Fisheries Act* authorization process to determine the most effective offsetting approaches.

Sediment laden water will be returned to the river as the reservoir is drained. However, release of water from the reservoir is not expected to change sediment deposition patterns or impact fish habitat between the release point and the Glenmore Reservoir.

8.1.5 Fish Entrainment and Mortality

AT developed fish mortality estimates based on the following assumptions:

- The number of adult fish in the Elbow River ranges from 4,185 to 5,860 and the total population (including adult, juvenile, and fry) ranges from 139,495 to 1,172,000.
- The number of fish entrained is proportional to the volume of water diverted into the off-stream reservoir.
- The projected worst case scenario for fish entrainment in the off-stream reservoir during flood operations is approximately one per cent of the total population of the Elbow River fish species (between Elbow Falls and the inlet to Glenmore Reservoir).

- The primary causes for fish mortality in the off-stream reservoir will be duration of residency and prolonged exposure to suspended sediments. Additional risks to fish survival are injury, predation, increased water temperature, decreased dissolved oxygen, and stranding.
- Mortality of 20 to 40 per cent could occur for juvenile and adult salmonids entrained in the reservoir during a 1:100 year flood (early or late release).
- Mortality of 20 to 40 per cent for adult salmonids and 40 to 60 per cent for juvenile salmonids could occur following entrainment during the design flood (early release).

Based on the assumptions above, 42 to 50 adult fish and 1,395 to 11,720 fish in all classes would be entrained during the design flood. Entrainment would result in the death of 17 to 24 adult fish and a total ranging from 558 to 4,688 individuals in all classes. These estimates do not account for fish rescue in the reservoir, which may increase the survival rate.

Fish mortality estimates remain somewhat uncertain, but entrainment during flood operations is not expected to exceed one per cent of the total Elbow River fish population with fish immediately upstream of the diversion works most at risk. During a year in which the Project is operational for flood mitigation, brown trout and brook trout are the sportfish most likely to be entrained. Bull trout entrainment during flood operations is expected to be low as they are not commonly found immediately upstream of the proposed location for the diversion works.

The reservoir would be drawn down when bull trout are migrating to the upper reaches of the Elbow River to spawn; therefore, bull trout mortality as a result of reservoir water release is not expected. Reservoir water drawdown and release will coincide with rainbow trout and cutthroat trout incubation and rearing periods. Release will likely impact fry incubation and rearing cohorts downstream of the project. This loss is expected to be similar to the loss that would occur during a natural flood event.

Mitigation of mortality includes engineering Project structures to reduce the risk of injury during entrainment or release (e.g., grading as necessary to reduce stranding in isolated pools within the reservoir and managing release to minimize the duration of reservoir water retention). A draft fish rescue and fish health monitoring plan describes AT's commitments to mitigate and monitor the potential effects of flood operation on fish health. This includes tracking injury and mortality within the reservoir and after fish have been released back into the Elbow River. Fisheries and Oceans Canada will also require offsetting any harmful alteration, disruption, or destruction of fish habitat attributable to construction and operation of the Project and the unavoidable loss of fish. Monitoring and reporting of entrainment mortality will confirm whether predicted mortality conforms with actual mortality rates. Fish monitoring and rescue will be adaptively managed as required to meet actual conditions.

Residual effects on fish mortality are expected to be not significant. The proportion of the fish population entrained within the reservoir is low relative to the overall population in the Elbow River. Bull trout mortality as a result of entrainment is expected to be not significant because of low occurrence near the Project and downstream of the Project during expected flood

operations. Negative effects including lethal effects to bull trout are expected to be minimal during reservoir drawdown as they will be spawning in the upper reaches of the Elbow River during the release period. Fish entrainment during flood operations is not expected to threaten the long-term sustainability or productivity of fish populations in the Elbow River.

8.1.6 *Dissolved Oxygen and Temperature*

Dissolved oxygen is expected to decrease and temperature is expected to increase in water retained in the reservoir relative to water in the river. Release of water will potentially reduce dissolved oxygen and increase temperature in the mainstream of the Elbow River. The magnitude of these effects will vary depending on retention time, release rates, ambient conditions, and river flows. Stress resulting from lower dissolved oxygen and increased temperature are not expected to have negative effects on fish use of habitat. The effect on viability of fish populations in the Elbow River, as a result of changes in dissolved oxygen and temperature, was assessed as not significant and reversible.

8.1.7 *Methylmercury*

Microbial activity under saturated soil can result in the methylation of inorganic mercury to methylmercury. Methylmercury is a toxic form of mercury that can bioaccumulate in aquatic food webs. Both mercury methylation and demethylation occur concurrently in saturated soils, with equilibrium established within days to weeks. Because vegetation and soil in the reservoir would be inundated during flood operation, a potential exists for methylmercury release into the reservoir water and back into Elbow River.

The estimated low and high methylmercury concentrations in all diversion and release scenarios are below the Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guideline for the Protection of Aquatic Life. The reservoir area is not expected to continue to contribute methylmercury after it is drained. Infrequent use of the reservoir and relatively short retention times is expected to limit methylmercury production and release. Significant effects on aquatic organisms are not expected.

8.2 **Views of the Interveners**

Stoney Nakoda Nations

Fish, especially bull trout, are of great cultural importance to the Stoney Nakoda Nations (SNN). The SNN expressed concern that fish health and fish habitat health may be negatively impacted as a result of the Project and these impacts may have been underestimated. Traditional understanding of water, fish capture methods, and the SNN's asserted water rights are not considered in the material provided by Alberta Transportation. For example, the Stoney Nakoda Nations shared that they have traditional ways of capturing fish using natural materials from the landscape. These ways do not pose a high mortality risk to the fish captured and would allow them to be safely held until they could be transported to the river and released. The SNN expressed concern that alternate methods of capture have not been considered in the current

fish rescue plan. Until they have a full understanding of the final fish rescue and fish habitat offsetting plans, the Stoney Nakoda Nations do not feel their concerns related to fish have been fully addressed.

SR1 Concerned Landowners Group

The SR1 Concerned Landowners Group (SCLG) stated that there is a relatively high degree of uncertainty related to the understanding of aquatic ecosystems, let alone modelling their interaction with the Project and then managing them for intended outcomes. Furthermore, referencing a letter from Alberta Environment and Parks submitted to the Board, the SCLG viewed the possibility of bull trout potentially being extirpated as a potential negative outcome of the Project. Though uncertainty remains in the impacts and consequences on bull trout and fish and fish habitat, the SCLG acknowledged that Alberta Transportation has put in an appropriate amount of effort, adequately assessed and addressed most of the fish and fish habitat concerns, and has been willing to look at all potential solutions related to fish and fish habitat.

While the SR1 Concerned Landowners Group agreed that materials submitted by Alberta Transportation are thorough and address required data collection and analysis for fish, fish habitat, and aquatic ecosystems for projects of this nature, the SCLG stated that pre-project baseline data invariably misses some critical information and situations. Furthermore, their expressed opinion was that further upfront efforts would be more beneficial than simply monitoring and adaptively managing impacts once the Project is constructed and in operation. Continuous monitoring prior to construction could be used to update mitigation activities and to better incorporate all environmental considerations before final design and construction. The SR1 Concerned Landowners Group pointed out that fish population and distribution estimates in June could be different than those obtained during the field surveys. The SCLG proposed that collection of baseline data should be continued on the Elbow River prior to Project construction and operation.

The SCLG submitted that the in-stream structures and channel modifications as designed will maintain fish passage under the normal range of flow conditions. The SR1 Concerned Landowners Group's opinion was that the proposed structures will be superior to a classic fishway. While generally supportive of the design, the SCLG recommended that it would be beneficial to further demonstrate that the service spillway is not the limiting factor to fish passage at low flows. This could be completed through further modelling of fish passage at the structure during low flows.

The SCLG felt strongly that everything possible should be done to keep fish out of the diversion channel and suggested additional measures to limit fish entrainment. These included sonic devices near the diversion structure and louvres on the lower portions of the debris deflection rack near the diversion channel inlet. The SCLG submitted that the entrainment estimates made by Alberta Transportation appeared to be reasonable.

The SR1 Concerned Landowners Group suggested that alternative scenarios for reservoir release, such as limiting release rates to 10 per cent of river flows, should also be considered, and modelling of these alternative scenarios could be incorporated into operation design. The

SCLG did acknowledge that slower releases back into the Elbow River would result in longer residence times of water within the off-stream reservoir and would likely increase mortality of entrained fish. The SCLG acknowledged that early release scenarios, as requested by federal regulators, would avoid some adverse effects on fish and fish habitat, and that release scenarios would be assessed and included in approvals related to federal regulators.

The SCLG placed considerable emphasis during the hearing on the challenges that exist in capturing fish within a reservoir. They recommended that a robust and detailed fish rescue plan be developed that incorporates all structural or operational aspects required for successful fish rescue. They also noted that mitigation measures aimed at keeping dissolved oxygen levels as high as possible during filling and release would be beneficial. The SR1 Concerned Landowners Group agreed that the draft fish rescue plan provides a reasonable starting point.

8.3 Views of Alberta Transportation

Alberta Transportation indicated that they are aware of and have regard for the concerns raised by Indigenous groups and landowners. Alberta Transportation was confident that the assessment and analysis related to fish and fish habitat is correct and that no further baseline work is required. Going forward they plan to rely on monitoring to verify predictions and mitigate as required.

AT disagreed with the Stoney Nakoda Nations that impacts related to aquatic resources are underestimated. They acknowledged the reasonableness and even-handedness with which the SCLG reviewed effects on fish and fish habitat and indicated that the written submission of the SCLG will be forwarded and used in consultation with Fisheries and Oceans Canada. Alberta Transportation indicated that extensive surveys were conducted to assess fish populations and fish habitat, with field work conducted in 2016, 2019, and 2020. AT believed field work, including the 2020 electrofishing survey, was conducted using the most appropriate methods for the time and place. Furthermore, the surveys provided robust support for the desktop reviews as well as information used to develop monitoring and mitigation methods. Alberta Transportation felt the data collection and analysis exceeded what would normally be expected for an environmental impact assessment. Additional baseline data collection is not proposed or deemed to be necessary.

Alberta Transportation submitted that they have adequately demonstrated that fish passage will be maintained during both non-flood and post-flood operations for all species and sizes where passage is currently possible. Further modelling is not proposed or felt to be necessary.

AT submitted that there would be limited interaction of the Project with fish and fish habitat during dry operations. No link has been made between flooding in general and potential for disease in fish in the Elbow River; and none is expected as a result of the Project. Alberta Transportation believes the off-stream design of the reservoir will have relatively less impact on fish and fish habitat than an in-stream reservoir.

Alberta Transportation stated that fish entrainment is expected during flood operations and that AT's estimates of entrainment rates were appropriately calculated and assessed, though some uncertainty remains. Alberta Transportation agreed that all reasonable measures should be employed to prevent entrainment and were open to suggestions to reduce the number of fish entering the diversion channel, such as the use of sonic devices.

AT indicated that once reservoir draining commences post flood, the low-level outlet allows entrained fish to escape back to the Elbow River. Any fish that move through the low-level outlet and unnamed creek could find refuge at or near the creek's confluence with the Elbow River.

Alberta Transportation acknowledged that the number of fish requiring rescue will be proportional to the amount of water diverted during any given flood event and that rescue efforts will be scaled appropriately for larger floods. The draft rescue plan proposes that rescue activities focus on the perimeter of the reservoir, with work progressing inwards as release of water proceeds. The primary goal of concentrating activity along the perimeter is to ensure that fish stranded in pools are not missed as the water level drops. Fish rescue activities will be led by appropriate professionals with expertise in electrofishing and fish transport. Procedures will be put in place to acquire the necessary permits for fish rescue operations from Fisheries and Oceans Canada and Alberta Environment and Parks in a timely manner.

Alberta Transportation acknowledged that the Project has the potential to interact with bull trout in the Elbow River; however, they did not agree with the statement by Alberta Environment and Parks (AEP) brought forward by the SCLG that the Project could result in extirpation of bull trout from the local fish population. Alberta Transportation's view was that the claim was unsubstantiated, and that appropriate information has been assessed, evaluated, and supports the conclusion that bull trout will not be extirpated. AT pointed out that the upper reaches of the Elbow River are relatively more important for bull trout and that locating the Project further downstream avoids areas critical for their life cycle. Alberta Transportation did acknowledge that bull trout numbers in the Elbow River are low and the Project may impact their numbers, but not to the extent that the population would be extirpated.

Alberta Transportation highlighted that they will be required to offset potential residual effects to bull trout and critical fish habitat, in consultation with Fisheries and Oceans Canada. These consultations were ongoing at the time of the hearing, and it was anticipated that all Project activities would align with the relevant regulations and the bull trout recovery strategy.

AT committed to monitoring effects on fish during Project operation and will provide offsetting to compensate for effects on fish habitat. Alberta Transportation reiterated that a fish rescue and fish health monitoring plan would be finalized in consultation with Indigenous groups and implemented as part of the Project.

8.4 Views of the Board

The potential negative impacts on fish populations and the recreational and Indigenous fishery were the main focus of concern by interveners with respect to aquatics. The Board recognizes

that the proximity to the City of Calgary, Tsuut'ina Nation, and the Stony Nakoda Nations, as well as traditional use by other Indigenous groups makes the Elbow River fishery both accessible and culturally important.

8.4.1 *Characterizing Fish Populations*

The Board understands that the wading methodology used in the 2020 electrofishing program may have missed, as indicated in the AEP letter, some larger fish found in deeper holding water, but also notes that relatively few larger/deeper pools exist along the surveyed reach of the Elbow River during late summer. The Board agrees with AT's conclusions that the Project does not pose a significant risk to bull trout populations, and is not likely to lead to extirpation of bull trout from the Elbow River. Alberta Transportation will be subject to conditions imposed by both federal and provincial agencies charged with responsibility for wild fisheries. This includes ongoing characterization of the fish populations that may be impacted by the project, particularly bull trout. The Board accepts Alberta Transportation's assertion that bull trout populations are predominantly found closer to the headwaters of the Elbow and will be less affected by an off-stream dry reservoir lower in the watershed than an in-stream reservoir closer to the headwaters. The Board finds that AT has characterized fish populations sufficiently for the purposes of the public interest determination.

8.4.2 *Fish Passage*

The Board agrees that the measures proposed for the in-stream phase of construction; including channel diversion, maintaining adequate flows, and limiting work to non-critical times; will allow an acceptable level of fish passage.

Fish passage during dry operations was raised as a concern in written evidence but was not a point of contention during the hearing. The SCLG commented that the design of the service spillway was superior to more traditional methods of fish passage such as fish ladders. The Board notes that the double gate design will allow the Operator to maintain sufficient depth for fish passage even at low water by raising one of the gates and diverting greater flow through the remaining gate. Furthermore, the Board accepts expert opinion that the diversion structure is not likely to be the passage limiting reach between Glenmore Reservoir and Elbow Falls during low flow periods. The Board finds that the service spillway as proposed will allow both the upstream and downstream passage necessary for fish to complete their lifecycles, except in the case of diversion events.

Raising the service spillway gates to allow stream diversion will physically block fish from moving upstream. Alberta Transportation has pointed out that the blockage will be infrequent and short in duration. Once diversion is complete and the spillway gates lowered, upstream passage would be restored as water flows return to lower levels. The Board accepts that temporary blockage of fish movement is necessary for the operation of the diversion structure and notes that upstream passage would normally be limited by high stream flows during flood events.

The Board notes that the in-stream works have been designed to a high standard with respect to fish passage and accepts AT's assertion that further modelling and evaluation is unnecessary. Going forward, emphasis on appropriate management and maintenance of the diversion structure during low-flow periods and during post-flood operations will be critical in ensuring continued passage for a variety of fish and fish sizes. This will require detailed and robust monitoring of fish passage to confirm that in-stream components are in fact allowing fish to pass freely.

8.4.3 Fish Habitat/Sedimentation

The Board's understanding of potential impacts of the Project on fish habitat and sediment deposition, and sediment deposition effects on fish life cycles, is summarized in the following key points:

- Fish habitat quality will be permanently reduced in the vicinity of Project diversion works.
- The permanent reduction is a small proportion of the available fish habitat in the LAA.
- Sediment loads will be reduced, and sediment distribution altered in the Elbow River downstream from the Project.
- Fish habitat will be altered by the changes in sediment load and distribution.
- Alterations in habitat will negatively affect juvenile and fry life stages to a greater extent than adult stages.
- Longer term, the attenuation of high magnitude floods will alter riparian ecology downstream of the Project.

The location and areal extent of habitat lost permanently to the construction of the in-stream works is well understood. Alberta Transportation is required to offset the loss through creation or improvement of habitat elsewhere in the watershed. Predicting the location and area of impacted habitat downstream from the Project is more uncertain, but Alberta Transportation will also be required under the *Fisheries Act* to mitigate and potentially offset any significant harms caused by changes in sediment distribution or other Project related factors. The development of an offset plan is required and will be reviewed and approved by Fisheries and Oceans Canada as part of their permitting process. The Board sees no reason to comment further on this topic other than to encourage Alberta Transportation to look to the Elbow River and tributaries for habitat offsetting opportunities before exploring opportunities in other reaches of the larger Bow watershed.

The Board understands that attenuation of high magnitude floods will, over time, change riparian and riverine ecology. On completion of the Project, the design flood will be reduced to the equivalent of a 1:50 year flood between the Project and Glenmore Reservoir. Flood fringe areas that would have been historically inundated during higher magnitude floods will be flooded

less frequently, if at all. The river channel will tend to be more confined and less braided as fewer side channels are created and this may affect available fish habitat. In the Board's view, the transformation from riparian and flood plain to upland ecosystems as well as the changes to river morphology, while they may be undesirable from a habitat preservation viewpoint, are unavoidable consequences of the Project meeting its flood mitigation objective. On balance, the Board finds that the benefits of flood protection to property and public safety outweigh the project effects on river morphology.

8.4.4 Fish Entrainment and Survival of Entrained Fish

The Board acknowledges that a high proportion of the fish in the reach immediately upstream of the diversion structure are likely to be entrained in the reservoir during flood operations but agrees with AT's position that entrained fish will be a relatively low proportion of the total fish population between Glenmore Reservoir and Elbow Falls. The SCLG suggested a number of additional measures, such as sound barriers and louvres on the debris deflection structure that might be used to reduce entrainment. The Board notes that during the hearing, Alberta Transportation agreed in principle with the idea that prevention of entrainment is preferable to attempted rescue, post flood. During their finalization of diversion structure design, the Board encourages Alberta Transportation to fully investigate and implement strategies that reduce the number of fish that may become entrained in the reservoir. The Board finds that fish entrainment and mortality during flood operations do not pose a significant threat to the viability of fish populations in the Elbow River.

8.4.5 Dissolved Oxygen, Temperature, and Suspended Sediment

The Board finds the mitigation measures proposed by Alberta Transportation acceptable for reducing construction impacts on in-stream water quality as they relate to aquatic ecology. The Board agrees with the AT's position that any adverse impacts will be manageable, temporary, and reversible.

Alberta Transportation has indicated, and the Board is aware that changes in water quality during floods would have lethal and para-lethal effects on fish populations and that these effects would occur during higher magnitude floods, with or without the Project. AT's modelling data also suggest that with the Project in place, lethal and para-lethal effects would be reduced or eliminated during the more frequently occurring lower magnitude floods. The Board also understands that low dissolved oxygen, higher temperature and suspended solids in the reservoir will impact entrained fish and that combined detrimental effects will likely increase with retention time. Furthermore, impounded water release following a high magnitude flood will lengthen the exposure of downstream fish to the detrimental effects of poor water quality (e.g., relatively higher total suspended sediment). In the Board's view, these negative effects are balanced by the likely mitigating effect of the Project on in-stream fish health and life cycles during lower magnitude floods. Alberta Transportation is on record as preferring an early release scenario for a range of reasons that include mitigating impacts on aquatic ecology, particularly to dissolved oxygen and temperature. While stating a clear preference, AT has committed to monitoring the quality of both river and reservoir waters during release and

adjusting release rates to maintain river water at acceptable levels for dissolved oxygen, temperature, and suspended sediments. The Board finds this approach acceptable, recognizing that the SCLG also supported this approach.

8.4.6 Methylmercury

Concerns that methylmercury may impact water quality and human health have been dealt with in other sections of this report, including Section 10, Surface Water Quality, Section 12, Terrain and Soils, and Section 14, Wildlife and Biodiversity. Of concern here is methylmercury released during inundation of upland soils entering the aquatic food chain. Methylmercury could potentially enter the aquatic food chain through invertebrates, become concentrated through fish, and further concentrated into fish-eating birds and mammals including humans.

The Board accepts that mercury methylation is an inherent function of soil microbial communities placed under anaerobic conditions. Consequently, it will take place while water is being held in the reservoir. Alberta Transportation's position is that short residence times, infrequent inundation, and concurrent demethylation will keep methylmercury levels below CCME thresholds and significant bioaccumulation in fish will not occur. The Board agrees with Alberta Transportation that the risk of ecologically significant accumulation of methylmercury in fish as a result of the Project is unlikely and there will be no unacceptable risks to human health from exposure to methylmercury in fish.

The Board takes note of the response to Undertaking 53 in the NRCB hearing (Exhibit #407) in which Alberta Transportation commits to post-flood monitoring of invertebrate and fish populations for total methylmercury (among other parameters) and finds that this abundance of caution approach is appropriate for this issue.

8.4.7 Feasibility of Fish Rescue

While Alberta Transportation has provided a well-reasoned approach to fish rescue, evidence from highly comparable situations was not presented and appears to be unavailable. In the Board's view, the efficacy of fish rescue efforts will very much depend on circumstances encountered following a flood. These may include water release timing imposed by river flow, air and water temperatures, ability to access drained portions of the reservoir, clarity of the impounded water, and numerous other factors—variables that for the most part cannot be predicted with certainty in advance. Consequently, fish rescue activities need to be adapted to meet the unfolding situation during post-flood operations. An approach to fish rescue that hopes for the best but plans for the worst is appropriate.

Given the low frequency of major floods and the relatively low proportion of the total fish population that are likely to be entrained, the Board has concluded that a total loss of entrained fish, while not desirable, would not constitute a significant adverse effect on fish populations in the Elbow River. Having said that, the Board encourages AT to investigate and implement any feasible alternative capture and rescue methods as well as additional harm reduction approaches that may enhance the survival of entrained fish. The Board is aware that all Project

related fish deaths must be reported to Fisheries and Oceans Canada. The Board requires that Alberta Environment and Parks make those reports available to the public.

The Board understands that the fish rescue plan, like many other required plans, is still in the draft stage with details to be worked out. The Board further notes that a finalized plan is required from other regulators including Fisheries and Oceans Canada and Alberta Environment and Parks as part of their approval and licensing processes prior to the Project becoming operational. Considering the commitments made by Alberta Transportation for development of a comprehensive fish rescue plan in consultation with Indigenous groups, the Board finds that the current draft plan meets the needs of the public interest decision.

The Board acknowledges that the Project will have negative impacts on aquatic ecology including the fish community and appreciated the views provided by both the proponent and interveners on this topic. Clearly, the protection of an aquatic ecosystem and an important recreational and Indigenous fishery is in the public interest and to some extent this interest conflicts with the primary goal of the project, namely flood protection for the City of Calgary. The Board agrees with Alberta Transportation's position that the extent of irreversible impacts is low and that these impacts can either be offset elsewhere in the watershed or mitigated in place. While there is some uncertainty surrounding the potential for ecological damage and the efficacy of mitigation measures with the Project in place, there is considerable certainty on the economic and social damage caused by unmitigated flooding. The huge potential for harm was clearly demonstrated in 2013. In balance, the Board finds that the large positive outcomes of flood mitigation outweigh the minor harms to aquatic ecology that may be attributable to the Project.

SECTION 9 HYDROLOGY AND SEDIMENT TRANSPORT

9.1 Summary from the Application (EIA)

Alberta Transportation's (AT's) hydrology assessment included the movement of fresh water on and beneath the land surface, and through the atmosphere, and also included the transport of sediment. The assessment focused on the Elbow River and Project components (including the diversion channel, off-stream reservoir, and low-level outlet). The hydrology local assessment area included the project development area plus the Elbow River, from Redwood Meadows to the inlet of Glenmore Reservoir. The regional assessment area included the Elbow River watershed from the headwaters to the Glenmore Dam. (Maps showing assessment areas are included in Appendix C.)

9.1.1 Elbow River Watershed

Alberta Transportation described that the Elbow River watershed occurs in the Front Ranges of the Rocky Mountains, Foothills of the Cordillera, and Plains of the Alberta Syncline, having a total area of approximately 1,238 square kilometres (km²). There is a distinct change in hydrology characteristics between the upper and lower watershed. The project development area lies within the foothills portion, in the transition area between the Rocky Mountains and foothills.

The Elbow River flows approximately 113 km from the Front Ranges to Glenmore Reservoir, subsequently flowing through the City of Calgary downstream of the Glenmore Dam to its confluence with the Bow River. The Elbow River is one of the steepest in Alberta (with an overall gradient of 0.9 per cent). A greater gradient near the headwaters results in a steep, generally single channel mountain stream with pool-riffle sequences. As the gradient gradually decreases downstream towards Glenmore Reservoir, the river transitions to a weakly braided/wandering pattern contained within a broad floodplain, with typically poorly defined tributaries. The Elbow River plays an important role for surface water flow, drinking water supply, and in regional surface water-groundwater interactions.

Alberta Transportation has considered the Elbow River as a navigable waterway and elected to "opt in" to the *Canadian Navigable Waters Act*. River passage through the Project will be addressed under that legislation.

9.1.2 Elbow River Hydrology

Alberta Transportation characterized Elbow River hydrology through use of historical information and data from existing stream-flow monitoring stations. The Elbow River has a median

discharge of approximately five to eight cubic metres per second (m³/s), with typically low winter discharges and runoff, and higher discharge and runoff in the spring when runoff is dominated by snowmelt. Mean average and mean peak monthly flows are both higher in June, identifying it as the primary month for flooding.

AT outlined that high flow events in the Elbow River are complex, with changes in magnitude reflecting different combinations of driving mechanisms. High magnitude discharge events (i.e., floods) occur when substantial rainfall occurs during spring snowmelt at higher elevations.

AT provided flood frequency estimates based on information and data from existing gauging stations (Table 9-1).

Table 9-1. Estimated Flood Frequencies for the Elbow River at the Diversion Site (modified from Table 6-6 in the EIA, Volume 3A, Section 6)

Recurrence Interval (years)	Peak Discharge (m³/s)
500	1,800
230	1,150 ¹
200	1,110
100	765
50	530
20	330
10	200
5	140
2	70

¹ Represents the estimated recurrence interval and peak discharge of the 2013 flood

The unnamed creek will be incorporated in the Project by receiving released water from the low-level outlet works. Alberta Transportation estimated mean flow in the unnamed creek as approximately 30 litres per second (L/s) or 0.03 m³/s, when water is present (based on one year of data). Surface flow is generally only initiated after prolonged rainfall or when rain falls on partially frozen ground in the small tributaries in the area that drain to the unnamed creek and Elbow River.

9.1.3 Elbow River Sediment Transport

AT described the dominant suspended sediment sources as derived from Elbow River channel and riparian erosion of colluvium and till, with considerable variation throughout the watershed. Data suggested that there is considerable variability in particle size along the Elbow River, though it is dominated by gravel-sized material and coarse silt and sand. Suspended sediment concentrations have a significant effect on water quality (See Section 10 Surface Water Quality).

Alberta Transportation outlined that total suspended sediment concentrations in the upper Elbow River are generally greatest during the summer, lowest in the fall and winter, and intermittent in the spring. Concentrations increase from upstream to downstream. Most sediment transport in the Elbow River occurs during high discharge events. AT believes that a substantial portion of the suspended sediment load during high flows, particularly fine sediment, goes into storage between Bragg Creek and Sarcee Bridge. It is assumed that the Elbow River is not sediment supply limited during floods.

9.1.4 *Project Interactions with Hydrology*

Alberta Transportation described that the Project would operate to divert all flood flows within the Elbow River greater than 160 m³/s, up to a maximum diversion flow capacity of 600 m³/s (i.e., up to a maximum Elbow River discharge of 760 m³/s). Discharge volumes greater than 760 m³/s would combine with the discharge allowed to pass the diversion structure and down the Elbow River (e.g., 160 m³/s plus flows greater than 760 m³/s minus 600 m³/s that is diverted to the off-stream reservoir). Elbow River discharge will be monitored using existing monitoring stations, as well as an additional station to be established near the diversion inlet and service spillway. The combined storage capacity of the Project (~78,000,000 m³) and Glenmore Reservoir (10,000,000 m³) is required to mitigate the design (2013) flood. The EIA indicates that Alberta Environment and Parks Operations and the City of Calgary would be in communication with one another in advance of and during the flood season.

Alberta Transportation presented two scenarios of how long diverted water will be stored in the off-stream reservoir:

1. early release – water stored until flows in the Elbow River recede to less than 160 m³/s
2. late release – water stored until flows in the Elbow River recede to less than 20 m³/s

In the early release scenario, the release rate would be staged to ensure flows in the Elbow River downstream of the confluence with the unnamed creek do not exceed 160 m³/s. The released water will be conveyed back to the Elbow River from the off-stream reservoir through the low-level outlet works and the unnamed creek channel. Release rates can vary through management of the low-level outlet, which has a maximum design release of 27 m³/s. The Project has been designed to reduce flood flows in the Elbow River regardless of when flooding may occur. The volume of water diverted during a flood is determined by the magnitude and duration of the flood. Water volumes and flow rates associated with the highest flood on record (2013) were used to design the Project. The operational threshold (160 m³/s) is equivalent to a one in seven (1:7) year flood, which has a 14 per cent chance of occurring in any given year.

Alberta Transportation committed to ensuring that regardless of the Project's frequency of operation, downstream withdrawal licences will not be curtailed or affected. Although flood mitigation activities at Bragg Creek and Redwood Meadows may slightly alter/increase flood flows in the Elbow River at the location of the Project, Alberta Transportation indicated that measurable effects are not expected.

9.1.5 Project Effects on Hydrology

Alberta Transportation outlined that the Project has the potential to affect hydrology by causing changes in the hydrological regime, suspended sediment transport, and channel morphology. Changes in hydrology due to the Project relative to baseline conditions were assessed as either negligible (less than 10 per cent change), low (10 to 15 per cent change), moderate (15 to 30 per cent change), or high (greater than 30 per cent change).

The Project has the potential to affect hydrology during construction and dry operations due to surface alterations adjacent to the Elbow River, though any changes in hydrology were believed to be unmeasurable within the larger hydrological regime of the Elbow River. Alberta Transportation indicated that groundwater, as well as any water in the intermittent tributaries intersected by the diversion channel and reservoir, will pass through the reservoir and low-level outlet and that these volumes will be relatively negligible when flow is present. Water needed for construction will be sourced and hauled in by a permitted supplier. Alberta Transportation has proposed a number of mitigation and monitoring activities, including best management practices and erosion and sediment control plans during construction and dry operations of the Project. No interactions are expected at these times relative to baseline conditions within the Elbow River and low-level outlet. As such, changes in hydrology and sediment transport during construction and dry operations were assessed as not significant.

Alberta Transportation highlighted that the Project will significantly modify Elbow River hydrology during flood and post-flood operations: the desired outcome of the Project. The diversion of water from the Elbow River to the off-stream reservoir will temporarily delay the transfer of water to Glenmore Reservoir by reducing peak volumes and flows for each scenario assessed (Table 9-2).

Table 9-2. Peak Flow Reduction Estimates in the Elbow River during Flood Operations of the Project

Scenario	Peak Flow Without Project (m³/s)	Peak Flow With Project (m³/s)	Reduction (%)
1:10 year flood	200	160	20
1:100 year flood	760	160	80
Design flood (2013)	1,150	550	50

Some backwater effects upstream of the diversion structure and the subsequent release of water through the low-level outlet will also alter flow patterns in the Elbow River. These intentional changes in water flow and sediment transport may also affect water quality, aquatic life, and other ecological and human receptors.

Regardless of release scenario (early or late), Alberta Transportation outlined that little effect will be seen on Elbow River hydrology. For example, during a design flood and early release

scenario, flows would remain at 160 m³/s in the Elbow River for approximately eight hours longer than without the Project.

9.1.6 Project Effects on Sediment Transport

Operation of the Project will change the nature of bedload transport and sediment load/yield, resulting in decreases to downstream sediment aggradation and degradation within the Elbow River in the local assessment area and the low-level outlet. This may affect ecologically important processes, including:

- overbank deposition;
- bank erosion;
- channel morphology;
- scouring and maintenance of large pools;
- maintenance and formation of side channels; and
- fish habitat structure.

Alberta Transportation indicated that the majority of changes to ecological function cannot be mitigated, but offset options may be possible (e.g., through *Fisheries Act* authorization).

Inflow rates and suspended sediment concentrations, as well as release times and rates, will affect sediment movement and deposition within the off-stream reservoir. For example, Alberta Transportation expected that earlier release times will reduce the spatial extent of sediment deposition within the reservoir due to the reduced amount of time that water spends in the reservoir. During retention in the reservoir, a portion of suspended sediment will permanently settle at the bottom; the longer the retention time, the greater the deposition. Sediment remaining in suspension would be returned to the Elbow River during release, together with remobilized and re-suspended sediment.

AT indicated that sediment transport and the geomorphology of the low-level outlet (including the unnamed creek) would also be modified by the release of water from the reservoir, though with design measures (e.g., armouring, silt fencing, etc.) and adaptive management, these effects may be mitigated.

Alberta Transportation concluded that regardless of the flood and/or release scenario, diversion of water to the off-stream reservoir is unlikely to have a measurable effect on annual or long-term flow rates or volumes, or sediment transport (i.e., hydrology) of the Elbow River. The Project will cause a high magnitude effect on discharge and suspended sediment concentrations and yields in the Elbow River downstream from the Project.

9.2 Views of the Interveners

Stoney Nakoda Nations

The Stoney Nakoda Nations (SNN) shared the belief that water is life, and that water and water sources are culturally significant and sacred. They asserted that traditional aspects of water, including descriptions and cultural stories shared by the SNN have not been included in the Project reports or assessments. The Stoney Nakoda Nations feel that the long-term impacts of the Project on water sources remain unknown and that any impacts to water will influence other culturally important aspects, including wildlife.

The SNN felt that requests for funding to conduct a hydrology specific study were denied by Alberta Transportation. The Stoney Nakoda Nations felt that several key pieces of information are not included in the material, or not in enough detail to determine potential impacts to the SNN. The SNN also believed that an understanding of flow control and projects along the Bow River system and total flood mitigation planning need to be considered within the context of the Project on the Elbow River.

SR1 Concerned Landowners Group

The SR1 Concerned Landowners Group (SCLG) submitted that there were issues related to the flood frequency analysis and flood volume estimates conducted by Alberta Transportation. The SCLG felt that the magnitude of floods that have occurred in the past, prior to recorded data, and those that may be expected to occur in the future have not been adequately considered, and subsequently questioned the viability of the Project long-term. Specifically, the SCLG indicated that historical anecdotal evidence on flooding in the Bow River, which occurred prior to the record of measured data, should be included in the flood frequency analysis for the Elbow River. The SCLG also suggested that future flood events should be considered, as the frequency and intensity of flood events are going to increase in the future. The SCLG was of the view that climate variability and climate change has not been adequately assessed as part of the application and has not included consideration of wet and dry periods over long periods of time.

The SCLG was of the opinion that the design flood may not represent a true 1:200 year flood event if all historical information were considered. The SCLG presented an alternative method of including historical flood events in the region on the Bow River, by attempting to estimate equivalent discharge estimates on the Elbow River (based on a relationship between flows in the Elbow and Bow Rivers), acknowledging that the statistics used for flood frequency analysis are dependent on the input dataset. Flooding could have occurred on the Elbow River at the same time as on the Bow River, though there is no documented record of this occurring, and the SCLG thought that these floods should be considered holistically as major events in the region. The SCLG recognized that precipitation events and flooding would not present exactly the same for catchment areas related to the Bow River and Elbow River. The SCLG stated that most of the flow and start of floods is in the headwaters, as highlighted by flow correlations between the

Bragg Creek and Sarcee Bridge water monitoring stations, and felt that catchment area calculations were oversimplified and not appropriate.

The SCLG submitted that with climate change, a warmer climate will exist, and that larger flooding along the Elbow River will occur, with a higher frequency. The SCLG felt that by only considering the period of record in estimating flood frequency, a false sense of security may be created and that extrapolation of data may be warranted in addition to the use of quantifiable information.

The SCLG acknowledged that even when taking historical events into account, and using a ratio of Bow River to Elbow River flows, the historical floods prior to the record may be lower than the design flood, and that predicting all effects of climate change on flooding on the Elbow River is challenging.

The SCLG presented that adequate, or total, flood protection is not offered to those who reside between the Project and Glenmore Reservoir, and that those areas will still experience the effects of significant flood events (equivalent to that of an approximately 1:50 year flood event or 640 m³/s). Flood inundation maps for this flood scenario in the area between the Project and the City of Calgary were prepared and presented by the SCLG. While the volumes of water presented by Alberta Transportation in these areas appeared correct/consistent with that of the SCLG, the SCLG felt that the effects or resulting impacts were not adequately communicated or addressed with those affected in these areas.

City of Calgary

The City of Calgary maintained that the Project would have minimal impact on the Elbow River fluvial system and did not expect appreciable changes to the timing and availability of water in the Elbow River basin with the Project in place. The City of Calgary expected that the Project would work in tandem with the Glenmore Reservoir to reduce volumes up to a design flood event to the 160 m³/s safe flow threshold below Glenmore Dam. The Project may allow for some operational flexibility within the city and at Glenmore Reservoir. This may include not having to draw down the reservoir prior to the spring freshet.

The City of Calgary supported and agreed with the hydrology and flood assessment methodology, evaluations, and work completed by Alberta Transportation. The Project will provide benefits that will be realized in the City of Calgary along the Elbow River, regardless of any other flood mitigation projects developed for the Bow River upstream. The City of Calgary also indicated that city communities upstream from the Glenmore Reservoir would largely be protected from flooding as a result of the Project. These communities are designed to withstand a current 1:100 year flood and the Project would decrease peak flows below that level even during a design flood.

The City of Calgary indicated it would participate in year round and pre-flood season operations, forecasting, and monitoring activities on the Elbow River in conjunction with Alberta Transportation and Alberta Environment and Parks.

9.3 Views of Alberta Transportation

Alberta Transportation indicated that they were aware of concerns raised by Indigenous groups and landowners and believe they have conducted adequate analysis and consideration of impacts, including cumulative impacts, which can also be monitored and mitigated. Alberta Transportation was confident that the assessment and analysis related to water quantity is correct and will rely on monitoring and mitigation to verify predictions and to reduce uncertainty in outcomes.

AT restated that the hydrology assessment included examination of the flow regime of the Elbow River, suspended sediment transport, and geomorphology. The Project will have no impact on the hydrological regime of the Elbow River when not in operation and will reduce flow rates downstream during operations. The overall flow and amount of water in the Elbow River is not expected to change as a result of the Project, although reduced flow during diversion (i.e., flood mitigation) will occur. Sediment transport in the Elbow River will also be reduced during flood operations due to sediment deposition into the reservoir, and some minor changes of the Elbow River channel are expected as a result of diversion.

Alberta Transportation disagreed with the Stoney Nakoda Nations that impacts related to hydrology are underestimated. AT maintained that the Project should be considered irrespective of flow regulation on the Bow River and that Alberta Transportation was neither in a position, nor had information, to share regarding flow regulation efforts on the Bow River. Alberta Transportation stated that funding was made available and offered to the Stoney Nakoda Nations for a hydrology study, but the SNN did not provide a budget request to conduct a study.

AT outlined that the Project is designed to mitigate flooding equivalent to the 2013 flood, though it may be effective during events larger than 2013, given the design and safety considerations. The potential for higher peak flows in the Elbow River was considered within the design of the Project. The off-stream design of the Project would also limit interactions with the Elbow River, avoiding the development of lake habitats and significant alterations to the river regime. Alberta Transportation stated that although residents upstream of Glenmore Reservoir will still be subject to some flood risk, the Project will provide reduction of the flood risk to all downstream properties.

AT stated that predicting or estimating flood size along the Bow River based on historical anecdotal information, or other paleo techniques (e.g., tree ring data), as suggested by SCLG, has not correlated with measured flow data in the Elbow River, and these methods are speculative, and not directly related to, or useful in, flood analysis within the Elbow River. Alberta Transportation believed that the risk for flooding may or may not be higher in the Elbow River during wetter or drier periods within the South Saskatchewan River system, as headwater sections are subject to different conditions than further downstream and a lack of correlation in the data exists. AT deemed hydrometric records most appropriate and used these records to conduct the analysis.

Alberta Transportation acknowledged that no climatologists were consulted in the flood frequency analysis or determinations. Alberta Transportation agreed that climate change may alter future meteorological and hydrologic conditions within the Elbow River, but that accurate or precise predictions that would influence design of the Project cannot be made with any level of certainty. AT did not agree that the risk of rain or snow events would increase in frequency or intensity due to climate change and stated that there is no way to know whether the size of floods in the Elbow River would increase or decrease as a result of climate change. The effects and predictions related to climate change are complex and uncertain.

Alberta Transportation reiterated that a surface water monitoring plan would be finalized, in consultation with Indigenous groups, and implemented as part of the Project.

9.4 Views of the Board

The Board acknowledges that the Project has the potential to affect hydrology by causing changes in the hydrological regime, suspended sediment transport, and channel morphology. The Board finds that AT conducted reasonable work on the baseline studies and assessment of Project effects on hydrological components. It is the Board's view that the Project will have limited interaction with hydrology (water quantity) and sediment transport at the local assessment area and regional assessment area scale during construction and dry operations. The Board agrees with Alberta Transportation's assessment that the residual Project effects on hydrology during construction and dry operations are expected to be not significant, with a high degree of confidence. The Board acknowledges that the purpose of the Project is to alter hydrology (i.e., mitigate floods) during flood and post-flood operations. The Board finds that the protection of property, infrastructure, and public safety will benefit by diverting peak discharges into the off-stream reservoir and releasing the water once the flood risk has subsided.

The Board disagrees with the SNN that, to be effective, the Project needs to be reviewed in conjunction with flood control on the Bow River. The Project can be evaluated on its own merit. This view is supported by the City of Calgary, who indicated that the Project would provide substantial flood control for the City of Calgary, noting that approximately 40 per cent of the flood damage associated with the 2013 flood was attributable to Elbow River flooding.

The Board acknowledges concerns of the SCLG related to information about flooding on the Bow River that predates the historical record (e.g., pre-1908). The SCLG contended that if information on pre-1908 floods on the Bow River (specifically in 1879, 1897, and 1902) was considered, the design flood for the Project may not represent a 1:200 year flood event. The Board finds that using pre-record flood information tends to be unreliable because this information is largely anecdotal and somewhat speculative. The SCLG also contended that by establishing a statistical relationship between flooding on the Bow and Elbow Rivers, information about flooding events on the Elbow River could be inferred from historic Bow River flooding events. It is the Board's position that using this statistical relationship to obtain historic flood information for the Elbow River is not reliable due to a variety of factors, including the different catchment areas (e.g., precipitation in the Bow River basin that causes flooding may not impact the Elbow River), and relatively weak statistical relationships and poor correlations between river discharges. In addition, the methods and references provided by the SCLG, which attempted to include pre-record information, did not demonstrate significantly different discharge estimates for 1:200 year flood events on the Elbow River. Given the high uncertainty of flood

information prior to recorded data, as well as some uncertainty and errors associated with recorded data and statistical methods used to estimate flood frequency and peak discharge in general, the Board is of the view that the approach used by Alberta Transportation to only use recorded data (i.e., post 1908) is prudent. It ensures that only reliable, well-documented, and validated information is used for the detailed engineering work required for the Project.

The SCLG suggestion to use “Paleo” records, specifically tree-ring analysis, to collect information about historic floods was deemed to be of limited value by Alberta Transportation. The Board agrees with AT that this information may provide general information about historic climatic conditions, but lacks the detail and accuracy required for use in flood frequency analysis or peak discharge estimates. The information is also of limited value for predicting future flood events, including peak flows, due to the approximate nature of the data and uncertainties associated with climate change.

Several interveners expressed the concern that the Project is under-designed given that climate change effects may result in more frequent and intense future flood events. The Board appreciates that climate change science is complex and as a result predicting future flood events is speculative and inconclusive. The Board notes that AT cited several research papers during the hearing that suggest climate change will not result in increased flood events in the Project area due to a number of factors such as changes in precipitation type and amounts, temperature, and the interaction/timing of these variables. Even though the likelihood of increased flood events due to climate change appears low, the Board notes that AT incorporated conservative features into the Project design. For example, the Elbow River diversion was increased by 25 per cent from a design flood (i.e., from 480 m³/s for a design flood to 600 m³/s) and the capacity of the off-stream reservoir volume is designed to contain 10 per cent more water than that required to contain a design flood. While this may or may not offset effects of climate change, it is nearly impossible to determine all aspects of future flood events.

The SCLG indicated that since the off-stream reservoir is not designed to store water, it will be of limited value for managing drought conditions that may arise due to climate change. The Board agrees with this statement, though it does not support the relevance of this contention as the Project is designed for flood control/mitigation, not to store water during droughts.

The SCLG expressed concern that residents between the Project and Glenmore Reservoir would not be adequately protected from a flood, and are expected to still experience flooding. The Board acknowledges that these residents may continue to be impacted by flooding events; however, the impact would be substantially less than without the Project. For example, during a design flood, the peak flow rate in the Elbow River would be approximately 640 m³/s and the residents would experience a flood equivalent to an approximate 1:50 year event. The Board also understands that most structures in the stretch between the Project and the Glenmore Reservoir are above the 1:100 year flood level as per current Rocky View County and City of Calgary bylaws so no flood damage would be experienced by these developments during a design flood. The Board understands that any future developments below the 1:100 flood level must obtain prior authorization from Rocky View County.

The Board realizes the benefits in the early-release scenario as updated by Alberta Transportation for draining the off-stream reservoir after a flood. This scenario would reduce sediment accumulation in the off-stream reservoir and reduce potential impacts on water quality,

specifically dissolved oxygen and temperature (discussed in Section 10 Surface Water Quality). Discharge of sediment-laden reservoir water to the Elbow River when it already has a high sediment load due to flooding conditions would result in a relatively lower impact on the sediment regime within the Elbow River. The Board is also of the opinion that relocation and realignment of the low-level outlet works, and armoring sections of the unnamed creek will contribute to reduced erosion in the creek and have benefits for surface water quality and aquatic ecology (discussed in Section 8, Aquatic Ecology).

The Board finds that actions proposed by Alberta Transportation to mitigate Project construction and operation impacts on hydrology and suspended sediment are reasonable. It is noted that the mitigation plan for the Project is based on best management practices and standards, such as those described in the *Fish Habitat Manual* (Alberta Transportation 2001), the *Code of Practice for Watercourse Crossings* (ESRD 2013), and the *Department of Fisheries and Oceans Measures to Avoid Causing Harm to Fish and Fish Habitat* (DFO 2013a). Further assurance of this will be provided through implementation of Alberta Transportation's Environmental Construction Operations (ECO) Plan process, to be followed by construction contractors. The Board finds it reasonable to assume that the mitigation plan will evolve according to any additional requirements identified during the approval process and monitoring.

The Board believes that many of the issues associated with hydrology highlight the importance of an appropriate and adequate sediment and surface water sampling and monitoring program. Although the Project is not anticipated to have significant impacts on hydrology (other than during a flood event), monitoring is important to verify predictions and mitigate observed impacts. The Board expects Alberta Transportation to honour all hydrology and suspended sediment related monitoring commitments outlined in the draft surface water monitoring plan. This includes the commitment made to conduct assessments of deposited sediment after each flood event to determine subsequent actions and mitigations should any be required.

SECTION 10 SURFACE WATER QUALITY

10.1 Summary from the Application (EIA)

Alberta Transportation (AT) characterized surface water quality, compared surface water quality to existing guidelines and objectives (including the South Saskatchewan Region Surface Water Quality Management Framework), and assessed changes in water quality during construction, dry operations, flood, and post-flood operations. The assessment areas overlapped with the assessment of hydrology (Section 9 Hydrology and Sediment Transport). Since the main Project-related effect on water quality is believed to be related to suspended sediment (e.g., total suspended solids), water quality modelling and the effects assessment focused on this effect. The purpose of the Project is not to reduce sediment or improve water quality, but rather to mitigate flows in the Elbow River.

Alberta Transportation described the baseline water quality in the Elbow River upstream of the Glenmore Reservoir as generally good. Some parameter concentrations have increased over time (e.g., dissolved phosphorus, turbidity) and some exceedances of guideline values have been observed (e.g., aluminum, iron, fluoride, copper). Both generally increased in frequency from upstream to downstream.

AT expected general water quality in the Elbow River, including mercury methylation, to be unaffected by the Project. Alberta Transportation acknowledged uncertainty remains as to mitigation measures/efforts related to total suspended sediment in released water. However, AT has proposed monitoring and adaptive management, which should not affect implementation of the Water Quality Management Framework (as part of the *South Saskatchewan Regional Plan*) and the Bow River Phosphorus Management Plan. Alberta Transportation committed to making all results and data readily available and also indicated that the draft surface water quality plan outlines opportunities for Indigenous involvement.

10.1.1 *Suspended Sediment and Related Parameters*

AT assessed changes in suspended sediment (see Section 9, Hydrology and Sediment Transport) and associated parameter concentrations based on existing conditions and relationships between suspended sediments and other water quality parameters. The quantitative assessment of suspended sediment was used as a surrogate to qualitatively examine the effects of the Project on parameters with spatial and temporal patterns similar to that of suspended sediment (e.g., total trace elements and total nutrients).

Alberta Transportation expected that during construction and dry operation, with the proposed mitigation and monitoring in place, Project effects on surface water quality (e.g., introduction of sediment, use of herbicides) would be not significant to negligible.

AT predicted changes in total suspended solid concentrations during flood operations in the Elbow River, off-stream reservoir, and at the low-level outlet. Higher average and maximum total suspended solids concentrations were expected during an early release scenario when high concentrations and flood conditions exist in the Elbow River. Alberta Transportation predicted exceedances in water quality parameters for total suspended solids at 12 sites between the low-level outlet and Glenmore Reservoir during the one in ten (1:10) year early release scenario, the 1:100 year early and late release scenarios, and the design flood early and late release scenarios.

Alberta Transportation expected that changes in suspended sediment transport will result in a significant effect on water quality (reversible and infrequent). Diversion of Elbow River water during a flood followed by sediment settling in the reservoir will cause a significant decrease in total suspended sediment load downstream of the Project. Parameters that are associated with suspended sediment are also expected to be deposited in the off-stream reservoir. When water is subsequently released from the reservoir to the Elbow River after a flood, it is expected that concentrations of sediment and related parameters in Elbow River water downstream of the unnamed creek/river confluence will increase (since flow rates and concentrations of sediment-related parameters in the Elbow would be reduced after a flood). The changes are not anticipated to alter the overall water quality of the Elbow River or Glenmore Reservoir. The conditions in the off-stream reservoir are not predicted to change physical and chemical properties of total suspended solids in flood water in a manner that changes the relationship between suspended sediment and trace elements (or other sediment-related parameters).

10.1.2 *Dissolved Oxygen and Temperature*

AT indicated that dissolved oxygen, temperature, and biological oxygen demand (based on total organic carbon) were modelled for the three return periods and each early and late release (Table 10-1). Median dissolved oxygen concentrations in the off-stream reservoir generally ranged from eight to 10 milligrams per litre (mg/L). Dissolved oxygen concentrations in the reservoir were not predicted to drop below six mg/L, except for the last few days during the late release scenario of the 1:10 year flood when they may drop to two mg/L. Higher temperatures and low dissolved oxygen may result in localized areas in the reservoir where conditions could cause changes in redox potential. This could result in the release of nutrients from sediment, and the release from the reservoir of elevated nutrient concentrations. The earlier release of water from the reservoir, while the water is still cool and relatively more oxygenated, and when the Elbow River is still turbid, is expected to have less of an impact on fish and aquatic plant and animal life compared to a later release, as the difference between the reservoir and river concentrations will be less.

10.1.3 *Nutrients*

Alberta Transportation summarized that nutrient concentrations of water diverted from the Elbow River will influence nutrient concentrations in the off-stream reservoir and in water released through the low-level outlet. Concentrations will also depend on environmental conditions (e.g., dissolved oxygen) and the duration that water is held and released from the

reservoir. The reservoir is expected to be a nutrient sink (i.e., it will reduce nutrient concentrations) most of the time for total nutrients through sedimentation and deposition. Because low dissolved oxygen is not expected in the 1:100 year and design flood scenarios for early release, nutrients were not predicted to be mobilized or transferred appreciably from the particulate form. Dissolved nutrient concentrations are not expected to decrease over time in water stored within the reservoir, as the relationship between suspended sediments and dissolved nutrients is not significant.

AT outlined that nutrient concentrations in the Elbow River generally tend to decrease over the summer. Therefore, releasing water from the reservoir later in the summer (i.e., late release) may have a bigger relative impact, when nutrient concentrations are lower in the Elbow River relative to released water. The median nutrient concentrations of water released from the reservoir are greater than in the Elbow during early release for the 1:100 and design floods, and also during late release for all scenarios (Table 10-1). In an early release scenario, physical and chemical reactions will have a shorter time period to modify concentrations and relative differences between released water and water in the Elbow River should be less.

Table 10-1. Comparison of Water Quality Released from Off-Stream Reservoir and Elbow River

Scenario	Comparison of Water Quality	
1:10 year	Early	Water quality expected to be similar
	Late	Total and total dissolved phosphorus expected to be higher in released water
1:100 year	Early	All median concentrations expected to be higher in released water
	Late	All median concentrations expected to be higher in released water
Design	Early	All median concentrations expected to be higher in released water
	Late	All median concentrations expected to be higher in released water

Although release water may temporarily increase nutrient concentrations downstream of the Project, AT does not expect the Project to increase overall nutrient loads in the Elbow River or Glenmore Reservoir. Trophic status will not be affected, nor will released nutrients affect the diurnal dissolved oxygen processes.

10.2 Views of the Interveners

Stoney Nakoda Nations

The Stoney Nakoda Nations (SNN) were concerned with impacts to water quality of water contained in the off-stream reservoir, specifically whether water temperature will be monitored.

SR1 Concerned Landowners Group

The SR1 Concerned Landowners Group (SCLG) expressed concerns about the:

- impact of sewage that may be released from Redwood Meadows and Bragg Creek waste water treatment plants during floods on water quality in the Elbow River, off-stream reservoir, and Glenmore Reservoir;
- generation of methylmercury in the reservoir water and potential impacts on public health and aquatic life; and
- algal blooms in off-stream reservoir water as a result of changes in water temperature and oxygen levels.

Calalta Amusements Ltd. and Calalta Waterworks Ltd.

Calalta Amusements Ltd. and Calalta Waterworks Ltd. (Calalta) was concerned that high sediment loads in water released from the reservoir could cause damage to both the Calalta intake system, located downstream of the confluence between the unnamed creek and the Elbow River, and the high technology ultra-membrane filtration plant. Calalta proposed river monitoring to ensure suspended sediment levels do not exceed a reasonable amount during construction, and also proposed river monitoring to measure sediment when the reservoir is in operation and when water is released back into the river. Monitoring and assessment by a third party was Calalta's preferred approach with Alberta Transportation and/or Alberta Environment and Parks picking up the costs of any damages. Calalta suggested that if the Calalta system and plant is determined to be affected by suspended sediment causing a disruption of service, Alberta Transportation and/or Alberta Environment and Parks should provide emergency potable water to all Calalta water users on the system. Calalta confirmed that they did not experience issues with their intake system during the 2013 flood, although this does not ensure future impacts will not occur. Calalta requested a mediation agreement to address these issues prior to construction of the Project.

City of Calgary

The City of Calgary agreed that the Project would have little effect on surface water quality with proposed mitigation measures to manage residual effects, and accepted Alberta Transportation's analysis of surface water quality. The City of Calgary believed that water quality dynamics may be impacted intermittently during flood operations, and did not anticipate any effects on Elbow River water quality during periods of normal operation.

The City of Calgary outlined that the Project would be better able to handle sediment management during flood operations, than the Glenmore Reservoir, and anticipated that operation of the Project during flood events would reduce loading of sediment and sediment-related parameters to the Glenmore Dam.

The City of Calgary acknowledged that operations of the Project and the Glenmore Water Treatment Plant would need to be coordinated to ensure appropriate surface water quality for environmental and public health purposes.

The City of Calgary expected to work with Alberta Transportation and/or Alberta Environment and Parks to monitor surface water quality in the Elbow River and at the Project sites and facilities, and to address any potential risks or concerns as they occur.

10.3 Views of Alberta Transportation

Alberta Transportation indicated that they were aware, through the EIA process, of concerns raised by Indigenous groups and landowners, and have conducted adequate analysis and consideration of impacts, including cumulative impacts, which can also be monitored and mitigated. AT was confident that the assessment and analysis related to surface water quality is correct and will rely on monitoring and mitigation to verify predictions and to reduce uncertainty in outcomes.

Alberta Transportation submitted that the main impacts of the Project associated with surface water quality would be related to total suspended solids (sediment). Sediment concentrations would be high during flooding, and the Project would not significantly alter or change that fact. During a flood, the Elbow River will contain sediment and associated nutrients which would be deposited in the off-stream reservoir. Other parameters of potential concern include water temperature and dissolved oxygen. Alberta Transportation indicated that any changes to water quality, if realized, would be manageable and addressed.

AT indicated that during dry operation, the Project will have no effect on water quality in the Elbow River. During flood operation, the Project will reduce sediment downstream. When floodwater is released from the off-stream reservoir, suspended sediment will also be released, particularly at the end of the drawdown period. Alberta Transportation suggested that although water released from the reservoir may be “turbid”, this would not be significantly different from water quality in the Elbow River. Water will be released back into the Elbow River as early as practicable to reduce the effects of differences in water quality.

Alberta Transportation understood that Calalta does not currently experience water quantity and quality issues and that turbidity is not an issue with water supply, nor was it in 2013. AT indicated that should Calalta’s infrastructure or operation be negatively impacted by the operation of the Project such that it cannot meet the “Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems”, the Government of Alberta will provide reasonable assistance, such as providing the users serviced by Calalta with potable water either hauled to the point of distribution, or delivered, as preferred by Calalta. Alberta Transportation suggested that the Project will reduce the likelihood of major channel changes in the Elbow River that could compromise Calalta’s infrastructure and wells associated with the water treatment plant, and committed to continue discussions with Calalta.

AT summarized that it is highly unlikely and, based on assessment, not expected for cyanobacteria to accumulate and cause algal blooms in the off-stream reservoir. The potential for wastewater treatment plant upsets at Bragg Creek and Redwood Meadows were also assessed and determined to have negligible possible impacts on the off-stream reservoir and Elbow River quality during a design flood.

Alberta Transportation submitted that the Project is not expected to impact water quality in the Elbow River basin. AT reiterated that a surface water monitoring plan would be finalized, in consultation with Indigenous groups, and implemented as part of the Project, and would include reporting and releasing data to all interested parties. Alberta Transportation outlined that water quality monitoring will be conducted in the Elbow River upstream of the Project diversion inlet and in the off-stream reservoir. The monitoring plan also includes water quality monitoring of springs within the local assessment area.

10.4 Views of the Board

The Board finds that Alberta Transportation used reasonable methodology to assess Project impacts on surface water quality. The Board acknowledges that the intent of the Project is to divert water from the Elbow River and to temporarily store it in the off-stream reservoir until flood conditions abate. The Project is not intended or designed to affect water quality. It is understood by the Board that this diversion will affect Elbow River flows and any impacts on surface water quality will be temporary and manageable.

The Board agrees that construction and dry operations will not have a significant impact on surface water quality when the proposed mitigation and monitoring is implemented to control suspended sediment. Mitigation measures proposed by Alberta Transportation include the use of erosion control measures such as berms and ditches to manage water flow and thus reduce sedimentation levels. The Board notes that some interveners were concerned that the use of herbicides to control weeds along Project infrastructure during construction and dry operations could impact water quality. The Board is confident that the likelihood of impacts to surface water quality from herbicides is low as Alberta Transportation has committed to follow the Environmental Code of Practice for Pesticides.

The Board agrees with Alberta Transportation that during a flood, impacts on water quality are mainly associated with total suspended sediment which would be high in Elbow River water, even without the Project. Following the diversion of Elbow River water to the off-stream reservoir during a flood, deposition of sediment and associated parameters, including nutrients, is expected in the reservoir. Other potential impacts to water quality associated with water stored in the off-stream reservoir include increases in water temperature and decreases in dissolved oxygen concentrations. The Board expects that Project impacts on surface water quality will vary with water residence time within the off-stream reservoir. The longer water is retained in the reservoir, the greater the impacts on surface water quality since there will be more time for physical, biological, and chemical reactions. Since not all of the sediment deposited in the off-stream reservoir after a flood will be returned to the river during reservoir draining, the Board finds it reasonable to conclude that there will be less sediment (and sediment-associated parameters such as nutrients) in the Elbow River water downstream of the Project, including in the Glenmore Reservoir.

Given the water quality modelling conducted by Alberta Transportation, the Board agrees that potential exists for residual unmitigated Project effects on aquatic life related to water quality, depending on the flood and release scenarios. The extent of these effects will depend on the concentration and exposure to total suspended solids and residence times within the reservoir, and will vary across flood and release scenarios. As stated in Section 9 Hydrology and Sediment Transport, the Board supports AT's proposal to use an "early release" scenario for draining the reservoir following a flood. The Board notes that in an early release scenario, the quality of water released from the reservoir would be similar to receding flood water in the Elbow River (especially for smaller floods, e.g., 1:10 year). By reducing the potential for water quality changes, early release would have fewer effects on aquatic life and vegetation. (See Section 8, Aquatic Ecology, Section 12, Terrain and Soils, and Section 13, Vegetation for more detailed discussion of flood operations effects on those components).

Some interveners indicated that because vegetation and soil would be inundated in the reservoir during a flood, potential exists for the release of methylmercury into reservoir water and ultimately the Elbow River. The Board finds that the literature review, estimations, and analysis of potential methylmercury generation in the reservoir conducted by Alberta Transportation provide compelling evidence that methylmercury concentrations are expected to be variable (they may be higher later in the release period). Regardless, they are not expected to exceed the CCME Canadian Water Quality Guideline for the Protection of Aquatic Life concentrations.

Calalta contended that suspended sediment in water released from the reservoir may impact operations of their water treatment plant or damage their intake wells located in the flood plain downstream from the confluence of the unnamed creek and the Elbow River. The Board agrees with Alberta Transportation that any impacts are unlikely since the source wells are located well away from the river. The Board notes that Calalta's water treatment plant was able to maintain water treatment and distribution during the 2013 flood. The Board is appreciative of AT's offer to continue discussions with Calalta on their treatment plant concerns, and their commitment on behalf of the Government of Alberta to provide assistance in the unlikely event treatment plant infrastructure is damaged or operation interrupted. The Board notes that the Project may actually provide some erosion protection for the Calalta Waterworks intakes since less water will be flowing and hence less channel erosion occurring in the Elbow River downstream of the Project during and after a flood.

The SCLG expressed concern that sewage from the Redwood Meadows and Bragg Creek sewage treatment plants could impact water quality in the Elbow River and off-stream reservoir during a flood. The Board acknowledges the potential for the release of untreated sewage into the river during a design flood; however, it is unlikely that sewage release would have any significant impact on water quality in the reservoir or the river since high flood water volumes would greatly dilute any sewage. According to Alberta Transportation's calculations, the total sewage volume from the two plants would amount to about 0.004 per cent of the reservoir volume during a design flood, without considering the additional volume of diluting water in the Elbow River. The Board also finds that Charles Hansen's assertion that COVID-19 associated with sewage contamination from upstream holding tanks could contaminate the City of Calgary's Glenmore Reservoir water supply is unsupported and appears to have little, if any, relation to the Project.

The Board is confident that the draft surface water monitoring plan developed by Alberta Transportation in consultation with stakeholders, will be effective in identifying Project impacts on water quality, and that the information will be useful for validating modelling predictions, and for identifying appropriate mitigative action as required. The Board expects that all monitoring commitments in the plan will be followed. The Board also expects that sampling and monitoring program results will be provided to Alberta Environment and Parks, Fisheries and Oceans Canada, and the Impact Assessment Agency of Canada, and made publicly available.

The Board also notes that Alberta Transportation committed to conducting an assessment of deposited sediment after each flood that will involve analyzing the risk to future surface water quality from deposited sediment and determining appropriate mitigative action (e.g., monitoring, treatment, and remediation) as necessary. The Board understands that the results of the assessment will be shared with Alberta Environment and Parks, Fisheries and Oceans Canada, and the Impact Assessment Agency of Canada, and made available to Indigenous groups and the public.

SECTION 11 HYDROGEOLOGY

11.1 Summary from the Application (EIA)

Alberta Transportation (AT) characterized potential interactions between the Project and the quality and quantity of groundwater resources at local and regional scales during construction, dry operations, flood operations and post-flood operations. The local assessment area included the project development area plus a one kilometre buffer. The regional assessment area, which was modified in response to concerns raised during consultation, was based on the boundary areas for the numerical groundwater model (used to predict potential effects of the Project on groundwater). (Maps showing assessment areas are included in Appendix C.) These boundary areas consisted of watershed boundaries and surface water and shallow groundwater flow divides, and included portions of the Tsuut'ina Nation reserve that fall within the Elbow River watershed.

11.1.1 Construction and Dry Operations

Diversion Channel

Alberta Transportation indicated that the Project has the potential to affect groundwater quantity through groundwater seepage into the diversion channel. When dry, the diversion channel is expected to receive seepage from the local-scale water table since the channel will be excavated through saturated unconsolidated and bedrock deposits. The estimated groundwater seepage rate into the diversion channel is 0.026 cubic metres per second (m³/s) under non-flood average flow conditions. According to Alberta Transportation, the change in groundwater discharge into the Elbow River as a result of seepage from the diversion channel is expected to be imperceptible. The seepage water quality is predicted to be similar to in-situ shallow groundwater quality.

The effects on groundwater quantity near the diversion channel were anticipated to be irreversible as the diversion channel will be in place indefinitely. Alberta Transportation stipulated that because these effects are not expected to significantly impact the yield of domestic water wells located in the vicinity of the diversion channel, the residual effects on groundwater are not significant.

Dewatering

The Project has the potential to change groundwater quantity in and near the project development area as a result of local, shallow, and temporary subsurface dewatering that might

be required during construction. Alberta Transportation outlined that the location, timing, and method for dewatering are unknown, and therefore were not simulated in the numerical model.

Alberta Transportation indicated that effects on groundwater quantity due to Project dewatering activities would not be entirely mitigated at a local scale because the intent of dewatering is to temporarily lower the groundwater table. Groundwater that is collected during dewatering would be returned to the local watershed to mitigate regional-scale effects on the groundwater system.

11.1.2 Flood and Post-Flood Operations

During flood and post-flood operations, groundwater levels within the off-stream reservoir are expected to be up to 24 metres higher near the upstream toe (i.e., the wet side) of the dam structure when compared to pre-Project conditions. Net changes in groundwater level are predicted to decrease in a northwesterly direction towards the higher elevation areas of the reservoir. Groundwater flow patterns near the off-stream reservoir are expected to change due to mounding effects caused by retention of water and increased local hydraulic heads. Alberta Transportation predicted that potential flowing artesian conditions may occur in the low-lying areas to the south and east of the dam, though these effects are uncertain and expected to be limited to within the local assessment area.

Alberta Transportation predicted that the residual effects on groundwater quality during flood and post-flood operations are not significant. Groundwater quality at existing water wells is not predicted to be affected to the point where groundwater becomes non-potable or cannot meet the *Guidelines for Canadian Drinking Water Quality*.

11.1.3 Monitoring and Mitigation

Groundwater Monitoring Plan

Alberta Transportation presented a draft groundwater monitoring plan that is designed to determine changes in groundwater quality and quantity as a result of construction, as well as operation throughout the life of the Project. A three tier groundwater monitoring system is proposed. The density and distribution of groundwater monitoring wells will be based on the need to detect any changes in groundwater quality. Alberta Transportation indicated that Indigenous groups will have the opportunity to provide input on the monitoring well locations. Remedial action will be implemented should monitoring results suggest that Project-related effects may exist.

Seepage and Dewatering

Alberta Transportation indicated that the need for dewatering during construction will be determined on a site-specific basis once the construction schedule is finalized. Depending on local conditions at the time of construction and the time of year, construction dewatering may not be required in all cases. In areas of competent bedrock, no mitigation measures are planned for groundwater seepage that may occur. For excavation through unconsolidated deposits or weakly cemented bedrock, seepage will be observed as excavation progresses. Construction dewatering may be reduced through construction planning. If required, dewatering would be done locally and according to the terms and conditions of dewatering licences issued by Alberta Environment and Parks, as well as best management practices.

Flood and Post-Flood

Existing water wells within the project development area will be decommissioned in accordance with the Water (Ministerial) Regulation of the *Water Act* to prevent groundwater impact from flood operations. Similarly, monitoring wells installed as part of the hydrogeology and geotechnical field programs will be assessed for their potential to act as conduits for groundwater impact. Alberta Transportation specified that if flowing artesian conditions are identified, groundwater discharge from the artesian wells would be directed to the Elbow River or its tributaries through conveyance measures, including shallow ditches or temporary piping. Erosion control and water quality monitoring would be conducted to protect the receiving waterbody and verify that the water quality is appropriate for discharge.

11.2 Views of the Interveners

Stoney Nakoda Nations

The Stoney Nakoda Nations (SNN) expressed concerns that their understanding of the cultural and historical use of water was not incorporated in the environmental impact assessment. The SNN requested that Alberta Transportation monitor groundwater quality and quantity in wells located on the lands of the Waste Igic Nabi Ltd. corporation prior to and during all Project operations and that, if impacts are identified, potable water be provided for agricultural use and other purposes.

SR1 Concerned Landowners Group

The SR1 Concerned Landowners Group (SCLG) expressed several concerns about the methodology used to assess project impacts on groundwater quality and quantity. Specific concerns included:

- inadequate knowledge of the hydrogeologic regime, and subsequent impact of Project operations, efficacy of the numerical groundwater model and issues regarding geochemical processes and water quality;
- an insufficient number of hydraulic conductivity measurements in the underlying unconsolidated deposits to adequately represent site conditions;
- the reporting of hydraulic conductivity testing was not transparent, as inconclusive hydraulic conductivity test results in the unconsolidated deposits were not included as part of the environmental impact assessment;
- lack of consideration in the predictive modelling of potential fractures in the unconsolidated deposits;
- underestimation of seepage rates during flooding operations (Alberta Transportation estimated a leakage of 426 cubic metres per day (m³/day) from the reservoir when full while the SCLG estimated a leakage rate of more than 100,000 m³/day);
- a perceived positive bias for calculated residuals and a spatial bias to higher residuals east of the project development area in the numerical model, indicating issues within the model domain and reduced confidence in the numerical groundwater model;
- not including a coarse glacial fluvial deposit underlying portions of the unnamed creek area as a layer in the numerical model;
- limited drawdown effects observed in the low level outlet;
- an insufficient monitoring period to demonstrate consistent upward hydraulic gradient in the project development area; and
- no assessment of Project impacts on groundwater quality, including the presence of selenium and uranium and the potential for geochemical reactions resulting in increased mobilization, due to interaction between oxygenated floodwater and minerals in the unconsolidated deposits.

The SR1 Concerned Landowners Group requested that Alberta Transportation monitor groundwater quality in Rocky View County residential wells, for those who wished to participate in the monitoring program. The SCLG also suggested that AT establish a contingent liability fund to address community concerns for groundwater quality to ensure sufficient funding is set aside to address potential complications and unexpected outcomes of the Project.

The City of Calgary agreed with Alberta Transportation's opinion that flood and post-flood Project impacts on groundwater are expected to be both limited and reversible.

11.3 Views of Alberta Transportation

Alberta Transportation indicated that they are open to considering requests from landowners who are directly adjacent to the Project development area and within the local assessment area, north of the Elbow River, regarding groundwater monitoring on a one time, case-by-case basis during the baseline phase of the Project. Alberta Transportation stated that they are not prepared to establish a contingent liability fund as requested by the SCLG for potential issues arising from groundwater impacts. Alberta Transportation further noted that the groundwater flow direction in the underlying bedrock is generally southward, away from SCLG members' residences. Alberta Transportation indicated that since the Waste Logic Nabi Ltd. lands are west (hydraulically up-gradient) of the Project area, there are no plans to monitor water wells in this area.

AT outlined that the subsurface movement of any contaminants in groundwater is controlled by subsurface natural attenuation processes (e.g., adsorption). These processes cause subsurface contaminants to move at different rates in the groundwater system. As a conservative measure in their modelling, Alberta Transportation assumed that all contaminants moved at the same speed as groundwater. They outlined that any chemical reactions in groundwater would take time to occur and are kinetically limited due to the short-term duration of the storage of water within the reservoir. AT outlined that the storage of flood water would lead to further dilution of any contaminants as opposed to adding to them.

Given the low hydraulic conductivity of overburden materials in the project development area, Alberta Transportation asserted that flood operations are unlikely to result in significant infiltration of groundwater. While there is potential for effects on underlying groundwater quality, AT concluded that the effects will be limited. Mitigation measures would be implemented in the unlikely event that Project operations impact groundwater quality.

Alberta Transportation acknowledged that the groundwater flow regime is complex in the unconsolidated deposits and the upper bedrock. They noted that, based on a comparison of averages between chemical parameters in groundwater, the bedrock and unconsolidated deposits were considered as separate datasets.

AT acknowledged that groundwater flow patterns near the off-stream reservoir are expected to change due to mounding effects caused by retention of water and resulting in increased local hydraulic heads. AT agreed that the increase in hydraulic head during flood operations will increase the vertical gradient, potentially increasing infiltration. Alberta Transportation disagreed

with the SCLG that the reservoir seepage rate during flooding operations was underestimated and were confident in the estimated seepage rates generated by the numerical groundwater model.

Alberta Transportation disagreed with the SCLG that there was insufficient hydraulic conductivity testing in the unconsolidated deposits. Even though results for only three single well response hydraulic conductivity tests were reported for overburden materials, Alberta Transportation noted that additional testing of the unconsolidated deposits was attempted but was unsuccessful due to insufficient water in the monitoring wells or a slow response time. AT also noted that permeability tests, completed as part of the geotechnical program, provided additional information about hydraulic properties of overburden materials.

In order to address concerns related to fracturing in unconsolidated deposits and its potential effect on hydraulic conductivity, Alberta Transportation indicated that they took a conservative approach by using hydraulic conductivity values in the numerical modelling that were higher than values measured in the field. AT also noted that they conducted a sensitivity analysis to determine the effect of increasing the hydraulic conductivity of the unconsolidated deposits on groundwater levels. Alberta Transportation expected that the magnitude of effects would be limited and would not extend beyond the local assessment area.

AT outlined that potential exists for desiccation cracking as a result of drying out of the upper sediments within the project development area. However, it was expected that if cracking was to occur, it would be limited to the upper metre or so of the unconsolidated deposits due to shallow groundwater levels in the reservoir area.

Alberta Transportation outlined that some fluvial deposits were encountered in the local assessment area below the unnamed creek, between the glacial till unit and bedrock surface. They suggested that these deposits are not stratigraphically connected to a sand unit identified in a geologic cross-section from a hydrogeologic study conducted in an area east of the Project area that was presented by the SCLG. Alberta Transportation highlighted that the fluvial unit underlying portions of the unnamed creek area was included in the numerical groundwater model.

AT rejected the assertion that the model calibration residuals demonstrate a systemic bias. Alberta Transportation acknowledged that areas exist in which the residuals are greater in magnitude. In light of this, they noted that the context, in particular the topography, must be considered. Alberta Transportation outlined that when the context is considered relative to the residuals, there is no systemic bias.

11.4 Views of the Board

The Board finds that the:

- general methodology and assessments employed by AT to establish baseline conditions for groundwater flow, quality, and quantity were appropriate;
- selection of the regional assessment area was reasonable;
- numerical model used by the proponent was an appropriate tool for evaluating potential impacts of Project operations on the hydrogeologic system;
- Project has the potential to impact the quality and quantity of groundwater resources during the construction, dry operation, flood and post-flood operations; however, these impacts are expected to be local, and low in magnitude; and
- implementation of mitigation measures and the monitoring proposed by Alberta Transportation are sufficient to deal with any expected groundwater impacts.

The Board agrees with the SR1 Concerned Landowners Group that the development of a representative hydrostratigraphic framework, and the accuracy, precision, and quality of data used, have a significant impact on the integrity of modelling results. The SCLG expressed a concern that only three single well response tests were conducted in the overburden materials which, in their view, was not adequate to properly characterize the hydraulic conductivity of unconsolidated materials. Alberta Transportation responded that more than three single well response tests were conducted; however, some of the tests were not successful due to slow recovery rates. The Board agrees that slow water level recovery can suggest a low hydraulic conductivity for geologic materials tested by the well. In addition, the Board notes that the proponent conducted numerous permeability tests on the unconsolidated deposits during the geotechnical investigation. These tests provided additional information about the hydraulic properties of overburden materials.

The Board acknowledges that shallow overburden materials are likely fractured, as suggested by the SR1 Concerned Landowners Group, and believes that the proponent's conservative approach of using hydraulic conductivity values two orders of magnitude higher in the numerical model than those measured in the field is appropriate to account for potential fracturing and heterogeneity. The Board also notes that, as an additional conservative measure, Alberta Transportation calculated the infiltration rate from the reservoir during a design flood when the reservoir level would be at its maximum height and therefore when the greatest hydraulic head is present. The Board expects that seepage rates from the reservoir will be low given the generally low hydraulic conductivity of overburden materials and a decrease in hydraulic head with distance west of the dam.

The Board notes that the proponent took a conservative approach in the groundwater flow modelling by using hydraulic conductivity values that were two orders of magnitude greater than those measured in the field to account for uncertainties, such as possible fracturing in overburden materials and heterogeneity. The proponent also addressed concerns about the accuracy of the modelling predictions by reviewing an analogous solution and by completing sensitivity analyses on various model parameters. It is the Board's view that Alberta Transportation's sensitivity analysis accounted for any variation in hydraulic conductivity values in the unconsolidated deposits and that the results of these analyses demonstrate that Project effects on groundwater are not expected to extend beyond the local assessment area.

The Board appreciates that modelling of potential effects on groundwater is complex, with many inherent uncertainties and errors, and that more work could be done to improve the quality of modelling assumptions and inputs. However, it is the Board's view that further efforts to collect additional or more robust model input information or adjust model parameters would not substantially alter predicted effects of the Project on groundwater quality and quantity. It is the Board's view that the numerical model and its outputs and predictions have been adequately completed and appropriately applied for assessment of current hydrogeological conditions and impacts of the Project on hydrogeology.

The Board acknowledges that during Project construction, groundwater quantity changes are anticipated due to temporary dewatering required for the construction of Project components such as the diversion channel. The Board agrees with Alberta Transportation that these changes are expected to be temporary, with groundwater levels expected to return to normal once dewatering activities cease. The Board expects that any construction dewatering will be in accordance with terms and conditions attached to approvals under the *Environmental Protection and Enhancement Act*, the *Water Act*, the *Fisheries Act*, and the *Canadian Navigable Waters Act*. Further, the Board is supportive of the proponent following an environmental construction operation plan, prepared in concert with the selected construction contractor, to detail and implement mitigative action to minimize groundwater impacts during construction.

The Board acknowledges that during dry operations there may be some permanent lowering of groundwater levels in portions of the diversion channel that are excavated below the water table. The Board agrees with Alberta Transportation that the impact of these lower water levels on nearby domestic water wells is expected to be limited. However, as a condition of approval, the Board requires the ongoing monitoring of water levels in domestic water wells west of the diversion channel to the boundary of the local assessment area that may be impacted by dewatering during the Project construction; during flood and dryland operation, monitoring of the wells must be continued by the Operator for a minimum of five years or until it can be demonstrated that permanent lowering of the water level does not significantly impact yields from the water. The Board further requires the Operator to take mitigative action if significant yield reductions attributable to the Project are observed at water wells.

The Board understands that during flood and post-flood operations, groundwater levels in the local assessment area may be impacted. For example, groundwater levels in the Elbow River valley alluvial deposits would rise during a flood with or without the Project since the deposits are hydraulically connected to the river. Groundwater levels are also expected to rise in the

diversion channel and off-stream reservoir areas during flood operations due to mounding effects. The Board acknowledges that the infiltration of flood-affected water has the potential to impact groundwater quality but agrees with the proponent that the impact of infiltrating flood-affected water on groundwater quality is not expected to be significant due to the general low hydraulic conductivity of overburden materials, general high quality of the flood water, and limited time that water will be stored in the reservoir. The Board also believes the decommissioning of existing water wells in the project development area will be important to remove any conduits through which flood waters could enter the groundwater system and increase potential for groundwater contamination.

It is reasonable to assume that any impacts on groundwater quality or quantity are reversible when the flood passes, with the exception of portions of the diversion channel area where there is a permanent lowering of the water table. The Board agrees that no specific mitigation measures are required to address temporary increases in groundwater levels during flooding events because the temporary and reversible impacts of higher groundwater levels are relatively insignificant relative to the positive impacts of the Project to act as flood mitigation for surface water.

The Board acknowledges the concerns of landowners about potential effects of the Project on local water wells and springs in the area. According to Alberta Transportation, the Project is not expected to have a significant effect on groundwater quality and quantity in the local assessment area. It is the Board's view that ongoing groundwater monitoring and testing is required to verify and validate the results of the hydrogeological modelling and to monitor the effects of floods on groundwater quality and quantity. With respect to monitoring, the Board:

- agrees that the three tier groundwater monitoring program proposed by Alberta Transportation will be effective in verifying model predictions and assessments, as well as informing any mitigation measures or follow-up monitoring as required;
- appreciates that, in response to concerns from west Rocky View County residents, the proponent has offered to test their water wells, if requested, on a one-time basis to establish baseline, and potentially integrate some of the domestic wells into AT's groundwater monitoring plan;
- does not support the Stoney Nakoda Nation's request for Alberta Transportation to monitor groundwater quality and quantity in water wells on Woste Igc Nabi Ltd. lands as this area is located hydraulically upgradient of the Project and is therefore not expected to be impacted by the Project.

11.5 Conditions

The Operator shall:

- a) monitor water levels in domestic water wells west of the diversion channel to the boundary of the local assessment area that may be impacted by dewatering during the Project construction. During flood and dryland operation, monitoring of the wells should be continued by the Operator for a minimum of five years or until it can be demonstrated that permanent lowering of the water level does not significantly impact yields from the water wells, and
- b) take mitigative action if significant yield reductions attributable to the Project are observed at the water wells

SECTION 12 TERRAIN AND SOILS

12.1 Summary from the Application (EIA)

Alberta Transportation (AT) assessed potential Project impacts on terrain and soils using agricultural land capability parameters, terrain stability indicators, soil characteristics and classification criteria, and construction/reclamation suitability standards. Field surveys in conjunction with existing data, scientific literature, professional judgement, and past project experience were used to characterize the valued component within the project development area (PDA), local assessment area (PDA plus one kilometre buffer), and regional assessment area (PDA plus 15 kilometre buffer). Maps showing assessment areas are included in Appendix C.

The local assessment area (LAA), and most of the regional assessment area (RAA) occur in the Foothills Parkland natural sub-region and includes natural areas along the Elbow River valley, agricultural land, native grassland, shrub land, and forested areas. Alberta Transportation described the bedrock in the area as uniform throughout the regional assessment area consisting of a succession of predominantly marine origin formations, overlain by interbedded sandstone, siltstone, and mudstone. The surficial material in the local and regional assessment areas are predominantly glaciolacustrine (70 per cent of LAA) of mainly fine (silt and clay) texture. This material forms the underlying material for the earthen dam, the area behind the dam, and most of the diversion channel. Fluvial material (silt, sand, gravel) of moderately coarse to very coarse texture is found along the floodplains of the Elbow River and its tributaries (14 per cent of the local assessment area). The dominant soil types in the local assessment area are deep, well drained, Black and Dark Gray Chernozems. Regosols (weakly developed mineral soils) were found in the area of the inlet and outlet structures, and Gleysols (soil developed under prolonged water saturation) were found in wetlands along the tributaries of the Elbow River.

The slopes in most of the local assessment area were determined as less than five per cent with good slope stability (Class 1) and between eight per cent and 30 per cent along the fluvial channels of the tributaries with moderate likelihood for landslide initiation (Class 4). The embankment of the Elbow River has steep slopes with active landslides (Class 5) or high likelihood of landslide initiation due to oversteepening from bank erosion.

The agricultural land capability in the majority of the local assessment area is currently rated as Class 3. Areas with poorly developed soils and gravel (along the embankment of the Elbow River and in the area of the tributaries) fell into lower capability classes. Wind erosion risk was rated as negligible within the local assessment area, while the Elbow River banks (escarpments) were found to be more susceptible.

12.1.1 *Construction and Dry Operations*

Changes in Terrain Stability

Alberta Transportation anticipated changes to slope stability at the dam, the outlet structure, and the soil storage sites during construction, due to changes to slope morphology and drainage paths. Excavation of the diversion channel will create banks with steeper slopes and lower inherent stability compared to existing topography. Excavated soils from the diversion channel will be stored on temporary laydown/stockpile areas located near the dam. Material unfit for construction will be left as temporary spoil near the diversion structure and disposed of at approved landfills. Borrow sites have been identified near the dam and additional soil material will be taken from these areas as needed. Construction of the diversion structure inlet will stabilize a currently unstable section of the Elbow River escarpment. Construction is not expected to change terrain stability in flat areas during land clearing, bridge construction, utility realignment, or at laydown areas. Maintenance activities during dry operation are not expected to affect terrain stability.

Changes in Agricultural Land Capability, Soil Quality and Quantity

Post-construction effects on agricultural land capability were expected to be significant and adverse. One hundred and thirty hectares (ha) of the land with agricultural land capability Class 3, and approximately seven per cent of Class 4 and 5 lands within the PDA will be converted to permanent infrastructure. Additional reduction of agricultural land capability could occur due to admixing, compaction and rutting, water and wind erosion in the construction zone.

Alberta Transportation anticipated that some admixing of comparatively poorer and better soils could occur during topsoil stripping and salvage. This may have lasting negative effects on vegetation growth by decreasing topsoil fertility but Alberta Transportation did not expect any degradation of soil properties during stockpiling. The reclamation suitability of disturbed soils is generally not expected to change. Any soil compacted during construction will be mitigated by deep ripping prior to placement or replacement of topsoil. Soil materials excavated from the diversion channel (and pre-determined borrow areas if required) are expected to be sufficient for the construction of dam infrastructure and will be stored on temporary laydown areas until needed. Material unsuitable for construction (saline materials, soils contaminated with livestock waste, septic areas, deeper shale bedrock, or materials with higher metal content) will be temporarily stored in designated areas and disposed of in landfills.

Alberta Transportation determined that the Elbow River banks are currently at risk of wind erosion but the risk is negligible in the rest of the LAA. During construction, water and wind erosion on soil stockpiles and borrow pits will be mitigated by using proper piling techniques, and the use of tackifier or cover crops where warranted. Bank and riparian areas exposed during construction will be reclaimed and revegetated. Following remediation of construction impacts, no further reductions in soil quality or increases in wind erosion risk were anticipated during dry operations.

Alberta Transportation will use trained personnel to conduct soil monitoring and erosion and sediment control during and post construction in accordance with developed guidelines.

12.1.2 Flood and Post-Flood Operations

Changes in Terrain Stability

Reservoir filling is not expected to affect terrain stability. Reservoir draining might affect terrain stability along the channel banks within the reservoir and the outlet channel and will be mitigated by controlled drawdown. The magnitude of destabilization depends on the size of the flood event but will be adverse in some areas of the PDA. Once drawdown is complete, banks and other areas will be inspected, repaired, and revegetated as needed to restore slope stability.

Changes in Agricultural Land Capability, Soil Quality and Quantity

Sedimentation

Alberta Transportation stated that flood operations would produce a significant adverse environmental effect on soil capability for agricultural land ratings. Alberta Transportation submitted results from updated modelling of sediment deposition for the design flood under an early and a late release scenario. The models were updated in response to information requests and included more detailed information on the expected texture of the entrained sediment.

Using the new model results, the area covered with sediments with a depth greater than three centimetres (cm) was estimated to be 319 ha and 337 ha for the early and late release scenarios respectively. The areas with sediment deposition greater than one metre (m) in depth were smaller than originally forecast in the initial model runs and restricted to the area around the diversion structure outlet (channel mouth as it enters the reservoir).

Although the incoming sediment is expected to include a mix of particle sizes (sand, silt, and clay), Alberta Transportation predicted that significant stratification will occur during settling. Areas of deepest deposition near the outlet of the diversion channel will be coarser (sandy) material. Since fine material settles out more slowly, areas of finer (clayey) sediment will tend to be less thick and deposited further away from the diversion channel outlet.

The soil water storage capacity of sediment deposits was generally expected to be greater than forecast by the older model, but still lower than the original soils, particularly in areas with deeper, coarser overlays. The new soils will be moderately well to well drained.

Sediments are expected to contain calcium carbonate minerals and will have a higher pH than the underlying soils. This will potentially change nutrient availability of phosphorus and a number of the plant essential micronutrients. Changes to salinity levels are not anticipated. Because there are no sources upstream, Alberta Transportation did not anticipate sediment derived from contaminated soils will enter the reservoir during flood events. AT did not

anticipate removing sediment; however, sediment redistribution may be required within the reservoir to facilitate surface drainage and reservoir function. Additional post-flood mitigation may include stabilization of sediments, and augmentation of soil nutrient concentrations to assist re-establishment of vegetation.

Soil Submergence, Soil Anoxia, and the Drying Process

Alberta Transportation anticipated that soils would be submerged for five to 67 days depending on the magnitude of the flood, the predicted release rates, and depth of water. Soils under shallow water will be exposed first as the water retreats. Submerged soils would be fully saturated with water, and reduced oxygen availability (anoxia) in the upper horizons will result in denitrification (conversion of nitrate and nitrite nitrogen to gaseous forms), and in soil organic matter conversion with a resulting reduction in nutrient availability. The effects of anoxia on nutrient availability in deeper soil horizons was anticipated to be less, mainly due to lower soil organic matter content in subsurface horizons. Soil anoxia can lead to the biological formation of methylmercury, a toxic form of mercury that can accumulate in the food chain. Demethylation, a biological process that detoxifies methylmercury, also naturally occurs in soil. Based on the relatively short retention time, the infrequency of flood events, and the concurrence of naturally detoxifying soil processes, accumulation of methylmercury in soils is not expected.

The reduced oxygen availability while the soils remained saturated will change the redox potential and may increase the solubility of ionic forms of iron, manganese, phosphorus, arsenic, nickel, and selenium. During the flood and dewatering phase some of these ions will enter the soil water column and potentially migrate towards the soil surface. Higher oxygen levels in the upper soil horizons and higher calcium ion levels of the added sediment, will cause the migrating ions in solution to precipitate. Since these less soluble forms will be retained in the soil or sediment, entry into surface waters is not anticipated at a significant level. Ions that do enter surface water during drainage are expected to precipitate quickly due to higher oxygen levels and will largely be retained in the soil system. Vertical drainage might move some dissolved phosphorus to groundwater.

The soil drying process is influenced by several environmental factors including precipitation, temperature, and wind. Continued runoff into the unnamed creek may also keep soils saturated along the drainage pathway. Pre-flood conditions are anticipated to be restored in the upper soil horizons within one to two months and within one to four years in the deeper soil layers. Salt concentrations in soil were found to be generally low in the PDA and salinization associated with the post-flood drying process is expected to be limited. If the lowering of the water table after a flood is slower than expected, groundwater might rise to the surface in seepage areas, where salts could be concentrated by evaporation. This effect is expected to be reversible as rainfall will over time leach soluble salts into deeper soil horizons. Ephemeral and temporary wetlands are expected to dry faster after a flood in comparison to deeper wetlands which will retain excess water for the entire growing season and potentially into the following year.

Wind and Water Erosion and Soil Compaction

Alberta Transportation submitted that wind erosion risk could be elevated following drainage of the reservoir particularly during winter. Long distance export of sediment containing calcium carbonate could raise the pH of receiving lands downwind. Alberta Transportation does not anticipate major soil compaction from the water load.

Alberta Transportation predicted that the overall effects on soil quality and quantity will be adverse, high in magnitude, irreversible, and of long-term duration but confined to the PDA. The anticipated negative effects are due to lower water holding capacity, lower nutrient availability, and a lower agricultural land capability compared to pre-flood soils in the PDA. Water erosion will not have a major further effect on land capability.

12.1.3 Monitoring and Mitigation

After each flood, soils and sediment will be assessed using a risk analysis based on visual assessments, point sampling, and chemical analysis. If contaminated soils are found in the PDA, the material will be encapsulated, and moved off site to an *Environmental Protection and Enhancement Act*-approved facility. Post-flood monitoring will quantify dynamic and static soil property changes and, if needed, mitigation measures will be implemented. Any saline or sodic areas will be mitigated through revegetation with native species tolerant to the new condition.

Post-flood methods for limiting water erosion include the installation of riprap, vegetation, and other means to reduce water velocity on newly susceptible slopes. The use of tackifiers and seeding fast-growing cover crops are proposed methods for stabilizing bare soils and sediment in the short-term and minimizing wind erosion risk. Reseeding using native perennials will occur as soon as possible in order to restore permanent cover and minimize erosion risk longer term.

To reduce soil rutting and compaction during repair and maintenance operations, suitable equipment (for example, tracked vehicles) will be employed and vehicle access will be restricted to designated areas and maintenance roads where soils have sufficiently dried to support traffic. Alberta Transportation submitted that the operations and maintenance plan for the Project would also include procedures for sediment/bank stabilization and debris management.

12.2 Views of the Interveners

Stoney Nakoda Nations

The Stoney Nakoda Nations (SNN) stated that they did not have a clear understanding about how the dry reservoir area will be cleared of vegetation and graded and how bank erosion will be identified and mitigated during construction and dry operation. The SNN were also concerned about the impact of soil compaction on the success of re-establishment of native grasses. In addition, there was uncertainty about potential post-flood contamination and how it

will be monitored and contained during flood and post flood operations, and general soil quality post flood.

SR1 Concerned Landowners Group

The SR1 Concerned Landowners Group (SCLG) was particularly concerned about the potential negative impacts on air quality associated with post-flood wind erosion of the sediments in the reservoir. These concerns are addressed in more detail in Section 15, Air Quality Assessment and Public Health Impacts.

The SCLG stated that several additional issues related to terrain and soils had not been sufficiently explained. These include the proposed erosion protection along the unnamed creek within the reservoir area and the establishment of a new 500 m long channel within the reservoir to connect the unnamed creek to the new location of the low-level outlet structure. The SCLG also stated that it was unclear how much time it will take for newly deposited sediment to dry out and whether that would delay sediment stabilization and revegetation activities.

The SR1 Concerned Landowners Group was concerned about the impact of sedimentation on agricultural land capability, particularly considering the amount of sediment expected to be deposited in the reservoir during higher magnitude floods. A key element of their concern was that a decrease in agricultural land capability could increase the potential for the establishment of noxious weeds and invasive species within the reservoir, and this would lead to increased weed problems on adjacent lands. Weed problems could potentially increase with reoccurring flood events and additional sediment loads over time. The SCLG also stated that the impact of continued sediment deposition in the reservoir area from successive floods has not been adequately explored with respect to where successive floods would deposit additional sediment layers and how these additional layers would affect terrain stability and soil dewatering. They also expressed concern about how accumulated sediments in the reservoir area will be managed when SR1 is decommissioned.

The SCLG proposed that general management activities (e.g., dust suppression) should be documented and reported annually, and that post-flood reports should be prepared that include, at a minimum, maps of sediment deposition areas and soil chemical analysis.

12.3 Views of Alberta Transportation

Alberta Transportation did not dispute that flooding and associated sediment deposition would have adverse impacts on the agricultural land capability within the PDA. AT stated that updated model results forecast lower than originally anticipated effects and soils will still have sufficient capability to support vegetation.

Alberta Transportation explained that the latest sedimentation model results changed the sediment distribution and coverage compared to earlier model results. Areas covered with coarse sediment (sand) are anticipated to be limited to a small area around the channel mouth,

with deposition of clay and silt in all other areas of the reservoir. This was expected to result in a lesser impact on land capability because of higher water holding capacity in areas with finer textured sediments, and the ability of vegetation to access nutrients from native underlying soils in areas where deposits are less than 30 cm deep. Alberta Transportation proposed a range of different methods to mitigate soil problems that could hinder re-establishment of vegetation post flood.

Alberta Transportation explained that the early release scenario for the reservoir would result in less deposition of fine material. A late release would lead to an overall thicker sediment layer and deposition of more fine material, which could slow soil dewatering, extend soil saturation and anoxia, and result in higher vegetation losses. To mitigate sedimentation issues and promote fish health (see Section 8, Aquatic Ecology), AT proposed employing the early reservoir release scenario.

Generally, Alberta Transportation did not propose to remove sediment from the PDA, but following a flood event, AT will move or recontour where needed to allow proper drainage and function of dam infrastructure. Alberta Transportation also committed to start post-flood surveys of the reservoir and mitigate soil erosion as early as practicable after release (likely within two weeks). Initial control measures such as the application of tackifiers will follow drainage lines on the landscape as the water recedes. AT stressed that starting mitigation measures is not dependent on the reservoir being completely drained.

AT committed to conduct sediment sampling and an assessment that includes a risk analysis to determine subsequent actions and mitigations following each flood. This could include long-term monitoring and, potentially, treatment and remediation or removal of contaminated sediment. The results will be made available to the public.

12.4 Views of the Board

The Board recognizes that Project effects on soil in the reservoir have the potential to impact other valued components such as human health, vegetation, water quality, and land use. For a more detailed discussion of Board views on these potential impacts, and the monitoring and mitigation plans developed for the specific valued components see Section 7, Land Use and Management; Section 10, Surface Water Quality; Section 13, Vegetation; and Section 15, Air Quality Assessment and Public Health Impacts.

Alberta Transportation stated that Project construction and operation is expected to have adverse effects on agricultural land capability. The Board recognizes that components of the Project including the dam, diversion channel and sections of the low-level outlet, will permanently remove land from agricultural use. Results from AT's updated sedimentation model suggest that the loss of capability following floods will be less than originally anticipated and will not prevent the re-establishment of vegetation. The Board agrees with AT on this point, notes that agricultural production will no longer be the primary use of land within the PDA, and finds that reduction of agricultural land capability does not detract from the capacity of the land to act

as an off-stream reservoir. The Board is confident that the reservoir land, with appropriate management and mitigation strategies, will support revegetation following flood events.

The SCLG raised concerns that a lowering of agricultural land capability following Project construction and floods would lead to establishment of noxious weeds and invasive species. The Board recognizes that both construction and sediment deposition will create conditions where establishment of weeds that exploit disturbed lands could occur. The Board notes that disturbed lands are relatively common in agricultural areas; conventional tillage, for example, creates an open seedbed for weed establishment. The Board notes that to address the potential for unwanted weed establishment in the PDA, Alberta Transportation has committed to a comprehensive weed management strategy (see Section 13, Vegetation). In the Board's view, AT has provided monitoring and mitigation strategies that adequately reduce the risk of weed infestation during construction and the operations phase of the Project.

The Board acknowledges that construction of the dam and diversion canal will modify relatively flat terrain to terrain with significant slope. The Board notes that diversion channel and dam slope stability is well understood and will rely on the director of dam safety's review to ensure that sloped infrastructure has been engineered appropriately.

SECTION 13 VEGETATION

13.1 Summary from the Application (EIA)

Alberta Transportation (AT) assessed potential Project impacts on vegetation in the local assessment area (LAA), which includes the project development area (PDA), for potential changes to plant community, species diversity, and wetland extent and function. Potential changes in landscape diversity were assessed within the regional assessment area (RAA) to determine the overall impact at the regional level. (Maps showing assessment areas are included in Appendix C.)

The LAA and most of the RAA are located in the Foothills Parkland natural sub-region. The landscape in the RAA is a mosaic of agricultural lands, small patches of native grasslands, coniferous and broadleaf forests, wetlands, and riparian areas.

Alberta Transportation's vegetation assessments included inventorying native plant community cover areas and cover types as well as occurrence of invasive plant species and traditional use plants. Existing data, field surveys, community engagement, scientific literature, professional judgement, and past project experience were used to complete the assessment.

Alberta Transportation did not identify any ecological communities of management concern within the RAA during baseline field surveys. Three species of management concern (SOMC), 41 plant species of traditional use by Indigenous people, and six different noxious weeds—predominantly creeping thistle (*Cirsium arvense*) and perennial sow-thistle (*Sonchus arvensis*)—were found within the PDA. Wetlands in the PDA were determined to be of mostly high or moderate value, mainly isolated and without apparent outlets.

13.1.1 Construction and Dry Operations

Project construction was not anticipated to result in loss of known SOMCs within the PDA. The identified species occur predominantly in wetlands and moist depressions and it is possible that not all occurrences have been recorded. The re-establishment of any SOMCs disturbed by the Project is characterized as difficult, and the effects of construction are anticipated to be adverse, long term, and likely irreversible but low in magnitude. Long-term irreversible effect on unidentified plant species of management concern might occur but will be of low magnitude.

Key mitigation measures for vegetation that will be implemented during construction include:

- monitoring activities that disturb vegetation during construction;
- restricting construction activities to the immediate construction site;

- reclaiming disturbed areas by reseeding with native seed mixtures;
- implementing erosion control;
- preserving natural drainage patterns; and
- establishing a weed monitoring and control plan as part of a comprehensive vegetation and wetland mitigation, monitoring, and revegetation plan.

Construction of permanent structures will result in the loss of 16 per cent of high value and 36 per cent of moderate wetland area. Wetlands irreversibly lost to permanent structures will be offset pursuant to *Alberta Wetland Policy* requirements. Residual effects on wetlands following construction are anticipated to be low in magnitude and restricted to the PDA.

13.1.2 Flood and Post-Flood Operations

Woody upland species are generally less tolerant of anaerobic conditions than grasses. Alberta Transportation predicted that flood events will lead to a conversion of shrubland into grassland. There will also be a loss of wetlands through sediment infilling. It was expected that surviving woody plants within the PDA and blown in seed will over time recolonize the sediment inundated areas.

Alberta Transportation evaluated the following three flood scenarios for effects on vegetation:

1:10 Year Flood

In a one in ten (1:10) year flood the inundated area would be restricted to approximately 20 hectares (ha) in the reservoir. Most of the dominant species in this area have some tolerance to temporary flooding. Species of management concern as well as plant community types that support growth of traditional use plants were not anticipated to be affected. Soil would likely become oxygen deficient (anoxia) in the flood affected areas, affecting plant growth, reproduction, and competitive ability of existing vegetation. This would impact community diversity and alter wetland function.

1:100 Year Flood

A 1:100 year flood was predicted to cover approximately 480 ha. The flooded area was expected to cover 42 ha of temporary, seasonal, and semi-permanent wetlands, accounting for 80 per cent of high and moderate value wetlands in the PDA. Wetland function is expected to be reduced due to reduced plant cover although seasonal and semi-permanent wetland species, adapted to prolonged submergence, are expected to persist. Alberta Transportation estimated a loss of 33 per cent of high and 40 per cent of moderate value wetlands (12 ha total) following a 1:100 year flood. Changes in overall surface flow patterns caused by sediment deposition would alter wetland basin shape and depth and result in a new post-flood topography with potentially

altered drainage patterns. The anticipated loss of 12 ha is based on current wetland conditions and could change with significant variations in the regional moisture regime.

The impact on community diversity was expected to be similar to a 1:10 flood in that land units with shrubs and trees, including traditional use species that are part of the upland plant community, are expected to convert into grassland. There was potential for loss from the PDA of one species of management concern; namely, slender cress, *Rorippa tenerrima*. The time needed for re-establishment of plant communities post flood and the establishment of new wetlands is difficult to estimate but could take up to 10 years.

Design Flood

The design flood would cover approximately 800 ha. The increase in submerged area and extent and depth of sedimentation was anticipated to have a higher impact on upland plant communities than the two lesser flood scenarios. Most of the upland species in the PDA were characterized as flood intolerant which will lead to a high mortality rate in every stratum. Re-establishment is possible through the existing seedbank and propagules. More flood tolerant species might increase in abundance. Wetland species are more flood tolerant and are not expected to be impacted by submergence but may be buried under sediment.

The most recent sedimentation model predicted that 51 per cent of the flooded area would be covered by one to three centimetres (cm) of sediment. As these areas would be among the first uncovered by retreating water, they would be the least affected by submergence and sedimentation. Although a slight change of productivity would be likely in these areas, a shift to a new plant community is not expected. Mortality of short shrubs and herbs in areas with sediment deposition between 10 cm and 100 cm will be mitigated by reseeding efforts and recolonization from surrounding areas. A shift towards grass dominated plant communities is expected. Areas of deeper deposition (greater than three cm) and higher plant mortality rate would be susceptible to colonization by weeds and invasive species.

Deposition of sediments would likely alter the topography, resulting in changes to surface water flow and alteration of wetland basin shape and depth. A loss of 33 per cent of high value wetlands, 40 per cent of moderate value wetlands, and two per cent of moderate-low value wetlands is anticipated. The residual effect of the design flood was rated as adverse and moderate in magnitude because of the extent of areas with a sediment deposition greater than three cm.

13.1.3 *Monitoring and Mitigation*

Alberta Transportation proposed to seed sediment-covered areas inhabited by upland communities with cover crops for weed suppression in conjunction with custom seed mixes to promote re-establishment of native plant species. Wetlands will not be reseeded other than along the borders to prevent weed establishment because most weeds are anticipated to be intolerant to anoxic soils and periodic flooding. Revegetation efforts will follow the vegetation and wetland mitigation, monitoring and revegetation plan which is currently in draft form. Post

flood activities will include monitoring for noxious weeds, monitoring and repair of erosion, sediment control measures, debris management, and monitoring vegetation re-establishment with potential reseeding as required. Where sediment reshaping is required to allow drainage, it will be completed, to the extent possible, in a manner that reduces further impacts on surviving wetlands. Disturbed areas will be recontoured and reseeded with wetland seed mixes.

Alberta Transportation indicated that construction would impact landscape diversity, community diversity, and plant species diversity in areas occupied by Project infrastructure. Construction activities will also result in surface disturbance that will require remediation including re-establishment of disturbed soil and vegetation. Flood and post-flood operations were anticipated to affect vegetation in the project development area due to prolonged water saturation of soils and sediment deposition. This has the potential to cause a permanent shift in community distribution and replace shrub land and forested areas with permanent grassland. The residual effects on landscape diversity and community diversity were considered to be restricted to the PDA, irreversible in areas occupied by permanent structures, and overall low in magnitude. Alberta Transportation committed to a number of monitoring and mitigation activities with respect to vegetation and wetlands post flood and intends to document these fully prior to the Project being put into operation.

13.2 Views of the Interveners

Stoney Nakoda Nations

The Stoney Nakoda Nations (SNN) shared that culturally significant plants and harvesting areas will be destroyed or contaminated and rendered undesirable by the Project. They did not consider their traditional land use study to be complete and added that a full assessment of the area had not been completed due to limited access to the PDA. An additional issue raised was that the timing of the site visits with AT in late fall of 2016 prevented a full inventory of traditional use plants.

The SNN were concerned about the impacts of Project construction and flood operation on landscape diversity and on traditionally used plants, the effects of vegetation clearing on existing wetlands, and habitat fragmentation in general. The Stoney Nakoda Nations stated that it is unclear how these impacts can be mitigated. In particular, they asked what strategies have been developed for the preservation of traditional plant and seed material and what plans are in place to ensure successful post-construction and post-flood re-establishment of native plants. They were also interested in what weed monitoring plans were being developed, and the length of time before disturbed plant communities re-establish. The SNN did not feel they had been adequately consulted concerning impacts on vegetation and wetlands. They requested involvement going forward in all phases of the revegetation efforts and stressed the importance of being allowed to access the PDA prior to construction to map and salvage traditional use plants.

SR1 Concerned Landowners Group

The SR1 Concerned Landowners Group (SCLG) expressed concern about weed dispersal and submitted that Alberta Transportation has underestimated the problems arising from weed establishment post construction and post flood. In the SCLG's view, weeds will disperse beyond the PDA and they requested that a comprehensive weed management plan be put in place. In addition, the SR1 Concerned Landowners Group proposed several measures that would have the potential to mitigate weed dispersal. These include:

- the installation of a weed filter system on the low level outlet that would operate during dry operation;
- a local/regional weed management initiative; ensuring weeds are not brought on site by construction vehicles; and
- the use of gravel that is free of weed seeds on site.

The SCLG was of the opinion that the diversion of flood waters will result in the simplification of the Elbow River geomorphology with significant effects on the riparian vegetation downstream of the Project. It was the SCLG's view that these changes have not been adequately assessed and that the cumulative effects were underestimated.

The SR1 Concerned Landowners Group presented evidence showing that the Project area is designated as a high value landscape based largely on areas of intact native grasslands and wetlands. The SCLG argued that disturbance of native grasslands is not in accordance with the guidance given by the *Alberta Land Stewardship Act* and the *South Saskatchewan Regional Plan*. They further noted that efforts to re-establish native vegetation in disturbed areas along the Eastern slopes have proven to be problematic and are not always successful. The SCLG asserted that the high biodiversity of the native grasslands will be replaced with simplified vegetation communities with reduced functionality. The SCLG also commented on the problem of drought during revegetation efforts and questioned how sufficient soil moisture for plant establishment will be maintained. The SCLG was concerned about annual maintenance and management of the PDA over time, stating that a high level of uncertainty exists at present in the various draft management plans.

The SCLG disputed Alberta Transportation's conclusion of moderate impact with respect to wetland loss during construction and dry operation and stated that a loss of 52 per cent of high to moderate value wetlands within the PDA is significant. The SR1 Concerned Landowners Group also pointed out that wetland replacement is problematic in general, not transparent, and the offsetting costs are not included in the overall Project cost estimates. Apart from impacts of construction activities, wetland function will be further impacted during flood operations with long lasting effects. The SCLG felt it would be beneficial to conduct baseline quantitative biodiversity surveys including plants, wetlands, and soil in order to establish impacts on the Project area over time, and that changes should be reported regularly, including post flood.

The SCLG pointed out that no additional analysis was undertaken to assess the potential effects of the increased area of sediment deposition (as anticipated by Alberta Transportation in their updated sedimentation model), on revegetation potential and plant biodiversity. Also missing is the evaluation of long-term cumulative effects of multiple flood events and the resulting sediment accumulation impact on wetland functionality and plant community composition.

13.3 Views of Alberta Transportation

Alberta Transportation understood that the Project is located in an area of regional significance with respect to landscape features, ecological function, and biodiversity. Because of its unique topographic characteristics, the Project area is suitable for a gravity-filled dry dam and off-stream reservoir of sufficient volume for the purpose of flood mitigation on the Elbow River. No other areas within the Elbow River valley have these features.

Alberta Transportation pointed out that the maps used by the SCLG showing high value landscapes were fairly low resolution and might not be entirely representative of the actual site. They noted that undisturbed native lands currently comprise less than 30 per cent of the PDA. Alberta Transportation is not aware of any priority grassland areas targeted for conservation within the project development area but committed to avoid unnecessary disturbances of native plant communities. Throughout all Project phases, adaptive management practices will be used to increase the effectiveness of mitigation measures aimed at preserving vegetative cover.

AT conceded that given the location, Project interaction with surrounding landscapes is unavoidable. AT indicated that since the Project allows for Elbow River flows below 160 and over 760 cubic metres per second (m^3/s), riparian functions downstream of the Project will be maintained, albeit at a reduced level. It was also pointed out that while existing regional planning tools are important, adherence to them is not necessarily a regulatory requirement. Furthermore, the *South Saskatchewan Regional Plan* makes allowance for flood mitigation, which is the purpose of this Project (this is also discussed in Section 7, Land Use and Management).

Alberta Transportation stated that the updated sedimentation model does not change the estimate of habitat loss and alteration. They acknowledged that sediment deposits with lower water holding capacity than native soils might cause a shift toward more drought tolerant species. Generally, grasslands are expected to re-establish within three years and it will take about 12 years for revegetated areas to resemble natural communities. A full return to the pre-construction state is not expected and it is reasonable to assume that the community composition will be simplified. Any permanent losses of vegetative cover will be restricted to areas of permanent structures.

Alberta Transportation explained that different techniques can be applied to break up sediment deposits and ensure proper seed emergence and plant establishment. This can include various forms of tillage. Although a concrete timeline could not be given, Alberta Transportation expects to start reclamation efforts as soon as possible and predicts that it will take approximately three to four months to establish a cover crop over the entire area of sediment deposition. It is

possible that a temporary water licence for irrigation might be required to ensure establishment of cover crops and subsequent revegetation with native grassland species. The use of cover crops was proposed as a measure to mitigate potential weed establishment and reduce erosion. However, cover crops will not be allowed to go to seed and will be mowed or otherwise managed regularly to reduce competition with native grass seedlings. All reclamation efforts will be detailed in a vegetation and wetland mitigation, monitoring and revegetation plan which will provide detailed methodology for the initial plant establishment following construction or post flood, as well as monitoring and potential mitigation measures.

Alberta Transportation agreed with the SCLG that effective weed control within the project development area is important in preventing dispersal of weed seeds to surrounding lands or downstream areas. While not prepared to take the lead in a regional weed management plan, AT was willing to participate fully in plans developed by the municipality. AT reaffirmed their commitment to produce and implement a comprehensive weed management plan within the Project footprint and are prepared to ensure that weed control will, at a minimum, meet Alberta's *Weed Control Act* and Rocky View County requirements. Meeting these requirements includes the destruction of prohibited noxious weeds and the control of noxious weeds within the PDA. While fully committed to effective weed control, Alberta Transportation was of the opinion that some measures proposed by interveners are not practical, for example the installation of a weed seed filter system at the low level outlet during dry operations.

Alberta Transportation acknowledged that the Project would result in wetland loss during construction and likely further loss following major floods. On-site wetland impacts will be reduced through minimization of disturbances and reclamation where necessary. Irreversible wetland loss will be offset in accordance with the *Alberta Wetland Policy* following plans developed in cooperation with Alberta Environment and Parks. Additional assessments of wetlands and finalization of mitigation plans will occur under the *Water Act* application that has been submitted to Alberta Environment and Parks.

Alberta Transportation reaffirmed its commitment to cooperate with the Stoney Nakoda Nations on development of vegetation management plans and to allow pre-construction harvesting of traditionally used plants, to incorporate Indigenous knowledge, and to ensure that traditionally used plants and harvesting sites are protected to the extent possible, or re-established if disturbed.

13.4 Views of the Board

The Board finds that the methods used by Alberta Transportation were adequate for the assessment of valued components related to vegetation and wetlands and that the conclusions reached are generally consistent with the data and analysis. While the Board has regard for the evidence provided by the SCLG showing that most of the area within the project development area is rated as high value landscape, the Board agrees with AT that the maps presented were of low resolution and did not provide the necessary level of detail at the individual parcel level. As AT observed, a high proportion of the lands within the PDA have been disturbed in the past

by agricultural activity with small but significant patches remaining of native vegetation communities.

The Board makes the following observations regarding Project impacts on vegetation. While some of the Project effects can be mitigated, others cannot. The Board finds that those issues which cannot be mitigated are low in magnitude and represent a negligible change on a regional basis.

- Native (and non-native) vegetation will be destroyed during construction and drowned or buried during inundation.
- Surface disturbance during construction and flood operations creates considerable risk of weed invasion.
- Low spots will tend to receive higher sediment loads than adjacent upslope areas and this may result in further fragmentation of native vegetation patches.
- Lower water holding capacity in areas with thick sediment deposits may cause a shift toward more drought tolerant species.
- The extant patches of rough fescue grassland, if impacted by construction or flood, will be difficult to reclaim and these communities are likely to be simplified over time.
- Loss of shrubs and trees in areas that are inundated more frequently will simplify the community and will likely have effects on wildlife habitat and country foods.
- Much of the PDA is currently grazed and cessation of grazing may result in accumulation of combustible material and increase the grass fire hazard.
- Wetlands will be permanently lost in areas occupied by Project infrastructure and further losses will occur over time due to sedimentation.

The Board agrees with the SCLG that Project activities will create soil conditions that are ripe for exploitation by weeds and possible establishment of invasive species. Alberta Transportation has committed to a number of mitigation measures aimed at weed control. These include vehicle washing during construction, weed monitoring and control on-site, and adherence to provincial regulations and municipal ordinances for weed control. The Board encourages Alberta Transportation to maintain an open dialogue and transparent reporting on weed issues with the surrounding community during construction. The weed management plan should include community engagement and will need to be updated for post-construction operations once the Project is handed over to Alberta Environment and Parks.

The Board heard concerns from a number of groups regarding sediment management following a flood. Of particular concern was wind erosion of sediment and the effects wind-blown dust might have on community health, sensitive equipment, and visibility on major roads. Vegetation

plays a critical role in stabilizing soil and sediment and preventing wind erosion. Conversely, blowing soil particles can damage newly emerged seedlings. Post-flood reclamation plans must have mitigation of wind erosion as a primary focus with the rapid re-establishment of vegetative cover a priority activity. In addition to techniques already described such as soil tackifiers, tillage, cover crops, and hydroseeding, the Board encourages AT to explore other options, such as shelterbelts, that may be established prior to floods.

The Board notes a number of further commitments made by AT regarding revegetation following construction and post flood. These include use of appropriate native seed mixes and monitoring reseeded areas for a period of 18 months following seeding of reclaimed areas. While recognizing that AT has considerable experience in reclaiming disturbed land following construction, the Board nonetheless has questions about the length of the monitoring period for revegetation following floods. Assuming a flood in June and reseeding in late summer or early fall, an 18-month monitoring period would only extend through one complete growing season. The Board finds this monitoring period inadequate for slow-to-establish native species and consequently, the Board requires as a condition of approval, that post-flood vegetation monitoring be extended to cover a minimum of two full growing seasons.

The Board heard concerns regarding the danger of fire on lands where plant residues accumulate over time. Grass-based vegetation communities are adapted to grazing and grazers would be a natural component of the ecosystem. The Board notes here that moderate levels of grazing would be both healthy for the plant community as well as preventing the buildup of combustible material. It seems unlikely that wild ungulates will be present in sufficient numbers to keep vegetation under control and the Operator will need to develop secondary methods to reduce fuel accumulation, one of which may be grazing by domestic animals.

Alberta Transportation has agreed to include Indigenous communities in the development of vegetation management plans including selection of appropriate seed mixes for reclamation. In addition, AT has agreed to further consultation with the Stoney Nakoda Nations and ongoing access to the project development area to complete their catalogue of traditional plant species. One of the shortcomings of previous site visits pointed out by the SNN was the late fall timing. Timing of site visits prior to construction may prove difficult due to incomplete land acquisition. AT and the SNN are encouraged to work out arrangements to complete the work, even if it extends beyond the start of construction. This may require allowing the Stoney Nakoda Nations access to portions of the PDA during construction for cataloguing, harvest, and salvage of traditional use plants. The Board sees access as an issue that will resolve as land is acquired within the PDA. Such access would necessarily be limited within appropriate safety constraints.

The Board recognizes that the Project will result in destruction of wetlands during construction. Furthermore, sediment deposition, recontouring, and changes in drainage patterns, all have the potential to negatively impact wetlands post flood. The likely result will be reduction in extent of the permanent and seasonal graminoid marshes that make up the bulk of wetlands in the PDA. Undesired changes may range from changes in the vegetation community to complete loss of wetlands due to sediment filling. While the Board agrees with AT that the impacts at the regional level are minor, they also note that wetlands are critical habitat for a number of plant and animal species of management concern as well as plant species of traditional use.

It is the Board's understanding that wetland loss during construction will need to be offset under the *Alberta Wetland Policy*. The Board recognizes that post-flood scenarios will create additional losses in wetlands or changes in wetland function. The Board's understanding is that these losses will also require offsetting under the *Alberta Wetland Policy*. While offsetting may not be the ideal solution, in the Board's opinion the time to offset against future loss is during the early phases of the Project. Given the Project's proximity to Calgary and ongoing development in the region, opportunities for offsetting in the local area will likely decline over time. The Board encourages AT, in concert with Alberta Environment and Parks, to develop and implement an offset plan for all wetlands that are likely to be lost during the life of the Project.

Alberta Transportation stated that construction and operation will result in a reduction of trees and shrubs in the PDA. The Board notes that trees and shrubs are important habitat as well as a source of country foods. AT's reseeded is aimed at establishing native grassland vegetation on disturbed areas. In the Board's view, AT's approach of seeding to grassland vegetation in areas that have been disturbed by construction or by flood is appropriate. However, the Board believes a more proactive approach to maintaining tree and shrub cover in the PDA is required. In particular, as a condition of approval, the Board directs the Operator to assess the extent and species mix of trees and shrubs that are likely to be lost in the more frequently inundated areas and implement replacement plantings at higher elevations within the reservoir or along the perimeter.

The Board recognizes that private stewardship has resulted in preservation of native plant communities and natural wetland areas within portions of the PDA. The Board also understands that the Project will put these areas at risk and, despite best efforts, the nature of the upland plant communities and wetlands will almost certainly change over time. Native species may become dominant over a larger upland area; however, the plant community will likely lose complexity and with it, some functionality. Furthermore, native vegetation areas and wetlands lost to Project infrastructure are irretrievably lost. The Board knows that these changes, while regrettable, cannot be avoided or fully mitigated if the Project is to proceed. The Board finds that the reduction in risk to the human community through flood mitigation outweigh the harms visited on the plant and wetland communities within the project development area.

13.5 Conditions

The Operator shall:

- a) extend monitoring of revegetated areas from 18 months to a minimum of two full growing seasons following seeding, and
 - b) assess the extent and species mix of trees and shrubs that are likely to be lost in the more frequently inundated areas and implement replacement plantings at higher elevations within the reservoir or along the perimeter,
- to the satisfaction of Alberta Environment and Parks.

SECTION 14 WILDLIFE AND BIODIVERSITY

14.1 Summary from the Application (EIA)

Wildlife and biodiversity assessments were performed for the project development area (PDA), local assessment area (LAA), and regional assessment area (RAA) using existing data, field surveys, scientific literature, professional judgement, and past project experience. (Maps showing assessment areas are included in Appendix C.)

The local assessment area and most of the regional assessment area are located in the Foothills Parkland natural subregion, with the southwest portion of the RAA extending into the Montane natural subregion. The RAA overlaps several landscapes with high biodiversity (designated by the Government of Alberta as Key Wildlife Biodiversity Zones), most notably the Elbow and Bow River valleys. All of the Glenbow Ranch Provincial Park and parts of Bragg Creek Provincial Park and the Gooseberry Provincial Recreation Area are within the regional assessment area. The western side of the LAA and RAA are included in the support zone identified in the draft Alberta Grizzly Bear Recovery Plan.

Potential Project impacts on wildlife and biodiversity were assessed based on the occurrence and abundance of key wildlife species and current extent of suitable habitat. This baseline condition was compared to projected changes that are likely to occur during construction and operation of the Project. Wildlife indicator species included olive-sided flycatcher, Sprague's pipit, northern leopard frog, elk, and grizzly bear, among others. Biodiversity indicators used for plant communities and habitat assessment included native cover (upland and lowland), native cover patch size, and species richness and abundance.

14.1.1 Habitat Assessment

The LAA at present is predominantly agricultural land (48 per cent) of low habitat suitability. Intermixed with previously disturbed agricultural land are remnant patches of undisturbed vegetation with higher habitat suitability for species requiring grassland, shrubland, and mixed forest. Areas along the Elbow River valley provide important winter ungulate habitat and include floodplain, wetland, and forest areas with high biodiversity potential. Available habitat for broadleaf forest, conifer forest, and wetland-dependent species is a relatively low proportion of the local assessment area. Alberta Transportation (AT) found that the majority of the LAA consists of habitat with low and very low to nil suitability ratings for the key indicator species assessed. Within the larger regional assessment area, AT found suitable habitat for 86 wildlife species of management concern including 54 birds, 26 mammals, three amphibians, and three reptiles, including:

- 19 species at risk on Schedule 1 of the *Species at Risk Act* (SARA);

- three species of special concern according to the Committee on the Status of Endangered Wildlife in Canada;
- 12 species at risk listed by the Alberta Wildlife Association; and
- a number of species of traditional importance to Indigenous people.

Three of the five key indicators were detected during field activities, namely olive-sided flycatcher, elk, and grizzly bear.

14.1.2 *Project Effects on Habitat*

Alberta Transportation stated that construction of the Project will have direct effects within the LAA that are moderate in magnitude. These include replacement of existing land cover with Project structures (diversion channel, dam, low-level outlet, etc.). Project impacts on upland and wetland diversity and habitat connectivity (fragmentation) within the PDA are further described in the vegetation and wetland sections (see Section 13, Vegetation). Sensory disturbance caused by noise or light may reduce habitat use in areas adjacent to the construction sites. Within the larger footprint of the regional assessment area, construction effects are likely to be negligible.

Once the Project is operational, changes in habitat type and species composition will continue. During dry operations, the permanent structure areas will be removed as potential habitat, though revegetation of the dam face and diversion channel may somewhat replace suitable habitat and provide movement corridors for some species. Alberta Transportation assessed effects on wildlife habitat during flood and post-flood operations as moderate in magnitude during a design and a one-in-one hundred (1:100) year flood. These higher magnitude floods will change abundance and distribution of wildlife in the LAA as a result of diverted flood waters making habitat inaccessible.

Residual effects on habitat used by key indicator species were considered low in magnitude for all scenarios, except for the following:

- Construction and dry operation on habitat use by
 - olive-sided flycatcher and northern leopard frog; and
 - elk (winter and summer) and grizzly bear (spring and summer) feeding.
- Flood and post-flood operation on habitat use by
 - northern leopard frog during the design and 1:100 year flood;
 - elk summer and winter feeding (high during flood and moderate post-flood); and
 - grizzly bear spring feeding.

In general, the Project will reduce the amount of habitat available for key indicator species in and around the project development and local assessment areas, but the effects will likely be unmeasurable at the RAA level.

14.1.3 Project Effects on Wildlife and Biodiversity

AT indicated that during construction and dry operation, direct effects on wildlife could occur through direct habitat loss, reduced habitat effectiveness, impedance of wildlife movement, habitat fragmentation, and increased mortality risk. Indirect effects such as sensory disturbance caused by noise or light may also occur.

Flood and post-flood operations could impact wildlife through temporary inaccessibility to habitat, direct habitat loss or alteration, and reduced habitat effectiveness for terrestrial species, as well as through indirect effects (e.g., sensory disturbance during post flood remediation activities). Reservoir flooding will displace wildlife into other, potentially less suitable or effective habitats. The Project has the potential to affect bird and amphibian species richness and relative abundance within the PDA through change in land cover types.

14.1.4 Project Effects on Wildlife Movement

The development of project structures, access roads and road realignments, the diversion channel, floodplain berm, off-stream dam, and associated fencing around the PDA, were assessed as these have the potential to create physical barriers or sensory disturbance that might hinder wildlife movements. Diversion of water during a flood would block movement through the flooded area of the off-stream reservoir but would retain some wildlife habitat connectivity and corridors downstream of the diversion structure that would otherwise be temporarily flooded.

Alberta Transportation assessed the overall magnitude of residual effects on wildlife movement of the key indicator species as low during construction, dry operation, and flood and post-flood operations. The exceptions were the effects during construction and dry operations on northern leopard frog and elk (and other large ungulates) and the effects on elk (and other ungulates) during a design flood.

Alberta Transportation has proposed a number of activities, such as a wildlife camera program, to monitor wildlife movement and inform an adaptive management plan aimed at improving mitigation approaches. Other mitigation activities intended to maintain wildlife movement include surfacing the dam, diversion channel, floodplain berm and low-level outlet with materials that allow easy passage for ungulates, and using wildlife-friendly fencing.

14.1.5 Project Effects on Mortality Risk

Changes to mortality risk were assessed during construction. Wildlife mortality would likely increase as a result of nest destruction or failure (e.g., for raptors and songbirds), animal-vehicle collisions, and increased human-wildlife conflict, potentially resulting in destruction of nuisance animals. Flood and post-flood operation could result in destruction or abandonment of wildlife residences, drowning, and increased animal-vehicle collisions.

AT assessed the overall magnitude of residual effects on the mortality risk to wildlife as low or negligible for key indicator species during construction, dry operation, and flood and post-flood operations. Exceptions were during flood and post-flood operation when mortality risk in the PDA was assessed as moderate for some grassland-dependent birds, largely due to nest loss, and for the northern leopard frog.

The Project is not expected to have significant effects on wildlife health due to accumulation of methylmercury or other contaminants in the reservoir basin, post flood.

14.1.6 Project Effects on Biodiversity

Alberta Transportation predicted residual effects of the Project on biodiversity as low in magnitude during construction and dry operation, and negligible at the regional level for all flood scenarios and for post-flood operations. AT predicted that sediment deposited in the reservoir during major floods will change species and community diversity to some extent. For example, grassland birds may be displaced for several seasons post flood until lost vegetation is re-established. AT also pointed out that reduction of flooding downstream from the Project will preserve habitat and biodiversity in some areas while still allowing sufficient overbank flooding to regenerate portions of existing flood plain communities.

14.1.7 Monitoring and Mitigation

Alberta Transportation has committed to an extensive list of monitoring and mitigation activities and developed a draft wildlife mitigation and monitoring plan. The plan will be further developed as the Project proceeds through the permitting and approval process and will meet all required provincial and federal approval conditions. The draft plan focuses primarily on large mammals during all phases of the project (including the use of remote cameras). Large mammals are the species of management concern with the greatest uncertainty in their assessment, and they are predicted to be most affected by the Project. The plan also commits AT to surveys and monitoring, as well as harm reduction activities for birds, amphibians, and other mammals.

14.2 Views of the Interveners

Stoney Nakoda Nations

The Stoney Nakoda Nations (SNN) expressed concern that the Project would destroy or lead directly to the loss of a significant amount of critical habitat used by animals, fish, and birds of cultural importance. The SNN also felt that the Project infrastructure and proposed perimeter fences will act as barriers to wildlife migration and result in habitat fragmentation.

The SNN were concerned with potential noise impacts on wildlife and wildlife habitat. Black and grizzly bears, as well as eagles, were identified as species of cultural and spiritual significance that frequent the area and may be impacted by the Project. The SNN thought that the Project would have detrimental effects on eagle and migratory bird nests and disrupt the territories of a number of other important species.

The Stoney Nakoda Nations submitted that an overpass for wildlife movement over Highway 22, as they have continuously requested, would be more appropriate to facilitate migration and movement through the Project area rather than an underpass. In the SNN's view, wildlife overpasses are more effective at mitigating habitat fragmentation and animal-vehicle collisions. The SNN suggested that riprap within the diversion channel would make it unsuitable for ungulate crossing. The Stoney Nakoda Nations indicated that large animals travel along trails in the area and that destruction of existing trails would result in disturbance to wildlife habitat, corridors, and movement patterns.

The Stoney Nakoda Nations expressed a desire to collaborate, provide input, and work with Alberta Transportation on wildlife and biodiversity monitoring and mitigation to ensure traditional knowledge and wisdom are included in plans and activities.

SR1 Concerned Landowners Group

The SR1 Concerned Landowners Group (SCLG) submitted that the whole area west of Calgary to the Rocky Mountains, including the PDA, is a high-value landscape for wildlife and is identified as high risk for wildlife sensitivity. The SCLG described a number of ecological functions and processes that rely on large floods and felt that no comprehensive assessment was conducted on the effects of limiting flow to 160 cubic metres per second (m³/s) on downstream habitats and ecology.

The SR1 Concerned Landowners Group provided testimony on sightings and wildlife use in the LAA that indicated more frequent use than the sightings and use mapped by Alberta Transportation. The region has a large resident elk population and is also home to a number of grizzly bears. The SCLG felt that AT placed too little value on wildlife and biodiversity and were biased toward the monetary value of flood mitigation on property downstream.

Scott Wagner

Mr. Wagner expressed concern that wildlife use of the area would be significantly reduced as a result of the Project. Mr. Wagner believes that considerable numbers of elk frequent the area, possibly multiple herds. He provided photographs of both elk and grizzly bear presence within the LAA and was of the opinion that any negative effects on the local elk herds would also affect the grizzly bear population and vice-versa. Mr. Wagner was not only concerned with direct impacts from the Project, but also indirect ones such as increased hunting pressure in the area as a result of increased access, leading to the demise of the local elk herds.

14.3 Views of Alberta Transportation

Alberta Transportation indicated that they were aware of, and considered concerns raised by Indigenous rights holders and landowners. In AT's view, they have conducted adequate analysis and consideration of impacts, including residual and cumulative impacts. Alberta Transportation was confident that the assessment and analysis related to wildlife and biodiversity is correct and will rely on monitoring and mitigation to verify predictions and to reduce uncertainty in outcomes. It was noted that the entire Elbow River and adjacent uplands have been identified as important habitat and landscape of conservation significance, and this was considered in AT's assessment. Alberta Transportation outlined that the key wildlife indicator species selected for the assessment included wildlife species of cultural importance to the Stoney Nakoda Nations.

Alberta Transportation acknowledged the interveners' concerns regarding the Project's potential effects on the elk population in the area. Alberta Transportation recognized that elk are abundant in the local assessment area and that grizzly bears are also present, and understood the relationship between these species. They pointed out that habitat loss during construction and operation is a relatively small area of the RAA and was appropriately addressed as part of the assessment. Potential habitat loss due to sensory disturbance (e.g., noise) was included in the assessment and mitigation measures will be put in place during construction and, if necessary, post flood.

Alberta Transportation indicated that they have considered an overpass for animal movement over Highway 22 in detail and have communicated with the Stoney Nakoda Nations regarding their findings. While a wildlife overpass (such as the one being explored along Highway 1 near Canmore) can be beneficial, Highway 22 has been proposed as a corridor for transporting high loads. An overpass with the necessary height clearance would need to be an excessively large and complex structure, making the planned use of the diversion channel to allow animals to pass under Highway 22 the better solution. Alberta Transportation outlined that they have incorporated design features to facilitate wildlife movement into plans for the Highway 22 bridge span and that ripped portions of the diversion channel will be infilled with material smaller in diameter, covered in topsoil, and seeded with grasses to facilitate wildlife movement through the Project area.

AT indicated that wildlife-friendly fencing will be used in areas where fencing is required. In their view, significant impacts to birds and bird nests are not expected and potential impacts to nests would be identified in the draft mitigation and monitoring plan and activities.

Alberta Transportation reiterated that a wildlife mitigation and monitoring plan would be finalized, in consultation with Indigenous groups and local stakeholders, and implemented as part of the Project. This plan will include elements aimed at reducing or eliminating Project impacts on elk and grizzly bears using the local assessment area. The plan would also include communication with the community during final planning, construction, and operation. Alberta Transportation also agreed to conduct additional biodiversity studies/surveys prior to construction, as these would assist in subsequent monitoring, reporting, and mitigation.

Monitoring would be ongoing prior to and after construction, and would include remote camera monitoring for wildlife movement within the LAA. This would include camera monitoring of the Highway 22 underpass.

14.4 Views of the Board

During the hearing, the Board heard that the lands within the PDA have been held in stewardship by the ranching community for multiple generations and by the Stoney Nakoda Nations from time immemorial. The result is an area abundant in wildlife, including species of cultural importance to the people of the Stoney Nakoda Nations and the Springbank community. While agriculture is currently the dominant land use in the area, significant biodiversity is supported by preserved areas of natural habitat on private land. Access for Indigenous people to exercise rights with respect to hunting and gathering on private lands has been facilitated through person to person agreements in many cases. People of the region attested to their special attachment to both the land and the wildlife it supports, and their heartfelt concern for the future of elk, grizzly bear, and “the little animals that run around on the grass”⁸, as referred to by Elder Henry Holloway of the Stoney Nakoda Nations.

The Board recognizes the Project will change this relationship. Private lands will become public lands and the responsibility for stewardship of habitat and the wildlife it supports will shift more directly to the Government of Alberta. The Board agrees with AT that the proposed changes in Project design in conjunction with monitoring will substantially mitigate Project impacts on wildlife and biodiversity. The Board finds that Alberta Transportation, through the EIA process, completed sufficiently detailed assessments to accurately predict potential Project impacts on wildlife and biodiversity.

The Board is fully aware that construction of the Project will result in some habitat loss within the project development area. Alberta Transportation provided evidence that this loss is relatively small and can be considered insignificant within the larger footprint of the RAA. Similarly, filling of the reservoir during high magnitude floods will result in a change to land cover over time, but AT predicts these impacts on habitat will likely be unmeasurably small at the regional level. The Board agrees with this assessment and finds that the Project’s negligible impacts on regional biodiversity and habitat do not constitute a barrier to Project approval under the *Natural Resources Conservation Board Act*.

In the Board’s view, Alberta Transportation has outlined a robust program of monitoring and mitigation for the Project during the construction and operation phases. The list of mitigation activities during construction is substantial and includes, but is not limited to, on-site monitoring of habitat used by wildlife; avoiding disturbance of native land cover whenever possible; and the presence of professional biologists on-site to make real-time mitigation decisions when nests, dens, or other wildlife habitations are encountered. While some sensory disturbance of wildlife during construction will occur, Alberta Transportation has phased construction of the Project to the extent possible to avoid critical life cycle periods and has proposed measures to minimize noise and light impacts. Additionally, AT has committed to further dialogue with the SNN on

⁸ Transcript – Exhibit 368, page 896 (lines 2 -3)

using their traditional knowledge of the area and its wildlife during the design of wildlife and habitat monitoring and mitigation programs. Alberta Transportation's commitment to continuous liaison with the local community will also provide an opportunity for ongoing public dialogue on biodiversity and wildlife protection.

The Board recognizes that flooding of the reservoir will cause both displacement and some mortality of wildlife, since floods generally occur during periods when young of the year are vulnerable. In the Board's view, while this is regrettable, major floods are infrequent and losses within the reservoir are likely offset to some extent downstream of the Project where reduction in flooding will potentially reduce wildlife displacement and mortality. Alberta Transportation has also outlined procedures to be followed during diversion events to assist wildlife in moving to safety and to rescue stranded wildlife where practicable and safe to do so.

Although Alberta Transportation has rejected the development of a wildlife overpass, they have made design changes to the diversion channel floor and sides, and designed the Highway 22 bridge (to be constructed across the diversion channel) to allow wildlife to safely cross under Highway 22. The Board agrees with AT that an overpass is not a feasible solution to the problem of wildlife movement across Highway 22. The Board finds that use of the diversion channel as an underpass to provide safe wildlife passage under Highway 22 is the preferred solution.

The Board notes that Alberta Transportation has responsibility for, and significant experience with, managing wildlife crossings on major roads. The Board expects that AT will employ all feasible measures to reduce the risk of vehicle collisions with wildlife.

With respect to other permanent structures, the Board notes that wherever possible AT has incorporated elements into the design to facilitate wildlife use and movement. This includes a commitment to use wildlife-friendly fencing along the perimeter of the PDA and internally where access of cattle and people must be controlled.

The Board notes that Alberta Transportation, in cooperation with Alberta Environment and Parks, will finalize the wildlife monitoring plan and mitigation strategies prior to Project construction. The Board finds that the wildlife monitoring and mitigation draft plan is sufficiently comprehensive for the purposes of the Board's public interest decision.

The Board finds that the Project poses no significant risk to the viability of wildlife populations, including species at risk, or to biodiversity within the region and that the negligible and largely temporary impacts on these valued components does not constitute a barrier to project approval.

SECTION 15 AIR QUALITY ASSESSMENT AND PUBLIC HEALTH IMPACTS

15.1 Summary from the Application (EIA)

15.1.1 Air Quality Assessment

Spatial areas used for the air quality assessment included a local assessment area (LAA) and a regional assessment area (RAA), which together comprised a 20 by 20 kilometre (km) region extending approximately six km from the boundaries of the project development area (PDA). It was Alberta Transportation's view that use of one spatial area (LAA/RAA) for the air quality assessment is compliant with the Alberta Environment and Parks *Air Quality Model Guideline* (2013). Maps showing assessment areas are included in Appendix C.

Baseline Conditions

To establish baseline ambient conditions, Alberta Transportation (AT) conducted a particulate matter (PM) monitoring program for particles 2.5 microns in diameter or less (PM_{2.5}), total suspended particulate (TSP), and dustfall. The 10-week program was conducted during dry summer months to coincide with worst case conditions for PM generation in rural farm locations. For the 10-week period, PM_{2.5}, TSP, and average and individual dustfall concentrations were below the Alberta Ambient Air Quality Objectives (AAAQO).

To better define baseline ambient air quality conditions, the results of the PM monitoring program were combined with published ambient air quality data from regional air quality monitoring stations that have longer records. Baseline ambient air quality information on Criteria Air Contaminant gases (e.g., nitrogen oxides, sulphur dioxide), volatile organic compounds, polycyclic aromatic hydrocarbons, and metals from the monitoring stations was also reviewed. The baseline concentrations for these constituents ranged from 0.005 to 51 per cent of the AAAQO.

Impact of Construction on Air Quality

Alberta Transportation proposed to stage Project construction over a three-year period. The main source of air emissions was expected to be construction vehicle exhaust and fugitive dust emissions associated with soil-disturbing construction activities. The largest emissions are associated with construction of the off-stream dam, and raising of Highway 22, which involve the greatest movement of construction material. Lower emissions are expected for other activities such as construction of the water diversion channel, low-level outlet, and bridges. Laydown

areas for construction equipment and supplies, as well as Project reclamation activities, are not expected to impact air quality.

Alberta Transportation outlined that in order to develop effective mitigation strategies for reducing air emissions, an understanding of the potential changes to ambient air quality associated with Project activities is needed. The air quality assessment considered substances for which provincial or federal ambient air quality criteria exist. The impact of the Project on air quality was determined by comparing predicted concentrations and PM emissions due to Project construction activities, to non-Project related emissions.

An air dispersion computer model was used to predict the impact of construction emissions associated with the project on ambient air quality. Modelling was conducted following the 2013 *Alberta Air Quality Model Guideline*.

The ambient air quality assessment addressed three cases:

- Base Case – existing emissions in the LAA/RAA that include traffic exhaust, road dust emissions, and emissions from a compressor station; traffic emissions were determined for roads in the LAA/RAA using traffic count information and a traffic emissions model;
- Project Case – emissions from the Project only include the following emissions related to construction activities:
 - diesel exhaust emissions from off-road construction equipment and haul trucks; exhaust emission estimates were based on published engine emission standards, and emission simulator models; Alberta Transportation outlined that the estimated vehicle emissions are conservative since the model used emission information from older construction equipment that tends to have greater emissions than newer, off-road diesel construction equipment; and
 - fugitive dust emissions from truck traffic on haul roads, the handling/movement of top soil and overburden, and from top soil and overburden stockpile wind erosion; dust emissions associated with construction equipment activity were estimated using guidance from the United States Environmental Protection Agency.
- Application Case – emissions from the Base Case and Project Case combined; Alberta Transportation determined that, on an annual basis, the Project contributions to application case emissions range from 90 to 95 per cent for particulate emissions, and from 33 to 61 per cent for gaseous emissions.

The air quality assessment found that the potential exists for PM_{2.5} and TSP concentrations outside of the PDA to be greater than regulatory criteria. Alberta Transportation proposed an air quality monitoring and a record keeping program to ensure appropriate mitigative action is taken to address any exceedances.

According to Alberta Transportation, planned mitigation options to reduce emissions from construction vehicles include:

- requiring that Project construction vehicles meet current emission standards;
- proper maintenance of engines and exhaust systems and repair (prior to operation) if emissions are excessive;
- reducing idling times for construction equipment to the extent possible;
- reducing cold starts to the extent possible;
- limiting lineups (and associated idling) to the extent possible when using one-way traffic flows on Highway 22 and Springbank Road to accommodate construction activities;
- ensuring sulphur concentration in diesel fuel does not exceed 15 mg/kg (milligrams per kilogram; explicitly quantified in the project emission estimates); and
- ensuring discharge of atmospheric contaminants from construction operations be in accordance with regulatory requirements.

Proposed mitigation measures to manage fugitive dust during construction activities include:

- applying water to haul roads and disturbed areas during dry periods that are above freezing (explicitly quantified as a 75 per cent control efficiency);
- applying chemical dust suppressants (tackifiers) if water application does not sufficiently control dust;
- cleaning roads manually or with street cleaning vehicles;
- revegetating disturbed surfaces promptly if soil track-out/carry-out occurs;
- suspending dust generating activities during periods of excessive winds when dust suppression activities are not effective; and
- using silt fences and mulching to stabilize surfaces of temporary soil and overburden stockpiles during extended periods between use.

The prediction confidence was high for the estimated combustion emissions during construction activities. The residual air quality effects of construction were expected to be moderate to high in magnitude, adverse, varied according to season and time of day, within the LAA, of short-term duration, and reversible. Information from the ambient air quality monitoring program during construction will be used to assess model predictions, determine actual Project emission impacts, and assess the effectiveness of mitigation measures or need for additional mitigation.

Air Quality Impacts during Operation

During flood operations, fugitive dust emissions are not expected during reservoir filling and draining due to the wetted sediments. During dry operations, Alberta Transportation outlined that maintenance of the reservoir, channel, roads, and bridges may produce fugitive dust emissions, at much lower levels than the fugitive dust associated with construction activities.

During post-flood operations at the drained reservoir, there may be air quality effects from fugitive dust emissions during windy conditions as deposited sediments dry. The one in one hundred (1:100) year flood and the design flood were assessed for post-flood fugitive dust emissions from areas of the drained reservoir containing deposited sediments that were more than 10 centimetres (cm) thick. The 1:10 year flood was not assessed because the hydrological modelling conducted for the Project predicted negligible sediment deposition during this event. The area containing a sediment thickness of 10 cm or more for the design flood was predicted to be approximately double the area of similar sediment expected in a 1:100 year flood. Alberta Transportation estimated that fugitive dust emissions associated with wind erosion following a design flood would be approximately double those in a 1:100 year flood.

Windblown fugitive dust emissions will be mitigated in the short term by tackifier application and in the longer term by revegetation. Alberta Transportation predicted that the tackifier will have a dust control efficiency of 84 per cent. The air dispersion modelling used emission rates with tackifier applied.

The post-flood residual effects on fugitive dust are expected to be adverse in direction, of moderate to high magnitude, limited to the LAA, of short-term duration (less than one year), irregular in frequency (only in flood years and high wind conditions), and reversible (due to mitigation measures such as tackifier use and revegetation).

Air Quality Monitoring

An air quality monitoring program was designed by Alberta Transportation to provide information on the effectiveness of Project mitigation measures. Alberta Transportation indicated that the monitoring will be conducted according to the Alberta Environment and Parks *Air Monitoring Directive* (2016) and will meet expected provincial and federal monitoring and reporting conditions in the anticipated *Environmental Protection and Enhancement Act* approval.

Alberta Transportation expected that Project construction along the PDA boundary in proximity to the busiest Project haul roads and along highways will have the greatest potential for impact on air quality. AT committed to monitoring air quality at two monitoring locations between the diversion channel and the dam. If additional fill material for earthworks is required and sourced from the PDA, AT will establish a third monitoring station in proximity to the borrow area. Alberta Transportation committed to continuous air quality monitoring during construction for TSP and PM_{2.5}, and for meteorological parameters including wind speed, wind direction, and temperature. According to AT, PM₁₀ will not be monitored because there are no AAAQO or Canadian Ambient Air Quality Standards (CAAQS) for PM₁₀. Alberta Transportation asserted that air quality monitoring information will facilitate the timely application of additional mitigation measures for fugitive dust control should excessive PM_{2.5} levels be measured. In addition to air monitoring, AT plans to conduct daily visual inspections of haul roads and areas of major

earthworks in the vicinity of active construction areas, such as the diversion structure, diversion channel, dam, and low-level outlet.

Alberta Transportation believed that during post-flood operations air quality may be impacted by windblown silt from sediment in the reservoir deposited after a flood, particularly near the eastern boundary of the project development area. Once a flood subsides, ambient monitoring will be deployed to monitor potential air quality effects associated with windblown sediment. Alberta Transportation indicated that it will determine the need for monitoring in consultation with stakeholders and regulatory agencies. The need for monitoring will also depend on the quantity, location, and moisture of deposited sediment, as well as the time of year and whether mitigation action was taken. AT anticipated monitoring fugitive dust from post-flood operations through continuous monitoring of TSP, PM_{2.5}, and meteorological information including wind speed, wind direction, and temperature. These data will be used by Alberta Transportation to assist in determining the need for, or effectiveness of, mitigative actions following a flood where there is substantial sediment deposited in the off-stream reservoir.

Alberta Transportation indicated that since nitrogen dioxide and PM_{2.5} are recognized substances of public health concern it is prudent to monitor the concentration of these substances during the Project construction period to evaluate public and community exposure relative to both the AAAQO and the CAAQS. AT indicated that a residential area in Springbank, located approximately 4.5 km east of the eastern boundary of the project development area, would be a potentially suitable location for the monitoring station. The final location of the monitoring station will be determined in consultation with regulatory agencies and stakeholders. Continuous monitoring of PM_{2.5} and nitrogen dioxide, along with meteorological parameters including wind speed, wind direction, temperature and other variables is proposed. Alberta Transportation asserted that monitoring the concentration of PM_{2.5} and nitrogen dioxide at a location where people live makes sense. Meteorological information will be used to determine the source of any elevated concentrations of nitrogen dioxide and PM_{2.5}.

Alberta Transportation indicated that when air concentrations exceed designated alert levels, the monitoring station will be capable of sending automatic alerts to Alberta Transportation staff (during Project construction) or Alberta Environment and Parks staff (during Project operation), enabling a rapid response.

15.1.2 *Air Quality Impacts on Public Health*

Alberta Transportation conducted a human health risk assessment to determine Project air effects on public health during construction. The selection of chemicals of potential concern used in the human health risk assessment was based upon emissions identified as part of the air quality assessment. These include:

- Criteria Air Contaminants (sulphur dioxide, nitrogen dioxide, carbon monoxide, PM_{2.5});
- volatile organic contaminants associated with fuel combustion (e.g., acrolein, benzene);

- polycyclic aromatic hydrocarbons from fuel combustion; and
- metals associated with fuel exhaust.

During Project construction, Alberta Transportation considered inhalation as the main exposure route for airborne chemicals of potential concern from vehicle exhaust and fugitive dust emissions. Fifty eight human receptor locations within five km of the project development area were used for the human health risk assessment. It was Alberta Transportation's view that receptors outside of this radius would experience less change in air quality and therefore a lower degree of change in risk to human health.

Two categories of contaminants were used to assess impacts on public health: non-carcinogens and carcinogens. Potential human health effects were assessed using exposure ratio values for non-carcinogens, and incremental lifetime cancer risk values for carcinogens. Predicted exposure ratio values and incremental lifetime cancer risk values of 1.0 or less for inhalation indicate negligible health risk, while values greater than 1.0 indicate a potential unacceptable public health risk.

Public Health Risk Associated with Construction Air Quality Impacts

Alberta Transportation indicated that combustion exhaust and fugitive dust emissions are expected during the construction phase. The following chemicals of potential concern commonly associated with combustion exhaust and fugitive dust were determined to have an exposure ratio of less than 1.0, which suggests they are not expected to pose an unacceptable risk to public health:

- metals, including arsenic, manganese, mercury, chromium (VI), chromium (III), and nickel;
- carcinogenic polycyclic aromatic hydrocarbons, including benzo(a)pyrene, naphthalene, acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, phenanthrene, and pyrene;
- volatile organic compounds, including 1,3-butadiene, 2,2,4-trimethylpentane, acetaldehyde, acrolein, benzene, ethylbenzene, propionaldehyde, formaldehyde, toluene, and xylenes; and
- nitrogen dioxide (annual), sulfur dioxide, carbon monoxide, and diesel exhaust particles (annual).

Alberta Transportation determined that during construction, potentially unacceptable risks to public health exist at some human receptor locations for the following chemicals of potential concern:

- nitrogen dioxide (1-hour) at four receptor locations;

- PM_{2.5} (1-hour or 24-hour) at 18 residential receptor locations;
- PM_{2.5} (annual) at one receptor location;
- diesel exhaust particles (2-hour) at 23 receptor locations; and
- inhalation mixture group for lung cancer (chronic, based on hexavalent chromium) at one receptor location.

Alberta Transportation noted that the exposure ratios for the chemicals of concern that pose a potential public health risk, were barely above one. It was AT's view that inhalation health risk during the construction is not significant given the margin of error associated with determination of exposure ratios, the conservative approach to air dispersion modelling, and the proposed mitigation measures.

Public Health Risk Associated with Dry Operation, Flood, and Post-Flood Air Quality

Alberta Transportation outlined that emissions of chemicals of potential concern are not expected during dry operations, flood operations, and post-flood operations. Some Criteria Air Contaminants (e.g., nitrogen dioxide, PM_{2.5}) are associated with emissions from equipment used for post-flood clean-up and maintenance operations (e.g., reservoir clean-up, channel maintenance). However, Alberta Transportation indicated that negligible impact on human health is expected because these operations tend to be short-term, transient in nature, and involve a low number of vehicles and equipment.

According to Alberta Transportation, dust may be generated from wind erosion of sediments deposited in the reservoir after draining. Based on the determined exposure ratio, Alberta Transportation expected no unacceptable risks to human receptors from the inhalation of PM_{2.5} during the post-flood operation phase of the project. Alberta Transportation was of the view that potential health risks, associated mainly with PM_{2.5}, will be short term as vegetation regrowth is expected to help stabilize the sediment. Alberta Transportation indicated that additional mitigative actions such as tackifiers would be applied as needed until vegetation has been reestablished. (See Section 13 for details of post-flood revegetation).

Air Quality Monitoring and Public Health

Information from the air monitoring program will be used by Alberta Transportation for determining any AAAQO and CAAQS exceedances that have the potential to impact public health. The monitoring data will also be used to assess the effectiveness of mitigation and to make adjustments as necessary (i.e., an adaptive management approach).

15.2 Views of the Interveners

SR1 Concerned Landowners Group

The SR1 Concerned Landowners Group (SCLG) detailed extensive concerns about potential impacts of the Project on air quality. They asserted that Alberta Transportation did not take their concerns seriously and that a deterioration of air quality in the area could potentially impact the health of their community (reference was made to schools, multiple sports facilities, and other developments located east of the Project). It was the SCLG's view that numerous residents in the Springbank area were not documented as human health receptors as part of the health risk assessment. The SR1 Concerned Landowners Group also expressed concerns that dust storms in the area could disrupt activities at the Springbank Airport and affect vehicle safety on the TransCanada Highway.

The SR1 Concerned Landowners Group asserted that Alberta Transportation's assessment of air quality did not consider representative site specific conditions, resulting in a strong bias that under predicted post-flood impacts on air quality. The SCLG highlighted several receptor locations – proposed school developments, Kamp Kiwanis, a retreat centre, a soccer park, and existing schools – where total suspended particles and PM_{2.5} exceeded ambient air quality guidelines for the 200-year flood. Other concerns of the SCLG with respect to the air dispersion modelling were that Alberta Transportation:

- considered particle sizes from Elbow River bank samples as representative of post-flood sediment deposits. It was SCLG's view that particle size distribution of sediment from the Glenmore Reservoir should have been used by Alberta Transportation in its assessment since it is more representative of expected post-flood sediments. (Sediment deposited from still water is finer and therefore more prone to wind erosion);
- used surface roughness and threshold friction velocity factors in the model that were not representative of site conditions;
- did not use local meteorological data in its air assessment. The SR1 Concerned Landowners Group felt that the use of local meteorological data (e.g., from the Springbank Airport) would better represent the high winds that are common in the area (e.g., Chinooks);
- used areas of the reservoir that contained greater than 10 cm of sediment as a dust source in the model. It is SCLG's view that a larger post-flood reservoir area containing a sediment thickness of 3 cm or more should have been used instead; and
- used the 2013 version of Alberta's *Air Quality Model Guideline* rather than the 2020 version in its air quality assessment.

The SR1 Concerned Landowners Group questioned the effectiveness of Alberta Transportation's adaptive management approach to manage and respond to air quality issues, as mitigation measures were already incorporated into the air quality assessment. The SCLG also expressed concern regarding:

- the timing for mitigative action to begin;
- not including the cost of mitigative action in the Project budget; and
- the effectiveness of some of the proposed mitigative actions, such as the use of tackifiers to control dust emissions from sediment in the reservoir area after floods. Based on its research, the SCLG view is that Alberta Transportation overestimated the effectiveness of the tackifier it planned to use.

To address their concerns about air monitoring and response to guideline exceedances, the SR1 Concerned Landowners Group also requested that Alberta Transportation:

- consider the establishment of a contingent liability fund to address community concerns regarding air quality and to ensure sufficient funding is set aside to address potential complications and unexpected outcomes of the Project;
- establish and maintain shelterbelt trees at AT's expense following consultation with local stakeholders and adjacent landowners;
- create a mechanism to notify cyclists of air quality warnings;
- commit to mitigating airborne dust within 24 hours of an issue or a complaint; and
- monitor air quality with live readings at several locations within the Springbank community.

Calalta Amusements Ltd. and Calalta Waterworks Ltd.

Calalta Amusements Ltd. and Calalta Waterworks Ltd. (Calalta's) primary concerns related to the potential negative impact of dust and ambient air quality during construction and operation of the Project on employees, guests, and equipment at Calaway Park. Calalta indicated that agreement had been reached with Alberta Transportation on the installation of an air monitoring station at its amusement park property to monitor PM_{2.5} levels. Calalta requested that:

- results of dust monitoring at the station proposed for their amusement park property should be provided to Calalta on a weekly basis during the park's operation season, and monthly during the off-season;
- Alberta Transportation take appropriate mitigative action agreed to by both parties in the event of any air quality objective exceedances; Calalta suggested that pausing construction should be considered as a mitigative action; and
- Alberta Transportation provide business interruption insurance to Calalta in the event its Calaway Park operations are impacted by adverse air quality attributable to the Project.

Calalta noted that the strong westerly winds (i.e. Chinooks) experienced in the area on a regular basis should have been considered by Alberta Transportation in its assessment of Project impacts on air quality.

15.3 Views of Alberta Transportation

Alberta Transportation noted that the 2013 version of the Alberta Environment and Parks *Air Quality Modelling Guideline* was used as the basis of the Project air quality assessment. Alberta Transportation acknowledged that Alberta Environment and Parks has developed a draft 2020 modelling guideline that is currently out for public comment. It was AT's view that use of the draft 2020 guideline for its air quality assessment was not appropriate since it is not yet finalized.

In response to the SR1 Concerned Landowners Group and Calalta's concerns related to whether Chinook or high winds were considered as part of the air quality assessment, Alberta Transportation noted that they modelled five years of meteorological data and assessed a variety of meteorological conditions, including those that would be representative of Chinook conditions or high wind events.

Alberta Transportation acknowledged that there was an error in the initial air quality modelling related to estimated PM_{2.5} emissions for post-flood operations. Upon review of the emission calculations, predicted PM_{2.5} emission rates from post-flood operations were approximately double the values presented in the environmental impact assessment. However, Alberta Transportation asserted that the fundamental conclusions presented in the environmental impact assessment are unchanged and AT remains confident that their modelling results are correct. Updated air modelling did not show exceedances of PM_{2.5} limits at any of the school locations highlighted by the SR1 Concerned Landowners Group. In response to the statements made by the SCLG, Alberta Transportation noted that the evidence suggests children attending these schools will not be exposed to unacceptable levels of fugitive dust emissions during post-flood operations. As such, AT anticipated that post-flood air emissions will not have significant adverse effects on public health.

Alberta Transportation acknowledged intervenor concerns that a lag may occur between post-flood water release from the reservoir and flood mitigation activities, due to wet sediments that would make access to the area difficult. The proponent expected that mitigation could be implemented within two weeks of a post-flood water release from the reservoir. This timeframe was noted as a general guide for the monitoring and management program, rather than a fixed requirement.

In order to alleviate some of the intervenor concerns about air quality impacts of the Project on public health, Alberta Transportation committed to:

- appoint a community liaison to manage air quality concerns that may arise from Project operations;
- monitor TSP and PM_{2.5} levels post-flood release, continuing for 16 months following a flood event, with the option to monitor for a longer time period if determined necessary in consultation with stakeholders and regulatory agencies; the monitoring location will be

near the east portion of the project development boundary, with the exact location to be determined once sediment deposition areas are visible;

- develop and finalize a communication plan prior to Project construction that outlines the means and procedures for communicating Project air quality information to Indigenous groups and stakeholders; and
- consider requests regarding the planting of trees or a shelter belt as a method to mitigate potential Project impacts on air quality.

Alberta Transportation declined requests from the SR1 Concerned Landowners Group to establish a contingent liability fund for issues arising from air quality and to provide a dedicated warning system for cyclists. Alberta Transportation asserted that the combination of proposed mitigation strategies, air quality monitoring, and implementing an adaptive management approach are sufficient to ensure that any air quality effects of the Project on public health remain at acceptable levels.

Alberta Transportation indicated that it has had constructive conversations with Calalta Amusements Ltd. to address their air quality and public health concerns. AT is confident that its response to these concerns is reasonable and effective, and as such, Alberta Transportation rejected Calalta's insurance coverage request. However, Alberta Transportation committed to:

- installing an air monitoring station on Calalta's amusement park property to monitor $PM_{2.5}$ concentrations during Project construction, when the park is open to the public, and to share monitoring results with Calalta; and
- investigating any exceedances of air quality objectives, reporting them to the regulators and Calalta, and taking appropriate mitigative action if the exceedance is determined to be a result of Project construction.

15.4 Views of the Board

The Board finds that Alberta Transportation adequately assessed potential effects of the proposed Project on air quality in the area, and the impact of these effects on public health. The Board acknowledges the possibility for fine particulate matter (i.e., $PM_{2.5}$) to exceed ambient air quality standards outside of the project development area during the construction phase; however, these effects are expected to be short-term and reversible. Fugitive dust emissions are also expected with wind erosion of post-flood sediments that are deposited in the reservoir area. The Board notes that flooding events that result in sediment deposition in the reservoir are expected to be rare (Alberta Transportation claimed that the Project, if built, would only have been deployed 10 times since 1908), and therefore the Board believes post-flood fugitive dust emission would be correspondingly rare. In addition, most flood events are relatively small and have a relatively small area of sediment deposition and low potential for air quality exceedances. The Board agrees with Alberta Transportation that an adaptive management strategy, informed by vigilant monitoring and leading to effective mitigation measures, will be essential for managing any air quality impacts of the Project on public health.

The Board acknowledges that Alberta Transportation conducted its air quality assessment according to the 2013 Alberta *Air Quality Monitoring Guideline* and accepts that use of the draft 2020 guideline is inappropriate since it is currently under public review and therefore not finalized. The Board understands that dispersion modelling is an essential tool for making a variety of air quality decisions relating to new industrial developments such as the appropriateness of the facility location and monitoring network design. The Board agrees that model predictions are useful for determining areas likely to be impacted by emissions from a source and for determining air quality expected under various scenarios.

The Board understands that the quality of air modelling predictions are dependent on a variety of factors, including the accuracy of model inputs such as expected emission rates, local meteorology, and topography conditions. The Board notes that there was considerable disagreement between the proponent and the SR1 Concerned Landowners Group on how the model was applied and on modelling results. For example, the SCLG claimed that Alberta Transportation showed bias by choosing conservative or, in their view, unrepresentative data inputs for the dispersion modelling, resulting in understated air impacts associated with Project activities. The Board notes that even after Alberta Transportation addressed the PM_{2.5} model calculation errors identified by the SCLG, the proponent believed that the predicted impact on air quality during post-flood operations would not substantially change. The Board acknowledges that Alberta Transportation used conservative measures in its air quality modelling. For example, in response to SCLG concerns related to whether Chinook winds were considered as part of the air quality assessment, Alberta Transportation asserted that since five years of meteorological data were modelled, a variety of meteorological conditions were considered, including conditions representative of Chinook or high-wind events.

The Board finds that air dispersion models are an important decision-making tool and that monitoring is essential for testing model predictions and for quantifying Project emission impacts on air quality. The Board is confident in the effectiveness of the draft air quality management plan developed by Alberta Transportation for the Project that details air quality (ambient and at the PDA boundary), mitigation, and meteorological monitoring plans. The Board notes that the plan is being developed to satisfy requirements for an *Environmental Protection and Enhancement Act* approval and therefore will require approval from Alberta Environment and Parks. The Board also understands that the plan will be finalized in consultation with regulators, stakeholders, and Indigenous communities.

The SR1 Concerned Landowners Group and Calalta expressed concerns about access to air monitoring data, and timely mitigation when guideline air quality levels are exceeded. The Board is supportive of the air quality management plan, and the following commitments that were made by Alberta Transportation after the plan was developed:

- An additional continuous PM_{2.5} monitoring station will be installed on Calalta's property to operate when the park is open to the public during the Project construction phase. Monitoring results will be reported to Calalta on a regular basis, and any necessary mitigative action required will be conducted in consultation with Calalta.
- Continuous TSP and PM_{2.5} monitoring will occur at a location in the east project development area during post-flood operations for a 16-month period after a flood. It is the Board's view that the 16-month monitoring period is reasonable given that revegetation will occur within this period to reduce wind erosion potential. The Board

notes that AT has already committed to monitoring of meteorological conditions such as wind speed, wind direction, and temperature at this location in the draft air quality management plan.

- An air monitoring station will be established in the Springbank community (as committed to in the air quality management plan) to continuously monitor PM_{2.5}, and nitrogen dioxide concentrations, and meteorological parameters including wind speed, wind direction, temperature, and other variables. The Board supports continuous monitoring of PM_{2.5} and nitrogen dioxide since these parameters are recognized substances of public health concern. The Board agrees with Alberta Transportation that a timely response to exceedance events will occur since the monitoring station will be capable of sending automatic alerts to Alberta Transportation staff (during project construction) or Alberta Environment and Parks staff (during project operation) when air concentrations exceed designated alert levels.

To better understand post flood Project impacts on air quality and public health, the Board requires that, as a condition of approval, the Operator shall, in addition to air monitoring commitments, conduct continuous monitoring of PM_{2.5} and total suspended particulate levels and meteorological conditions for a minimum 16-month period post-flood at the proposed Calaway Park air monitoring station during the period when the park is open to the public, and at the Springbank community air monitoring station. All monitoring stations must be capable of sending automatic alerts to the Operator when air concentrations exceed designated alert levels so that any exceedance events, if confirmed to be attributable to Project activities, can be mitigated in a timely manner.

The Board supports Alberta Transportation's commitment to establish a community liaison to act as a single point of contact for stakeholders. It is the Board's understanding that the community liaison during construction will be appointed by Alberta Transportation and by Alberta Environment and Parks for Project operation. The community liaison will receive dust and air quality complaints from stakeholders and will provide stakeholders with air quality monitoring results, as requested.

The Board notes that considerable discussion occurred about the effectiveness of tackifiers to control dust. The SR1 Concerned Landowners Group expressed concerns about the effectiveness of tackifiers and the feasibility of applying a tackifier over a large area. The Board is confident that Alberta Transportation has the required experience with infrastructure construction projects to select the appropriate tackifier and ensure that it is applied properly.

Alberta Transportation rejected the SCLG requests to establish a contingent liability fund for issues arising from air quality, and to provide a dedicated warning system for cyclists. The Board agrees with Alberta Transportation that the draft air quality management plan, when finalized, should be effective in managing any air issues identified. In addition, it is the Board's view that Alberta Transportation's communications plan will be sufficient for notifying stakeholders, including cyclists, of any air quality issues related to the Project.

The Board notes that AT is not contemplating the business interruption insurance requested by Calalta for potential Project air quality impacts on operations at Calaway Park. AT's view is that

its commitments to install an air monitoring station at the amusement park to monitor air quality during construction and to take timely, appropriate mitigative action in the event of any air quality exceedances should be effective for dealing with Project impacts on air quality at Calaway Park. The Board finds that given AT's air monitoring commitments, and the enhancements to the commitments made by the Board as a condition of approval, any air impacts at the amusement park that are attributable to the Project can be effectively addressed, and therefore the requested insurance is not necessary.

The Board notes that in addition to air quality, the Air Quality and Climate Environment section of the EIA included information on Alberta Transportation's assessment of Project greenhouse gas contributions, and an ambient light assessment conducted for the LAA/RAA. Interveners presented no direct or cross examination evidence on these issues at the hearing.

The Board agrees with Alberta Transportation that the Project will not make significant contributions to provincial greenhouse gas emissions. Also, the Board accepts the methodology used for the ambient light assessment conducted for the LAA/RAA to determine the environmental effect of the Project on lighting. Based on the assessment results and the proposed mitigation measures, the Board is confident that residual effects are predicted to be low in magnitude and short-term in duration. The confidence in these residual effects predictions is medium since the exact number of mobile lighting units required during Project construction is unknown at this time.

15.5 Conditions

The Operator shall, in addition to air monitoring commitments, and to the satisfaction of Alberta Environment and Parks, conduct continuous monitoring of PM_{2.5} and total suspended particulate levels and meteorological conditions for a minimum 16-month period post-flood at the proposed Calaway Park air monitoring station during the period when the Park is open to the public, and at the Springbank community air monitoring station. All monitoring stations must be capable of sending automatic alerts to the Operator when air concentrations exceed designated alert levels so that any exceedance events, if confirmed to be attributable to Project activities, can be mitigated in a timely manner.

SECTION 16 ACOUSTIC ENVIRONMENT (NOISE)

16.1 Summary from the Application (EIA)

The local assessment area (LAA) for the acoustic environment (noise) assessment extends approximately three km from the boundary of the project development area. (Maps showing assessment areas are included in Appendix C.) The noise assessment was conducted in accordance with the *Guidance for Evaluating Human Impacts in Environmental Assessment: Noise* (Health Canada, 2017). Alberta Transportation (AT) conducted a desktop study to identify 45 potential receptors in the LAA. To determine baseline sound conditions, information from the desktop study was augmented with a field survey of receptors, and with ambient sound monitoring at four representative locations within the LAA. The proponent characterized the baseline noise environment in the LAA as rural, based on observations during the field survey. Predominant noise sources were the natural environment and sources resulting from human activity, including traffic and agriculture.

16.1.1 Construction

Alberta Transportation expects that construction of all project components will result in varying degrees of noise. To assess the impact, AT used Cadna/A modelling software. Noise source emissions used in the model included commonly accepted methods for estimating noise from construction machinery, and published manufacturer noise emissions information. Short-term noise exposure was assessed using mitigation noise levels (MNLs) recommended by Health Canada. MNL thresholds are the point at which mitigation measures are required to avoid widespread complaints. Alberta Transportation used an MNL for the LAA that is characteristic of quiet suburban or rural communities. Long-term exposure to construction noise was assessed using the “highly annoyed” and “sleep” noise threshold levels suggested by Health Canada.

Construction activities within the project development area will occur at different times, although some activities may occur simultaneously. To account for the variability and overlap of these activities, five worst case scenarios (maximum potential noise effect) were assessed. Assessment results for the scenarios were as follows:

- Scenario 1 – daytime operations lasting less than two months such as piling for the bridge on Township Road 242, dam embankment earthworks/roadworks; sound levels predicted to exceed MNL noise thresholds at four of 45 receptor locations;
- Scenario 2 – daytime operations lasting less than two months such as piling for the bridge on Highway 22, dam embankment earthworks/roadworks during daytime operation only; sound levels predicted to meet MNL noise thresholds at all 45 receptor locations;

- Scenario 3 – daytime and nighttime operations lasting more than two months, but less than a year, such as floodplain berm, diversion channel, and Springbank Road interchange; sound levels predicted to exceed MNL noise thresholds at 33 of 45 receptor locations;
- Scenario 4 – daytime and nighttime operations lasting more than a year such as earthworks and roadworks, dam embankment, floodplain berm, and diversion channel; sound levels predicted to exceed the “highly annoyed” threshold at 12 of 45 receptor locations; and
- Scenario 5 – nighttime operations during peak activity such as earthworks, dam embankment, diversion channel; sound levels predicted to exceed the “sleep disturbance” threshold at nine of 45 receptor locations.

The modelling conducted by Alberta Transportation was based on the execution of the project plan and does not include the mitigation measures. The modelling also assumed all receptors are located downwind of construction activities all the time and that all equipment is operating 100 per cent of the time. As a result of these conservative assumptions, AT expected that actual noise effects on receptors will be lower than the predicted modelling results.

Alberta Transportation expected residual noise associated with construction activities to be high in magnitude, adverse in direction, of short-term duration, and reversible within the local assessment area. AT expressed high confidence in its prediction of noise impacts during construction, based on predictions of equipment usage, the conservative assumptions used in the noise modelling, and the proposed mitigation measures.

Blasting noise is not anticipated during construction as all bedrock is expected to be mechanically removed using rippers and breakers. However, blasting may be considered as a possible construction option for managing bedrock that cannot be removed mechanically. If blasting is required, the blast design will be developed to meet air overpressure thresholds from Health Canada and Environment and Climate Change Canada.

Noise mitigation measures proposed by Alberta Transportation during construction include:

- limiting nighttime construction activities to the dam site and diversion channel;
- ensuring that vehicle noise abatement equipment (i.e., mufflers) is properly maintained;
- using noise abatement barriers as necessary to reduce noise levels; and
- temporarily relocating some residents to alternate accommodation if they are impacted by excessive noise during some construction periods.

The proposed plan for construction noise management includes planning, assessing, monitoring, communicating weekly, and mitigating. Residents will be notified in advance of noise generating activities and a complaint response procedure will be implemented to address any noise complaints received.

16.1.2 Flood and Post-Flood Operations

According to Alberta Transportation no noise is expected with reservoir filling and draining. However, noise may be generated during the following post-flood activities that may involve the use of heavy equipment:

- reservoir sediment partial cleanup;
- diversion channel maintenance; and
- road and bridge maintenance.

Alberta Transportation asserted that the noise impact on all receptors during the flood and post-flood operations will meet Health Canada noise thresholds. These impacts were not predicted to be significant because they tend to be low in magnitude, of short-term duration, and reversible. The prediction confidence was high because the noise effects are based on equipment usage during the flood and post-flood operation phase. In cases where heavy equipment is required for post-flood work, mitigation measures similar to those described in the construction section would be followed.

16.2 Views of the Board

The Board finds that the methodology used by Alberta Transportation to assess noise impacts associated with the Project is reasonable and appropriate. The Board agrees that with implementation of the proposed noise mitigation measures, Project noise impacts are expected to be low in magnitude, of short-term duration, and reversible. The Board recognizes that noise may generate complaints during the construction phase and strongly encourages AT to structure the complaint process to deal with community noise complaints in an expeditious manner.

The Board notes that there was no direct or cross examination evidence by interveners at the hearing regarding noise impacts from Project activities.

SECTION 17 PUBLIC SAFETY

17.1 Summary from the Application (EIA)

17.1.1 *Diversion Structure*

Alberta Transportation (AT) indicated that the flood water diversion structure consists of a diversion inlet, debris deflector, service spillway, floodplain berm, and auxiliary spillway. When flows in the Elbow River exceed 160 cubic metres per second (m^3/s), the diversion inlet gates will be opened and the service spillway gates will be adjusted to direct flood water from the Elbow River into the diversion channel leading to the off-stream reservoir. To accommodate a 2013 flood event (design flood), a diversion rate of $480 \text{ m}^3/\text{s}$ is required. The proposed diversion structure would provide a diversion rate of up to $600 \text{ m}^3/\text{s}$, which allows a 25 per cent margin of safety to account for unintended sedimentation, debris, and operational timing.

Diversion Inlet

The diversion inlet is a concrete structure located on the north side of the river that will have two 20 metre (m) wide by 4 m high steel lift gates. When open, the gates rest behind a breast plate and wing wall that restrict the height of water flowing into the diversion inlet to 4 m and the rate of water flow to $600 \text{ m}^3/\text{s}$. If the reservoir becomes full, the diversion inlet gates will be closed. When the Elbow River flow rate is less than $160 \text{ m}^3/\text{s}$, the steel lift gates remain closed and sit on a concrete sill that is 1.5 m above the service spillway elevation.

Debris Deflector

To prevent debris from entering the diversion inlet, AT proposed to construct a debris deflector barrier. Its design is a vertical steel tubular structure approximately 6 m high by 160 m long, supported by a reinforced concrete foundation.

Service Spillway

The service spillway is a concrete structure located in the Elbow River channel, adjacent and perpendicular to the diversion inlet. It spans the river channel and has two steel gates, each 24 m wide by 5 m high when fully raised. During non-flood conditions the gates can be fully lowered and would sit flush with the riverbed, allowing unimpeded river flow. During flood conditions the gates will be raised to redirect excess water into the diversion channel.

Floodplain Berm

A 1,000 m long floodplain berm will be constructed south of the service spillway. The purposes of this earthen embankment are to prevent the diversion structure from being circumvented by flow during a flood and to direct water to the diversion inlet.

Auxiliary Spillway

A 214 m long auxiliary spillway would be located adjacent to the service spillway on the floodplain berm, with a crest lower than the berm. The auxiliary spillway is a dam safety component to prevent the floodplain berm from overtopping, and is designed to activate when incoming flow from the Elbow River exceeds 1,720 m³/s.

AT completed breach analysis and inundation mapping to assess the flood impact of a potential failure of the diversion structure. Results showed an increase in peak discharge immediately downstream of the diversion structure of 2770 m³/s to 3103 m³/s for less than 30 minutes, corresponding to an approximately 0.2 m increase in water surface elevation. Approximately 1 kilometre (km) downstream, at the Highway 22 bridge, the increase in water surface elevation is less than 0.1 m and was considered by Alberta Transportation as a negligible change.

17.1.2 *Diversion Channel and Emergency Spillway*

AT proposed constructing a 4,700 m long diversion channel that can convey up to 600 m³/s of water from the diversion structure to the off-stream reservoir. The gradient of the channel will vary from 0.1 per cent to 0.2 per cent from the Elbow River to the reservoir. The channel bottom will be a minimum of 24 m wide. The ratio of the channel side slopes in soil will be 3 horizontal to 1 vertical (3H:1V) and in rock will be 2H:1V. For certain sections, a 5 m wide bench is included at the soil/bedrock interface. During the design flow of 600 m³/s, the water in the channel will be 6 m deep. Additional channel depth is provided for sufficient freeboard above the design water depth. Due to site topography, some parts of the channel walls will be “cut” and other parts of the channel will be “filled” to construct the diversion channel.

The emergency spillway is a concrete structure approximately 135 m long with a discharge capacity of 354 m³/s at 1.25 m of head and its purpose is to prevent overtopping of the off-stream dam in the event that the off-stream reservoir is full and the diversion inlet gates remain open. It will be located on the east side of the diversion channel, approximately 1,300 m upstream of the dam. Water that flows over the emergency spillway would flow overland back to the Elbow River.

17.1.3 *Off-Stream Reservoir and Dam*

Diverted flood waters will be temporarily contained in the off-stream reservoir which is located in a natural topographic depression. AT stated that the dam for the reservoir was designed in accordance with Canadian Dam Association (CDA) and Alberta’s *Dam and Canal Safety Directive*. A hazard classification is required for the selection of appropriate design standards established in the CDA *Dam Safety Guidelines*. The proposed off-stream reservoir dam has been given an “Extreme” consequence classification. If a dam breach or failure occurs, public

health and safety, the biophysical environment, lands used for traditional and non-traditional use, infrastructure and services, and employment and economy would be affected. The magnitude of these effects would depend on the size of the flood and volume of water in the reservoir.

The dam will consist of two earthen embankments to be constructed across two valleys adjacent and tributary to the Elbow River. The primary embankment is approximately 3,300 m long across the unnamed creek valley and has a maximum embankment height of 29 m at the unnamed creek. It will have 3.5H:1V side slopes and a 10 m wide crest. The secondary embankment is approximately 400 m long with a maximum embankment height of 11 m and a 10 m wide crest. It will have 3H:1V side slopes upstream, and 3.5H:1V side slopes downstream. The off-stream dam would be constructed with an impermeable core to help protect the integrity of the dam by preventing water from “piping” laterally through the dam.

The 2013 design flood storage requirement is 70 million m³. The proposed off-stream reservoir capacity is 77.8 million m³, which allows for a 10 per cent margin of safety.

17.1.4 Low-Level Outlet

Water will be released from the reservoir via a low-level outlet in the dam when the risk of flooding subsides and when Elbow River flows are below 160 m³/s. The proposed low-level outlet is a gated, horseshoe-shaped concrete structure 213 m long, and 2.7 m wide by 2.8 m high built through the dam embankment. Water will be released via the low-level outlet into a constructed channel that conveys water into the unnamed creek, which subsequently flows into the Elbow River. The maximum flow rate of the low-level outlet is 27 m³/s. If the reservoir is full to capacity, it will take approximately 38 days to drain the reservoir. During dry operation the low-level outlet will remain open to allow unimpeded flow of the unnamed creek.

17.1.5 Operations and Maintenance Plan

AT indicated that an operations and maintenance plan will be developed by Alberta Environment and Parks (AEP). It will be submitted to the dam safety regulator for review prior to operation as required under the *Water Act* and in accordance with the *Alberta Dam and Canal Safety Directive*.

17.1.6 Emergency Plans

The Water (Ministerial) Regulation under the *Water Act* requires an Emergency Preparedness Plan and an Emergency Response Plan that are specific to the Project and its operation prior to operation of the dam. The downstream local authorities, Rocky View County, the City of Calgary, and Tsuut’ina Nation, are responsible for initiating their own municipal emergency plans.

17.1.7 Roads

Road modifications proposed to accommodate the Project include:

- elevating Highway 22;
- constructing a bridge over the diversion channel on Highway 22;
- constructing a bridge over the diversion channel on Township Road 242;
- raising the grade of the Springbank Road and Highway 22 intersection;
- upgrading Range Road 40 to a county collector roadway; and
- replacing or modifying accesses to privately owned land as necessary.

Permanent Project access roads will be constructed to allow for operation and maintenance. Locking swing gates will be installed on these roads to limit access.

17.1.8 Pipelines

Four pipelines cross the proposed footprint of the diversion channel. All will remain in the current right of ways but will be repositioned so that they are at least 3 metres below the final grade of the channel.

Two pipelines pass through the location of the upper reaches of the off-stream reservoir, west of Highway 22, and will be retrofitted with pipe weighting where they may be underwater.

Three pipelines cross the project development area (PDA) at the deepest part of the off-stream reservoir. These will be abandoned and removed. The portions that remain active will be relocated to a shallower area of the reservoir and will be retrofitted with pipe weighting as needed.

Pipeline relocation and modification will be completed by contractors of the pipeline company's choice.

17.1.9 Power Lines

An electrical power transmission line that crosses the diversion channel will have pole locations adjusted to permit a clear span over the channel.

17.1.10 Residential Utilities

Primary overhead electricity distribution lines and main lines for shallow natural gas distribution are not expected to be affected by the Project.

A main internet/telephone cable that runs through the reservoir area will either need to be moved or placed in a sealed conduit, and a fibre optic internet cable will need to be realigned along Highway 22.

Land acquisition for the Project will determine specific private property utility requirements.

17.2 Views of the Interveners

SR1 Concerned Landowners Group

The SR1 Concerned Landowner Group (SCLG) stated concerns about the proposed Project design and referred to it as “experimental”, “unique”, “radical”, and “novel”. The SCLG did not believe that another project like this exists, and explained that the unproven design coupled with its extreme consequence rating causes question as to viability and safety of the Project.

The SCLG identified 24 concerns related to Project design and safety and provided recommendations for each concern. Alberta Transportation reviewed the recommendations and provided a written response which the SCLG confirmed alleviated 22 of the concerns. The two remaining concerns were related to:

- The emergency spillway discharge capacity – It was the SCLG’s understanding that the *CDA Dam Safety Guidelines* require the spillway discharge capacity to be equal to the diversion channel flow rate. The Project’s diversion channel design flow rate is 600 m³/s and the proposed spillway discharge capacity is 360 m³/s.
- An emergency (secondary) low-level outlet – This is to be used if emergency drawdown of the reservoir is needed. It also would serve as a backup if the primary outlet were to fail or become blocked.

The SCLG questioned why an emergency response plan for the Project had not yet been developed. They emphasized the importance of the plan, that it should include community input, and that it should be well understood by the community. They suggested that the Alberta Emergency Alert system, via cell phone notification, could be utilized to inform residents about emergency situations. The SCLG also requested information about evacuation procedures and who will bear the cost if it becomes necessary.

Roads, traffic safety, and funding of proposed road upgrades were expressed as areas of concern by the SR1 Concerned Landowners Group. They commented that the current operational plan, which allows Springbank Road to become partially submerged during a one in fifty (1:50) year flood return period or greater, is problematic. The SCLG requested that Alberta Transportation consider moving the road to allow uninterrupted access for residents. The SCLG stated that repairing Springbank Road after each flood equal to or greater than a 1:50 year return period would be costly and that Rocky View County, through local taxpayers, should not be responsible for funding the repairs.

The SCLG questioned whether proposed detours, particularly Range Road 40, are viable for school buses. They requested Alberta Transportation provide the cost of proposed upgrades to Range Road 40.

SCLG was also concerned about the remediation of damage to roads caused by construction traffic.

The SCLG requested that AT consider accepting a condition to move landowners’ driveways so that they will be unaffected by the Project.

Additional public safety matters raised by the SCLG were prevention of unauthorized access to the facilities and whether the potential for a terrorist attack on the Project has been considered. The SCLG suggested that security guards and a security system will be required for the life of the Project.

The SCLG asked that AT establish a contingent liability fund to be administered by an independent agency to address community concerns related to unexpected project outcomes. This request is also addressed in Section 11, Hydrogeology and Section 15, Air Quality Assessment and Public Health Impacts.

Stoney Nakoda Nations

The Stoney Nakoda Nations expressed concerns regarding emergency management and notification about emergency situations.

Scott Wagner

Mr. Wagner requested that AT provide information regarding how close the water in the reservoir will be to his residences when the reservoir is at full capacity. He stated that he has not yet received this information.

Mr. Wagner commented that management of grasses and shrubs in the off-stream reservoir is essential to prevent accumulation of fuel sources and reduce the risk of wildfires. He stated that local fire department policy does not allow the department to enter fields to fight fires and asked AT to review this policy and work with the municipality to change it.

17.3 Views of Alberta Transportation

17.3.1 Project Design

Alberta Transportation explained that the individual elements of the Project design are not unique and that the Project is not “experimental”. However, the proposed combination of elements is not common.

AT disagrees with the SCLG interpretation of the CDA guidelines regarding the emergency spillway discharge capacity. AT argued that there is no requirement for the spillway to be sized to accommodate the design flow or peak flow without consideration of routing effects of the reservoir.

Regarding the recommendation to provide an emergency (secondary) low-level outlet, AT stated that the proposed low-level outlet’s design capacity was selected based on industry standards for evacuation times for a reservoir and that no basis for increased capacity has been provided.

Alberta Transportation has forwarded the SCLG report to the dam safety regulator for information and consideration. AT stated that it is the director of dam safety's role to determine whether the Project design meets regulatory requirements for safety.

17.3.2 *Emergency Management Plan*

Alberta Transportation committed to engaging with the community in the creation of the emergency management plan. AT stated that pursuant to regulatory requirement, the EMP must be specific to the Project and must be in place prior to any diversion of water. AT's intention is to begin the process of developing the emergency management plan immediately following Project approval. Because the Project is listed as an extreme consequence dam and in accordance with the *Dam and Canal Safety Directive*, AT will include an emergency preparedness plan, emergency response plan and a flood action plan in the emergency management plan. Details of emergency situations that would warrant public notification, the procedures to follow in the event of an emergency, and use of the Alberta Emergency Alert system will be described in the plans. The plans must be approved by the director of dam safety prior to Project operation.

AT commented that if an incident or potential for an incident requiring evacuation occurred, AT or AEP would have a duty to inform all downstream local authorities. These authorities—Rocky View County, the City of Calgary, and Tsuut'ina Nation—are responsible for the care and control of their citizens during an emergency. This responsibility is delegated pursuant to sections 7.1 and 24 of the *Emergency Management Act*, and the Local Authority Emergency Management Regulation.

17.3.3 *Unauthorized Access and Security*

As part of the Project design, chain-link fencing and signage will be installed around certain facilities for public safety and security. Operations buildings and other critical infrastructure will include monitoring and alarms to detect unauthorized access.

The project development area will not be controlled through surveillance or on-site security personnel, however fencing will be used to define the PDA and to provide access control. Any security issues can be raised with the Community Liaison. Matters that the Community Liaison is unable to resolve, or that require immediate attention, should be directed to the appropriate law enforcement agency.

AT stated that the Project meets the definition of "essential infrastructure" pursuant to the *Critical Infrastructure Defence Act*, and therefore would be afforded the protections under that legislation.

17.3.4 *Roads and Traffic Safety*

Alberta Transportation stated three options were considered to address portions of the existing Springbank Road that are expected to be submerged during diversion events in excess of the 1:40 year flood return period. The preferred option is to retain the existing road; in the event of damage during flood operations, the road would be repaired by the Government of Alberta after flood waters recede.

As part of notifying local authorities of a flood and operation of the off-stream reservoir, the Operator would notify Rocky View County of the potential flooding of Springbank Road. Springbank Road closure, detours, and associated notifications are the responsibility of the county, as they are the local authority for municipal roads. Detour routes for school buses are the responsibility of the school division and its transportation providers. Alberta Transportation has committed to work with the county and the school division to plan for this situation.

When detours are required because of road closure due to Springbank Road flooding, traffic would be rerouted along Range Road 40 and Township Road 250. AT met with Rocky View County on March 25, 2021, and committed to upgrade Range Road 40 to a county collector as well as upgrade the intersection of Township Road 250 and Highway 22. The upgrades would occur prior to completion of the Project. Costs for these road upgrades (accuracy of +/- 25 per cent) were estimated at \$400,000 for the intersection improvement at Highway 22 and Township Road 250, and \$2.4 million for the Range Road 40 improvements.

AT explained that a Traffic Accommodation Strategy based on the *Traffic Accommodation in Work Zones Manual* will be required, which must:

- comply with all requirements of the road authority having jurisdiction over public roads used by the contractor in the execution of the work;
- determine the condition and availability of public highways and roads, clearances, restrictions, bridge load limits, bond requirements, and other limitations that may affect ingress to and egress from the site;
- comply with applicable load regulations during hauling of materials and equipment over public highways, roads, or bridges;
- minimize interference with local traffic; and
- before commencing the work, conduct a detailed video survey of public highways, roads, bridges, access roads, and local roads that are to be used, establishing the restoration standard for such facilities.

AT accepted and confirmed their obligation to engage with any landowner whose residential access (driveway) will be adversely affected by the Project. Whether the access is moved, maintained, or replaced will depend on the specifics of the situation.

17.3.5 Distance from Reservoir Water to Wagner Residences

Regarding Mr. Wagner's request for information about distance from the reservoir flood waters to his residences, AT produced aerial views of his primary and secondary residences overlain with the expected extent of reservoir water during a 2013 design flood (70 million m³) and with the reservoir filled to total capacity (77.8 million m³).

17.3.6 Wildfire Avoidance and Emergency Response

AT stated that fire risk management and suppression activities for the Project area will follow standard Crown land management practices and regulations including the *Forest and Prairie Protection Act*, and related regulations. Specific Project areas may be treated using fire smart principles if it is determined that the fire risk is unacceptable to Project infrastructure. Fire smart principles include, but are not limited to:

- thinning and pruning;
- removing volatile trees such as spruce and planting fire-resistant species such as aspen;
- the construction of fuel breaks; and
- general cleanup in and around the property.

Campfires will not be permitted inside the project development area.

AT has committed to entering into discussions with the local fire hall(s) to develop a relationship and gain a common understanding of their emergency response practices when responding to a fire in the area.

17.4 Views of the Board

17.4.1 Adequacy of Project Design

The Board is aware that as the Project is classified as an extreme consequence dam, it must satisfy the standards established in the *Alberta Dam and Canal Safety Directive* for such facilities. The Board understands that the *Canadian Dam Association Safety Guidelines* and the *Alberta Dam and Canal Safety Directive*, and the associated extreme consequence classification, are there to establish safety standards and protocol to protect against a dam breach or failure that would have public safety consequences. Having regard for the submissions filed by AT, the Board accepts that the Project has been designed to satisfy the *Canadian Dam Association Safety Guidelines* and the *Alberta Dam and Canal Safety Directive*.

The Board does not accept that the Project is experimental or radical in its design, rather the Board finds that the various design components have been successfully used in various projects identified by AT, including off-stream water storage projects in Alberta and dry dam flood projects that exist elsewhere in the world. While the combination of the various components that comprise the Project may be unique, the Board has no safety concerns related to the combined incorporation of specific components, due to the worldwide experience and understanding of their capabilities to perform as designed.

Having regard for the evidence advanced by the SCLG and the reply evidence filed by Alberta Transportation, the Board is satisfied that the flow rate of the emergency spillway design meets the *Canadian Dam Association Dam Safety Guidelines* requirement that it “should be capable of passing the IDF [inflow design flood], taking into account the routing effect of the reservoir, without infringing on the minimum freeboard requirements”⁹. While the Board understands that

⁹ AT SUB to NRCB hearing – Exhibit 327, Appendix E, page 1 (pdf 26), quoted by AT.

the Project will undergo a thorough review by the director of dam safety, it did consider the various components of the Project design that are material to this issue. The Board notes that:

- The design of the emergency spillway is presented in Section 9.6 of the Springbank Off-Stream Storage Project Preliminary Design Report (Exhibit 159).
- The emergency spillway provides a designated pathway for excess water in the event the off-stream storage reservoir exceeds its design storage capacity.
- The emergency spillway consists of a 135 m-wide side channel concrete drop structure, a riprap exit channel between retaining walls, and an excavated outlet channel. After passing through the spillway water will flow overland and eventually return to the Elbow River.
- The crest elevation of the emergency spillway overflow weir is 1210.75 m which correlates to the design storage capacity.
- The maximum design head elevation is 1212.0 m which correlates to the maximum design pool elevation.
- The maximum design pool elevation of 1212.0 m was determined through freeboard calculations using *Canadian Dam Association Safety Guidelines (2013)* which account for wind setup and wave runup to maintain 1.5 m of freeboard to the off-stream storage reservoir dam crest elevation of 1213.5 m.

The Board also finds that the mitigation measures and redundant systems that address the diversion inlet gates failing to close will significantly reduce risk. Alberta Transportation has committed to the addition of a debris deflection barrier, backup power generation, and manual overrides for lowering the gates without power. Additionally, the system was evaluated for the probable maximum flood filling the reservoir, followed by the gates being left completely open, allowing the remainder of the probable maximum flood to enter the diversion channel.

The SCLG's second outstanding issue was the addition of a secondary low-level outlet (or enlargement of the current low-level outlet) through the storage dam to be used if an emergency drawdown of the reservoir requires dewatering much faster than the current low-level outlet would allow. The SCLG preferred a secondary outlet, as this would allow for drawdown in the event the primary low-level outlet were to fail or become blocked. Alberta Transportation responded that the low-level outlet's discharge capacity was selected based on industry standards for evacuation times for a reservoir. AT confirmed that the outlet intake structure has a total height of eight m, which is sufficient to accommodate silt accumulation. Also, trash rack openings that extend to the top of the structure will help prevent blockage.

The Board accepts that AT has adequately sized the outlet structure and incorporated reasonable design measures to address the various operating scenarios. In reaching this conclusion, the Board is able to complete its public interest review with the knowledge and reliance that Alberta's director of dam safety has the mandate and expertise to address design and operation components associated with the Project.

The Board notes and appreciates the submission provided by the Flood and Water Management Council (FWMC) that largely expressed concerns about public safety. Issues raised included the ability of the Project to withstand back-to-back floods, the holding capacity of the off-stream reservoir, and the hazard classification of the dam and the diversion structure. The Board is confident that the issues raised by the FWMC were adequately canvassed by interveners at the hearing, primarily the SCLG. Further, the Board finds that these issues have been addressed.

17.4.2 *Emergency Management Plan*

The Board notes that AT did not provide emergency response planning documents as they will be prepared by AEP, the operator for the Project, when construction procurement is complete and the Project is closer to the commissioning phase. AT explained this was because the plans require information on equipment models, construction records, and other details of the facility that are not known at this time. The Board was told that AEP will begin preparation of the emergency response plan, emergency preparedness plan, and flood action plan following regulatory approval of the Project and in parallel with the construction process, and that the process will include communications with the City of Calgary, Rocky View County, and the Tsuut'ina Nation.

The Board reviewed the *Alberta Dam and Canal Safety Directive* (2018) under the *Water Act* that describes the various emergency planning documents required for the Project. These consist of an emergency management plan that includes an emergency preparedness plan, an emergency response plan, and a flood action plan. The knowledge that these plans will be prepared, and an understanding of the requirements of Alberta Dam Safety in order to approve the design, provides sufficient evidence for the Board to conclude that adequate emergency preparedness will be in place when needed.

17.4.3 *Wildfire Avoidance and Emergency Response*

The Board accepts that there are risks associated with wildfires in rural communities. Mr. Wagner told the panel that management of grasses and shrubs in the off-stream reservoir is essential to reduce the risk of wildfires. As the current farming and grazing activities will not be continuing, the Project area may require proactive measures to mitigate the wildfire risk. AT proposed that fire risk management and suppression activities for the project development area will follow standard Crown land management practices and regulations including the *Forest and Prairie Protection Act*, and related regulations.

The Board recommends that fire risk management and suppression activities be considered and discussed with stakeholders as the final Land Use Plan is developed.

17.4.4 *Unauthorized Access and Security*

Having regard for all submissions, the Board accepts that the unauthorized access and security measures proposed by AT are adequate for the Project.

17.4.5 Roads and Traffic Safety

The Board accepts that there will be road and traffic disruptions both during the construction of the Project and associated with flood operations. The Board has reviewed the proposed road construction and required realignment, as well as the flood-related closure on Springbank Road. While the Board considers the traffic effects to be negative, the Board finds that these effects will occur infrequently in the case of floods, and be of limited duration in the case of the road construction. The Board expects that AEP, the eventual Project operator, will be responsible for notifying Rocky View County regarding the need and timing of all road closures in the PDA to accommodate safe operation of the Project.

17.4.6 Other Matters – Pipelines, Power Lines, Residential Utilities, and Unexpected Outcomes

The Board has had regard for submissions about impacts of the Project on pipelines, power lines, and residential utilities, and considers the responses provided by AT adequate in all cases.

Finally, the Board considered the SCLG request that Alberta Transportation establish a contingent liability fund to be administered by an independent agency. The proposed contingency fund would be available to address community concerns and unexpected outcomes associated with the Project. In response, AT stated that the Project Community Liaison would be responsible for receiving concerns and complaints from stakeholders and Indigenous groups during construction and operation of the project. The Board finds that the AT response to the SCLG request is entirely reasonable.

SECTION 18 SOCIO-ECONOMIC CONSIDERATIONS

18.1 Summary from the Application (EIA)

To assess socio-economic effects of the Project, Alberta Transportation (AT) used a regional assessment area (RAA) that included the City of Calgary, Tsuut'ina Nation 145, and neighbouring census districts. (Maps showing assessment areas are included in Appendix C.) Alberta Transportation assessed the financial viability of the Project using a benefit-cost analysis and assessed construction impacts on the regional and provincial economy and labour force.

18.1.1 Employment and Economic Effects

The construction phase of the Project is expected to generate employment and related economic activity. Project residual effects due to construction are expected to be positive in direction, low in magnitude, short-term in duration, and reversible. Once construction is complete the Project will require a minimal workforce and intermittent maintenance. After flood events, cleanup efforts and fish rescue within the project development area (PDA) will generate limited economic activity.

Alberta Transportation updated its cost estimates for the Project in 2019 to \$312.2 million with the addition of the debris deflection barrier, and updated engineering and EIA costs. Based on the 2019 estimate, Alberta Transportation estimated Project capital expenditures at \$280 million (excluding land purchase), 80 per cent (\$224 million) of which is expected to be spent in the RAA. The remaining 20 per cent (\$56 million) is expected to be spent outside the regional assessment area from elsewhere in Alberta.

Based on the Project design, demand for skilled labour would be greatest among occupations in the trades, transportation, and equipment operation sectors. Assuming a six per cent unemployment rate in the regional assessment area for these occupations, there would be approximately 5,467 persons available to work on the Project. Given the availability of skilled labour, direct employment by the Project is not expected to contribute to labour shortages in the local assessment area.

Alberta Transportation estimated direct, indirect, and induced employment in Alberta resulting from Project construction as:

- direct construction: 610 person years;¹⁰
- other direct: 290 person years;
- indirect: 415 person years; and
- induced: 255 person years.

¹⁰ A person year of employment equals one person working full time for one year.

Alberta Transportation estimated Project-related indirect and induced employment effects to the rest of Canada to be 255 and 190 person years respectively. Total labour income in Alberta associated with employment during Project construction is estimated at \$113 million, and an additional \$26 million for the rest of Canada.

18.1.2 Project Benefits – Average Annual Damage Avoidance

Alberta Transportation found that residual economic effects during flood and post-flood operations are positive in direction and high in magnitude, resulting in a substantial economic benefit. These effects have a long-term duration and irregular frequency. As the Project effects are expected to be beneficial, a significance determination was not made.

Alberta Transportation represented Project benefits as the value of avoiding future flood damages, mainly in the City of Calgary. Damages associated with flood events of different magnitudes were calculated, up to and including the 2013 flood. Probability of flood events and associated damages were calculated and discounted to account for time value of money and represented as average annual damage (AAD) avoidance.

Within the defined flood risk area downstream of Glenmore Reservoir, Alberta Transportation calculated flood damages by applying the depth of flood water and resulting financial damage curve (depth-damage curves) for a particular flood magnitude based on probability of flood occurrence. Alberta Transportation used depth-damage curves that accounted for the location, elevation, zoning, and use of individual structures, infrastructure, and land. Damages and losses incorporated in the calculation of flood damages included residential (direct and displacement), commercial (direct and disruption), infrastructure, traffic disruption, habitat restoration, emergency operations, waste disposal, and intangibles.

For each of the “with Project” and “without Project” scenarios, Alberta Transportation calculated damages for 12 flood return periods ranging from five years to 1000 years. For both scenarios, Alberta Transportation multiplied the flood damages by the annual probability (for each of the 12 flood return periods) to calculate the average annual damages.

Using this method, in the 2017 analysis Alberta Transportation calculated the “without Project” AAD as approximately \$42 million and the “with Project” AAD as approximately \$14 million. The difference—\$28 million AAD—represents Project benefits. Discounting the \$28 million AAD at a four per cent discount rate over an assumed Project operational life of 100 years resulted in a net present value (NPV) of future benefits of \$653 million.

18.1.3 Project Costs

The primary costs attributed to the Project are associated with construction of the dam, diversion structure including the debris deflector, diversion canal, and land acquisition. Alberta Transportation has updated its Project cost budget several times since the beginning of the EIA process. AT indicated that it is relatively common that projects of this magnitude will experience significant cost adjustments as the Project moves from the conceptual stage through more detailed design and engineering phases. The early cost estimates, at the conceptual phase, put total Project costs at \$263.7 million. The most recent 2020 construction cost for the Project is estimated as \$480.6 million, representing \$340.6 million for construction and \$140 million for land acquisition.

18.1.4 Benefit-Cost Analyses

In its early work to compare potential flood mitigation alternatives, Alberta Environment and Parks (AEP) conducted a benefit-cost analysis (BCA) in 2015. AT updated the BCA as more information became available and in response to information requests from the regulators. Updated benefit-cost analyses were conducted in 2017 and 2019. The BCAs led to a wide range of benefit-cost ratios due to changing Project costs and timing, and length of benefit streams used in the analysis.

Table 18-1 shows the costs and benefits from 2015 through 2020.

Table 18-1. Springbank Off-Stream Reservoir (SR1) Benefits and Costs, and Benefit/Cost Ratio (compiled using information from the AT EIA and AT SIR responses)

	2015 ¹	2017	2019 ²	2019 ³	2020
	(in millions of dollars; \$)				
Project benefits (AAD avoidance)	13.7-26.1	28	28	28	N/P
Project benefits (NPV)	337-640	653	483	591	N/P
Project construction costs	223.7	291.7	312.2	312.2	340.6
Land acquisition costs	40	80 ⁴	140	140	140
Total Project costs	263.7	371.7	452.2	452.2	480.6
Project costs (NPV)	255-310	389	391	432	N/P
Benefit-cost ratio (unitless)	1.32-2.07	1.68	1.24	1.37	N/P

Note: AAD = average annual damage; NPV = net present value; N/P = not provided

1. A range of damage estimates were used in 2015.
2. Estimated costs of \$47.4 million include costs to date, including environmental impact assessment, McLean Creek Dam design and assessment, and consultation.
3. Project costs (design, construction, and land) were determined to be spread over 2019 to 2023. The present value cost of the Project was calculated to be \$432 million and only future costs were included (i.e., excludes estimated costs of \$47.4 million spent to date)
4. Net value of costs. Gross cost of land was expected to be \$140 million, with \$60 million expected to be recovered from sale of land.

18.2 Views of the Interveners

City of Calgary

The City of Calgary (the City) supported Alberta Transportation's conclusion that the Project will significantly reduce the risk of damages in Calgary associated with floods on the Elbow River.

The City emphasized that the benefits of the Project are “staggering” given that the expected damages of a one in 100 (1:100) and 1:200 year flood event would be well over \$1 billion. The loss of life due to flooding has also been significant with at least seven fatalities in southern Alberta since 2005, including three fatalities in Calgary.

The City agreed with Alberta Transportation’s methodology in calculating annual average damages. By contrast, the City used a zero per cent discount rate, as opposed to AT’s 4 per cent discount rate, in calculating the net present value of future damage avoidance. The City calculated benefits over 100 years as approximately \$2.7 billion. The City’s calculation did not consider capital depreciation, operation costs, or maintenance costs in arriving at the net present value of benefits. The City stated that a benefit-cost ratio of 5:1 is appropriate (\$2.7 billion NPV of benefits divided by Project costs of \$432 million NPV).

The City submitted that the Project is in the public interest and should be constructed as proposed.

Calgary River Communities Action Group and Flood Free Calgary

The Calgary River Communities Action Group and Flood Free Calgary (CRCAG/FFC) provided more than 218 letters and emails from group members and other community members supporting the approval of the Project. CRCAG/FFC noted that some of their members found it too difficult to write letters or emails detailing their 2013 flood stories “...and did not want to relive the pain they suffered in the immediate aftermath of the flood. Considering how long has passed since the flood, this reaction of some of our members speaks volumes.”¹¹ CRCAG/FFC conducted a survey and received 393 survey responses from individuals, families, and businesses that support approval of the Project.

Many of the letters, emails, and survey results provided details of the devastating, life-altering financial losses suffered by members of the Calgary River Communities Action Group and Flood Free Calgary. In addition, “...the primary and most upsetting theme running through the letters from residents is the immeasurable and continuing impact of flooding on physical and mental health. Many letters describe lingering stress, anxiety, fear, and a sense of insecurity in the absence of upstream flood mitigation. As one resident aptly describes, while the financial costs are quantifiable, ‘[t]here is no way to measure the emotions, and the fear it will happen again.’”¹²

Some of the letters, emails, and survey results referred to the lives directly lost in the 2013 flood. One email stated: “What can never be captured is what I have always felt to be residual loss of life. In a 3 block radius from our home, I personally know of 2 seniors who were uprooted from their homes, and in the 8 months following the flood, passed. I can’t say the flood caused their deaths, however I do know they were independently living until the flood. I often wonder, given the scope of the flood in well-established long standing communities, how many other seniors may have been similarly impacted.”¹³

CRCAG/FFC provided the following damage statistics stemming from the 2013 flood:

¹¹ CRCAG and FFC SUB to NRCB hearing – Exhibit 237, pages 10-11 (pdf 12-13)

¹² CRCAG and FFC SUB to NRCB hearing – Exhibit 237, page 24 (pdf 26)

¹³ CRCAG and FFC SUB to NRCB hearing – Exhibit 239, B-193, pdf 763

- 14,500 homes damaged in Calgary
- 136 homes required reconstruction on the Siksika Nation;
- 4,000 businesses and 3,000 buildings flooded; and
- LRT stations closed and other public transit disrupted.

CRCAG/FFC restated that Project benefit-cost ratios calculated by Alberta Transportation, of 1.68 in 2017 and 1.24 in 2019 remain above one. They also agreed with the City of Calgary's analysis that showed a Project benefit-cost return of 5:1, demonstrating the importance and viability of the Project.

The Calgary River Communities Action Group and Flood Free Calgary believed the approval of the Project will improve public safety and provide substantial benefits by avoiding future damages similar to the 2013 flood.

CRCAG/FFC pointed out that members of the SR1 Concerned Landowners Group, who oppose the Project, agree that flood mitigation is needed on the Elbow River in order to protect Calgary.

Stoney Nakoda Nations

The Stoney Nakoda Nations (SNN) raised concerns that the Government of Alberta (GoA) should have completed a comprehensive flood management plan for the Bow and Elbow basins prior to moving forward with the Project. The SNN asserted that the City of Calgary requires flood mitigation on both the Elbow and Bow rivers, as do other communities upstream of Calgary.

SR1 Concerned Landowners Group

The SR1 Concerned Landowners Group (SCLG) stated that its members do not dispute the need for flood mitigation to manage high consequence floods on the Elbow River. Its concerns related to the Project are primarily that:

- the McLean Creek project (MC1) is preferred over SR1;
- MC1 did not receive adequate consideration at the project selection stage;
- SR1 should have been built to divert higher flow rates during flooding and hold a larger capacity; and
- the costs of SR1 have risen dramatically since 2014, and not all costs associated with the Project have been included in Alberta Transportation's cost analysis.

More detailed views raised by the SCLG in conjunction with MC1 and Project capacity/sizing can be found in Section 3, Alternatives to the Project and Section 9, Hydrology and Sediment Transport.

The SCLG raised concerns about the increasing cost of SR1 since its inception in 2014. They raised concerns that the current \$140 million land acquisition budget is significantly higher than the 2015 land acquisition estimate of \$40 million. The SR1 Concerned Landowners Group

indicated that AT may still be underestimating the total cost to acquire all the land required for the project development area.

The SCLG raised a number of concerns related to costs that they feel should have been included in the overall Project cost estimates. These included:

- post-flood cleanup and remediation related to sedimentation and fish rescue;
- costs associated with flood mitigation at Bragg Creek and Redwood Meadows;
- the Alberta Transportation agreement and payment to Rocky View County;
- the Alberta Transportation agreement and payment to the Tsuut'ina First Nation; and
- unknown and undisclosed payments to other Indigenous groups.

The SCLG stated that the inclusion of these costs would bring the total Project costs to approximately \$580 million.

18.3 Views of Alberta Transportation

Alberta Transportation stated that flood control to mitigate damages in Calgary and protect public safety is of paramount importance. AT pointed to the impacts of the 2013 flood on Calgary as outlined by the City of Calgary, and CRCAG/FFC that included: fatalities, billions of dollars in damages, displacement of 88,000 Calgarians, damage to more than 14,500 homes, flooding of 4,000 business, and Calgary's downtown core left inaccessible for days.

AT emphasized that the need for the Project is "beyond question". The Project mitigates the devastating effects of severe flooding on the City of Calgary, including events of the magnitude of the 2013 flood. Alberta Transportation pointed to the object-based model that calculated flood damage from the Elbow River alone and estimated that \$1.5 billion is at risk due to future flooding of the Elbow River of the same magnitude as the 2013 flood.

Alberta Transportation outlined a number of positive economic impacts to Springbank community, Rocky View County, and Indigenous groups, including employment and business opportunities during construction.

AT stated that the current budget for the Project in the GoA's capital plan is \$432 million and emphasized that the Project is a sound investment in critical infrastructure that mitigates the devastating impact of flooding. In response to intervener concerns regarding escalating costs, Alberta Transportation conceded that the Project budget has increased over time. In AT's view these cost increases should not be viewed as out of the ordinary as the Project has evolved from the conceptual phase to the detailed design stage. In addition, AT stated that it is inappropriate to compare current estimated Project costs with early cost estimates of alternative projects that were never advanced to the same degree of engineering, design, and public and Indigenous consultation.

In response to concerns raised by the SCLG regarding rising land costs, Alberta Transportation conceded that land acquisition costs were underestimated in their early work. AT indicated that negotiations with landowners have provided a substantial number of appraisals that have provided Alberta Transportation with a better understanding of land acquisition costs.

Despite the rising cost estimate since 2015, AT maintains that the Project remains viable and necessary. Cost-benefit ratios in all scenarios remain above one, indicating that the Project benefits offset its costs.

Alberta Transportation did not agree that Project costs should be revised to include costs associated with post-flood cleanup, fish rescue, and mitigating sediment mobilization as suggested by the SR1 Concerned Landowners Group. AT indicated that these costs will be incurred infrequently based on flood events and are difficult to estimate. Alberta Transportation stated that these costs will ultimately be borne by AEP, the Project operator.

Alberta Transportation understands the view of the Stoney Nakoda Nations that flood mitigation options on the Bow River need to be advanced, including consultation with Indigenous communities. AT did not agree that the Project should be put on hold until decisions about flood control on the Bow River are finalized. Alberta Transportation stated that “the Project is needed, and it is needed now”¹⁴.

18.4 Views of the Board

The Board finds that the primary objective of the Project is to mitigate the effects of future Elbow River flood events, primarily in the City of Calgary. The Board finds that the evidence presented in the EIA and during the hearing process supports the need for the Project. It is the Board’s view that the Project will reduce the risk of loss of life and protect residences, businesses, and infrastructure during flood events; this is the chief factor in the Board’s approval of the Project. The Board notes that the need for flood mitigation to protect Calgary was undisputed at the hearing. The Board heard considerable testimony regarding the alternatives to achieve flood mitigation on the Elbow River which is presented in other sections of this decision report; in particular, Section 3, Alternatives Considered.

The Board heard emotional testimony from members of CRCAG/FFC and thank them for their participation during the review process and at the hearing. The Board is fully aware of the devastation caused by the 2013 flood and the direct impact it had on residents and businesses in Calgary and the region. The Calgary River Communities Action Group and Flood Free Calgary testified that Calgarians spent significant out-of-pocket financial resources to restore their residences and businesses following the 2013 flood. The presentations made by CRCAG/FFC members informed the Board that in addition to the financial implications of the 2013 flood, residents continue to experience negative emotional effects. The groups provided testimony that many people, including youth, continue to worry about the potential for another flood that could impact their homes and mental well-being. The Board notes that the Project will provide non-financial benefits to residents of Calgary through the reduction of stress, anxiety, fear, and insecurity.

¹⁴ AT SUB to NRCB hearing – Exhibit 409, para. 31

The Board notes that construction of the Project will generate employment, indirect employment income, and increased economic activity. The Project is not expected to require a significant workforce during the operational phase. The Board finds that Alberta Transportation's primary objective for constructing the Project is to mitigate flood damage associated with Elbow River flooding and reduce the risk of loss of life; it is not an "economic development project". The Board further notes that public investment in infrastructure of any kind creates economic activity and spin-off effects. As such, in reaching its public interest decision, the Board has not placed significant weight on the potential economic benefits associated with construction.

The benefit-cost analyses received considerable attention at the hearing with respect to; whether the analysis of alternatives with more recent cost data would lead to similar conclusions made at the time of project selection; and whether the Project remains viable today. The Board has concluded that Alberta Transportation's assessment of alternatives and selection of SR1 as the preferred project is sound (see Section 3, Alternatives to the Project for details). With respect to the more recent benefit-cost analyses, the Board makes the following observations and conclusions:

- The need for flood mitigation on the Elbow River is undisputed.
- Project benefits represented as annual average damages were largely uncontested. The Stoney Nakoda Nations' concern regarding double counting of benefits was refuted by AT and the City of Calgary; the SNN subsequently conceded.
- Project costs have risen significantly from the first analysis in 2015.
- The Board acknowledges that debris cleanup, remediating sedimentation, and fish rescue could add to Project cost; however, these costs are difficult to quantify given that flood events occur infrequently and vary in severity. In any event, the Board concludes that these costs are not likely to have significant impact on the outcome of the BCA or feasibility of the Project overall.

The Board acknowledges the SCLG's concerns related to Project cost increases between 2015 and 2020. The Board recognizes that the 2015 cost estimates were preliminary and based on an early stage conceptual design of the Project. While the Board understands that costs are likely to increase for Projects of this magnitude as they evolve through the design phase with more detailed engineering, it appears to the Board that a significant portion of the cost increase is attributable to AT underestimating the cost of land acquisition. It is the Board's view that Alberta Transportation could have improved how it appraised and estimated land acquisition costs earlier in the Project development stage.

The SCLG stated that negotiated settlements with the Tsuut'ina First Nation and Rocky View County should be included in total Project costs. In the Board's view, it would have been appropriate for Alberta Transportation to include the payment (or future payment) to Rocky View County in the total cost accounting for the Project. It is also the Board's view that the overall feasibility of the Project, including the benefit-cost conclusions, would likely remain unchanged with the addition of Rocky View County payments included. With respect to agreement for payment made to Tsuut'ina First Nation by AT, it is unclear to the Board whether similar agreements would have been required with alternative projects on the Elbow River.

The Board notes that in the SCLG's view, costs related to the Bragg Creek flood berm project should have been attributed to the SR1 Project since the MC1 alternative would have precluded the need for flood mitigation at Bragg Creek. The Board notes that the Bragg Creek flood berm project is separate and distinct from both SR1 and MC1.

The Board finds that, despite increases in Project cost projections, Alberta Transportation's updated benefit-cost analysis continues to show a benefit-cost ratio above one. In addition, the Board is unconvinced that inclusion of the Bragg Creek flood mitigation and Rocky View County costs would significantly alter conclusions of the BCA analysis.

The Board considered that the benefit-cost analysis is one factor among many considered by AT in its Project selection process. Chief among the factors considered by the Board in its decision to approve the Project are:

- protecting the public and reducing risk of loss of life;
- avoiding damage;
- preventing business interruption;
- protecting critical public infrastructure; and
- reducing the mental anguish of thousands of potentially flood impacted people.

The Board notes that some of these factors are not monetized in overall Project benefits.

SECTION 19 BOARD DECISION

19.1 Introduction

Having regard for the commitments made by Alberta Transportation (AT) and subject to the conditions imposed by the Board in this report, the Board finds that the Springbank Off-Stream Reservoir Project (“SR1” and the “Project”) is in the public interest. The reasons for this conclusion are outlined below and should be read in conjunction with the Board’s findings contained in this decision report.

The Board is directed by s. 2 of the *Natural Resources Conservation Board Act* (NRCBA) to review the Springbank Off-Stream Reservoir Project application to determine whether, in the Board’s opinion, the proposed Project is in the public interest, having regard to the social and economic effects of the Project and its effect on the environment. The Board has considered the application materials (that include the environmental impact assessment) from Alberta Transportation and the submissions from interested parties in reaching the conclusions contained in this decision report.

19.2 Public Interest Test

The Board does not have a fixed formula for determining whether a reviewable project is in the public interest. The outcome of a Board review is shaped by the nature of the project under review, its location, public support for the project, the project’s impact on the natural environment, and the project’s contribution to public benefits. There is no fixed objective test, but to make the determination, the Board balances the economic, environmental, and social interests in the context and time period in which they arise. The Board has consistently viewed that its duty under s. 2 of the NRCBA is, broadly speaking, a duty to weigh its conclusions respecting the various effects, some positive and some negative, that may result from the proposal, and to balance these effects in forming an overall opinion as to the public interest.

19.3 Procedural Determinations

In proceeding with its deliberations on the Project, the Board focused its assessment on potential social, economic, and environmental effects predicted to arise from the Project, as outlined in the application materials provided by Alberta Transportation, and the interventions and evidence received during the eleven-day hearing held between March 22 and April 7, 2021. The Board reviewed and assessed the entire record of evidence before it and after balancing the various social, economic, and environmental effects, concluded that the Project is in the public interest. Accordingly, references in this decision report to specific parts of the record are intended to assist the reader in understanding the Board’s reasoning in reaching its decision, and do not represent the full record of evidence considered by the Board.

19.4 Justifiable Need for and Design of the Project

As noted in its discussion in Section 18, Socio-Economic Effects and Section 9, Hydrology and Sediment Transport of this decision report, the Board accepts that Alberta Transportation provided compelling arguments supporting the need to mitigate future flood events on the Elbow River. The Board finds that the Project's design will satisfy the identified need to increase public safety and protect infrastructure, in particular, downstream of the Glenmore Reservoir.

The Board finds that the Project is justifiable as it will reduce risk to human life and financial losses from damages to residential, commercial, and public buildings and infrastructure; it will also reduce both direct and indirect economic losses from the disruption of business, primarily in Calgary.

The Board relies on downstream regulators to ensure projects are constructed and operated in accordance with provincial and/or federal regulatory requirements. In this case, the Board has full confidence in Alberta Transportation and Alberta Environment and Parks to finalize engineering design of the structure and carry out the construction, all meeting the requirements of the *Alberta Dam and Canal Safety Directive*.

The Board heard significant testimony from interveners in relation to project alternatives. In particular, the McLean Creek (MC1) dam was an alternative supported by the SR1 Concerned Landowners Group (SCLG). The Board made it clear that its jurisdiction is restricted to deciding whether the project under review is in the public interest. The Project terms of reference required AT to address potential alternative means of carrying out the objective of the Project. The Board found that the process used and conclusions reached by Alberta Transportation in selecting the Project were sound.

19.5 Economic Effects

The Board acknowledges the devastating impact that the 2013 flood had on southern Alberta, and in particular, on the City of Calgary. The 2013 flood is estimated to have caused approximately \$5 billion in damages in southern Alberta. The Government of Alberta acted quickly following the 2013 flood to begin updating its flood mapping information system and identifying flood mitigation options for the Elbow River.

Since 2013, the City of Calgary has implemented a number of flood resiliency measures within the city limits, including increasing the holding capacity of the Glenmore Reservoir. Damage estimates provided by Alberta Transportation and the City of Calgary indicate that a future flood on the Elbow River similar to that experienced in 2013, without further upstream mitigation, will cause close to \$2 billion in total damages.

The Board finds that the Project provides significant public benefits as measured by the reduced risk of loss of life, and avoidance of building damage, infrastructure damage, and business interruption costs. The Board also finds that the Project's \$28 million in average annualized

damage cost avoidance is one of the primary factors in the Board's finding that the Project is in the public interest.

The escalating costs of the Project, along with the benefit-cost analyses and resulting ratios, received considerable attention at the hearing. The Board acknowledges the increasing costs associated with the Project since the initial estimates in 2015. In particular, the Board is critical of AT's initial estimates of land acquisition costs in the early stages of the EIA. However, the Board observes that benefit-cost ratios that include increasing land and construction costs, remain above one—meaning the Project is still expected to deliver a positive economic return. In other words, Project benefits, measured in damage avoidance to private and public infrastructure and business interruption costs, are greater than the cost of constructing the Project, including land acquisition costs. The Board notes that the benefit-cost analysis is but one of many factors weighed in reaching this public interest determination.

19.6 Social Effects

In addition to physical damage to buildings and infrastructure, the Board acknowledges loss of life as well as the tremendous interruption in private lives and businesses caused by severe flooding in Calgary. These impacts are significant. The Board heard emotional testimony from members of the Calgary River Communities Action Group and Flood Free Calgary who experienced the 2013 flood. Many residents, including young people, continue to experience apprehension and anxiety each spring about the potential of yet another flood. The Board is confident that the Project will go a long way in reducing or even eliminating this anxiety.

Dam and public safety are of paramount importance to Albertans and indeed, to this Board. The Board understands public concern regarding the novel approach the Project will use to manage flood waters. However, the Board finds that the major Project components, namely the diversion structure, diversion channel, and off-stream reservoir, are all commonly used structures in Alberta and throughout the world. The Board does acknowledge that the use of all three structures in unison is somewhat unique, however, the Board does not accept that the design is radical or that it puts public safety at risk. The Board understands that the Canadian Dam Association safety guidelines for a high-consequence dam apply to the Project, providing further protection against a dam breach or failure.

The Board acknowledges that the Project is located primarily on private land and recognizes the associated adverse social effects on displaced landowners, some with more than 100 years of multi-generational land ownership. The Board heard and appreciates the testimony provided by landowners who will be displaced by the Project, and by community members concerned about potential Project impacts on themselves and their families. Going forward, the Board is optimistic that community concerns will be addressed by the Project community liaison to be established by AT and AEP.

The Board finds that Alberta Transportation engaged in extensive consultation with Indigenous communities since 2014. This is evidenced by ongoing interaction of Indigenous groups with Alberta Transportation staff and their consultation contractors, funding traditional use studies, meetings, site visits, and attendance with elders at the Project site. Of the thirteen Indigenous groups consulted by AT, the Stoney Nakoda Nations (SNN) is the only Indigenous group that formally participated in the hearing. The other Indigenous groups have either provided letters of

non-objection or have demonstrated a willingness to continue dialogue and consultation with AT outside of the Board's review process.

Overall, the Board finds that the discussions between Alberta Transportation and Indigenous communities illustrated a meaningful exchange of information to reach a mutual understanding of the Project and its impacts on Aboriginal rights. The Board concludes that, notwithstanding the concerns of the Stoney Nakoda Nations, through mitigation measures and commitments, Alberta Transportation has largely addressed the concerns of affected Indigenous communities about impacts to their rights.

The Board recognizes that Alberta Transportation must continue its consultation activity with all Indigenous groups through the Project construction and operational phases. In particular, the Board notes that AT is required, and has committed, to consult with the Stoney Nakoda Nations to complete their Traditional Land Use Assessment study and address outstanding concerns of the SNN.

Where significant concerns were raised by Indigenous groups about adverse Project impacts, AT proposed various mitigation or accommodation strategies. Chief among the mitigation strategies is AT's draft updated Guiding Principles and Direction for Future Land Use document. In the document's original form, the lands taken up by the reservoir, and part of the occupied Project area, were to be restricted from public access. The updated land use document allows for public access during dry operations and places a priority on access and use by Indigenous groups. The final Land Use Plan for the project development area (PDA) will come to fruition with participation and input from Indigenous peoples through the First Nations Land Use Advisory Committee. The Board commends Alberta Transportation for its work to create the Draft Land Use Plan and expects that Alberta Transportation and Alberta Environment and Parks will work with all stakeholder groups to accommodate the multiple demands that will be placed on the newly created Crown land.

In addition to helping address and mitigate Indigenous concerns, AT's decision to convert much of the PDA to Crown land will also provide the general public opportunities to use these new Crown lands. The Board recognizes that the SR1 Concerned Landowners Group made a number of requests of AT for improvements to the project development area that would provide a better user experience. In addition, the SCLG and Mr. Wagner requested that wildfire mitigation strategies be implemented, along with restrictions to firearm discharge in the PDA. The Board finds that Alberta Transportation and AEP must consult with Indigenous groups and community members to finalize the Land Use Plan for the project development area. Community consultation will include the creation of the Joint Land Use Advisory Committee. The Board expects that conditions of approval outlined in Section 7, Land Use and Management of this decision report will assist in addressing the concerns and requests made by interveners, and in resolving the competing interests for land use in the PDA.

The Board concludes that there are no unacceptable social impacts associated with the Project.

19.7 Management of Environmental Effects

In reviewing the EIA, hearing submissions, and testimony provided at the hearing, the Board finds that most environmental effects are well understood as low to negligible. Any Project

adverse environmental effects will likely be reduced to acceptable levels with proposed mitigation strategies. This conclusion is reached based on Board findings in each impact category within this decision report. The Board has weighed the entirety of evidence regarding Project effects; however, the following paragraphs on hydrology, air quality, and fish highlight potential adverse effects and conclusions of particular importance. For matters not highlighted within this section (e.g. wildlife and biodiversity, vegetation), please see the category-specific sections of this report.

The Project's adverse effects on hydrology are moderate but unavoidable since the objective of the Project is to mitigate high flow events in the Elbow River associated with floods. Other than during relatively infrequent flood events, the Project design will allow the Elbow River to remain close to its natural riverine state. During flood events, flows exceeding 160 cubic metres per second (m^3/s) will be diverted from the Elbow River into the reservoir. These point-in-time effects are significant but necessary to achieve the objective of the project: flood mitigation and damage avoidance.

Alberta Transportation modelled key air quality parameters that will result from the mobilization of sediments deposited in the reservoir during flood events, however, there is uncertainty surrounding the estimates given the complexity of air quality modelling and the degree of sedimentation that may occur. The Board finds that Alberta Transportation's mitigation plan, including the timely use of tackifiers, cover crops, and revegetation to stabilize sediment, in conjunction with extensive air quality monitoring will address these issues should they arise.

The design of the Project leaves the Elbow River close to its natural riverine state during non-flood years. During flood events, the diversion structure will alter river flows by diverting flows in excess of 160 m^3/s into the reservoir. During periods of flow diversion fish will become entrained in the canal and reservoir. Fish survival rates in the reservoir, total fish passage through the low-level outlet during reservoir draining, and efficacy of fish rescue post reservoir draining are uncertain. The Board acknowledges these uncertainties but finds that the early release option for post-flood draining of the reservoir combined with a robust fish rescue program will maximize fish survival rates. The Board also recognizes that the total number of fish entrained in a design flood event is expected to be approximately one per cent—a relatively small percentage of the total fish population between Elbow Falls and the Glenmore Reservoir. The Board finds that fish sustainability in the Elbow River is not jeopardized by the Project.

As directed under the NRCBA, the Board must ensure applications are consistent with regional plans under the *Alberta Land Stewardship Act* (ALSA). The Board has considered whether the Project is supported by the *South Saskatchewan Regional Plan* (SSRP) pursuant to ALSA. The Board finds that the Project is consistent with the long-term vision for the region to balance economic, environmental, and social goals, as established by the SSRP. As noted by the Board in its findings in Section 7, Land Use and Management, the *South Saskatchewan Regional Plan* contains the following objectives and expectations:

- "... mitigating impacts from flooding....";
- "... supporting the development of municipal flood hazard mitigation plans"; and

- “[mitigating] possible negative impacts on important water resources or risks to health, public safety and loss to property damage due to hazards associated with water, such as flooding, erosion and subsidence within the scope of jurisdiction.”

In comparing the description of the Project and its various constituent elements, the Board concludes that the Project is consistent with the SSRP long-term vision for the region to balance economic, environmental, and social goals.

The Board acknowledges that interveners at the hearing expressed a keen interest in monitoring of environmental effects and the need for public access to those results. The Board agrees it is important that environmental effects are being monitored and reported in a transparent manner. To that end, the Board requires as a condition of approval that, subject to privacy protection requirements, the Operator shall make Project monitoring results accessible to the public for:

- aquatic ecology;
- hydrology and sediment transport;
- surface water quality;
- groundwater quality and quantity;
- vegetation;
- terrain and soils;
- wildlife and biodiversity; and
- air quality.

19.8 Public Interest Determination

Based on the assessment of the evidence before it, the Board concludes that the Project is in the public interest. This opinion is founded upon the evidence supporting the public benefits of mitigating flood events downstream of the Project site and, in particular, on the City of Calgary. For the City of Calgary, the Project reduces the risk of loss of life; provides significant damage avoidance to private residences, businesses, and public infrastructure; and reduces or eliminates business interruption. Also important is the significant social benefit to residents apprehensive about the risk of future flooding. The Board finds that the considerable positive social and economic effects outweigh the adverse economic, social, and environmental effects, convincing the Board that the Project is in the public interest. In making this decision the Board notes that, while adverse environmental effects exist, the conditions in the approval, together with Alberta Transportation’s commitments, will mitigate any material environmental effects associated with the Project.

Subject to receipt of the necessary authorization of the Lieutenant Governor in Council, the Board grants an approval in respect of Alberta Transportation’s application for the Springbank Off-stream Reservoir Project. Appendix A provides the draft form of NRCB approval, including the required conditions.

DATED at EDMONTON, ALBERTA, this 22nd day of June, 2021.

Original signed by:

Peter Woloshyn, Chair

Sandi Roberts

Walter Ceroici

Daniel Heaney

APPENDIX A FORM OF APPROVAL

**THE PROVINCE OF ALBERTA
NATURAL RESOURCES CONSERVATION BOARD ACT
NATURAL RESOURCES CONSERVATION BOARD**

IN THE MATTER of an application of Alberta Transportation for approval to construct and operate an Off-Stream Reservoir Project on the Elbow River upstream of Calgary, Alberta

APPROVAL NO. NR 2021-01

WHEREAS the construction and operation of a water management project is a reviewable project under s. 4(d) of the *Natural Resources Conservation Board Act*, and

WHEREAS the Government of Alberta will transition operation and maintenance responsibilities from Alberta Transportation to Alberta Environment and Parks once construction is completed, and references to the Operator in this Approval refer to either Alberta Transportation and Alberta Environment and Parks in their role as the department responsible for Project construction, operation and maintenance, and

WHEREAS the Natural Resources Conservation Board (Board) is prepared to grant approval to the application by the Operator, subject to the following conditions, and the Lieutenant Governor in Council has given authorization (attached).

THEREFORE, the Board orders as follows:

1. The Project of the Operator, for construction and operation of the Off-Stream Reservoir Project (Project) on the Elbow River upstream of Calgary, Alberta, as described in Application No. 1701 from the Operator to the Board filed on November 2, 2017 as well as all supplemental materials supporting the application (Application) filed with the Board, is approved, subject to the undertakings and commitments in the Application and subject to the following terms and conditions.
2. The Operator shall:
 - a) provide Indigenous groups 30 days advance notice of commencing construction to allow them to harvest and transplant traditional and medicinal plants and to conduct ceremonies within the Project Development Area, and
 - b) provide access (while ensuring public safety) to Indigenous groups to conduct pre and post construction site visits to observe proposed mitigation measures and provide feedback to the Operator based on their observations,

to the satisfaction of Alberta Indigenous Relations.

3. The Operator shall develop an archaeological and heritage management plan in consultation with the Stoney Nakoda Nations for any structures, sites, or things of historical, archaeological, or architectural significance or physical or cultural heritage resources within the Project Development Area, including but not limited to sites and things subject to the *Historical Resources Act*; the plan shall be completed to the satisfaction of Alberta Culture, Multiculturalism and Status of Women.
4. The Operator, in consultation with the Stoney Nakoda Nations, shall:
 - a) ensure that the Operator's employees and contractors that are likely to be in close contact with the Stoney Nakoda Nations' members for the purposes of carrying out the Project receive cultural awareness training, and
 - b) retain an independent Indigenous Monitor to monitor all field work activities undertaken as part of the completion of the Stoney Nakoda Traditional Land Use Assessment (SNN TLUA). The Indigenous Monitor shall be retained by the Operator throughout the construction phase of the Project to ensure requirements of the SNN TLUA are met, including the management of archaeological and heritage finds of significance,all to the satisfaction of Alberta Indigenous Relations.
5. The Operator shall:
 - a) establish a Joint Land Use Advisory Committee consisting of members of Indigenous groups and the local community. The Board is hopeful that members of the committee will reach consensus recommendations about potential land uses and naming of the Project that may be included in a draft future Land Use Plan. The committee will be dissolved when the Government of Alberta finalizes the Land Use Plan for the Project area, or later at the discretion of the Operator.
 - b) ensure that the use of firearms in the Project area and its potential impact on public safety be a matter of consultation with both the First Nations Land Use Advisory Committee and the Joint Land Use Advisory Committee.
6. The Operator shall work with the Springbank Historical Society to document the history of the Project lands and to cooperate with the Government of Alberta to develop appropriate plaques or signage.
7. The Operator shall:
 - a) monitor water levels in domestic water wells west of the diversion channel to the boundary of the local assessment area that may be impacted by dewatering during the Project construction. During flood and dryland operation, monitoring of the wells should be continued by the Operator for a minimum of five years or until it can be demonstrated that permanent lowering of the water level does not significantly impact yields from the water wells, and
 - b) take mitigative action if significant yield reductions attributable to the Project are observed at water wells referred to in Condition 7(a),

to the satisfaction of Alberta Environment and Parks.

8. The Operator shall, in addition to air monitoring commitments and to the satisfaction of Alberta Environment and Parks, conduct continuous monitoring of PM_{2.5} and total suspended particulate levels and meteorological conditions for a minimum 16-month period post-flood at the proposed Calaway Park air monitoring station during the period when the Park is open to the public, and at the Springbank community air monitoring station. All monitoring stations must be capable of sending automatic alerts to the Operator when air concentrations exceed designated alert levels so that any exceedance events, if confirmed to be attributable to Project activities, can be mitigated in a timely manner.

9. The Operator shall:

- a) extend monitoring of revegetated areas from 18 months to a minimum of two full growing seasons following seeding, and
- b) assess the extent and species mix of trees and shrubs that are likely to be lost in the more frequently inundated areas and implement replacement plantings at higher elevations within the reservoir or along the perimeter,

to the satisfaction of Alberta Environment and Parks.

10. The Operator shall, subject to privacy protection requirements, make Project monitoring results for:

- Aquatic ecology,
- Hydrology and sediment transport,
- Surface water quality,
- Groundwater quality and quantity,
- Vegetation,
- Terrain and soils,
- Wildlife and biodiversity, and
- Air quality

easily accessible to the public, subject to the satisfaction of Alberta Environment and Parks.

Made at the City of Edmonton, in the Province of Alberta, this ____ day of _____, 2021.

NATURAL RESOURCES CONSERVATION BOARD

Peter Woloshyn, Chair

Sandi Roberts

Daniel Heaney

Walter Ceroici

APPENDIX B PARTIES THAT MADE SUBMISSIONS

PRINCIPALS AND REPRESENTATIVES

WITNESSES

Alberta Transportation

Ron Kruhlak, Q.C.
Gavin Fitch, Q.C.
Michael Barbero

Matthew Hebert
Mark Svenson
Wayne Speller
Dave Brescia
Matt Wood
David Sol
John Menninger
Yvonne Carignan
Malcolm Smith
Michele Perret
Jennifer Hallson
Colin Buchanan
Dan Back
Dave Luzi
Dan Yoshisaka
Darrell Jobson
Lacey AuCoin
Tania Noble
Nick De Carlo
Eliot Terry
Ivan Whitson
Reid Person

Calalta Amusements Ltd. and Calalta Waterworks Ltd.

Bob Williams

Calgary River Communities Action Group and Flood Free Calgary

Lou Cusano, Q.C.
Gino Bruni

Brenda Leeds Binder
Tony Morris
Paul Battistella

City of Calgary

Melissa Senek
Sara Munkittrick
David Mercer

Frank Frigo

SR1 Concerned Landowners Group

Richard Secord
Ifeoma Okoye

Karin Hunter
Mary Robinson
Karen Massey
Tracey Feist
Marshall Copithorne
Jan Erisman
Brian Copithorne
Lee and Diane Drewry
Barbara Tegtmeyer
Marlene Dusdal
Roger Austin
Ruth Keyes
Jon Fennell
Dave Klepacki
Ian Dowsett
Allan Locke
Brian Zelt
Cliff Wallis
Terry Osko

Scott Wagner

Scott Wagner

The Stoney Nakoda Nations

Douglas Rae
Sara Louden

William Snow
Jackson Wesley
Henry Holloway
John Snow Jr.
Larry Daniels Jr.
Chris Goodstoney
Megan Berry
Leslie Beckmann
Adena Vanderjagt

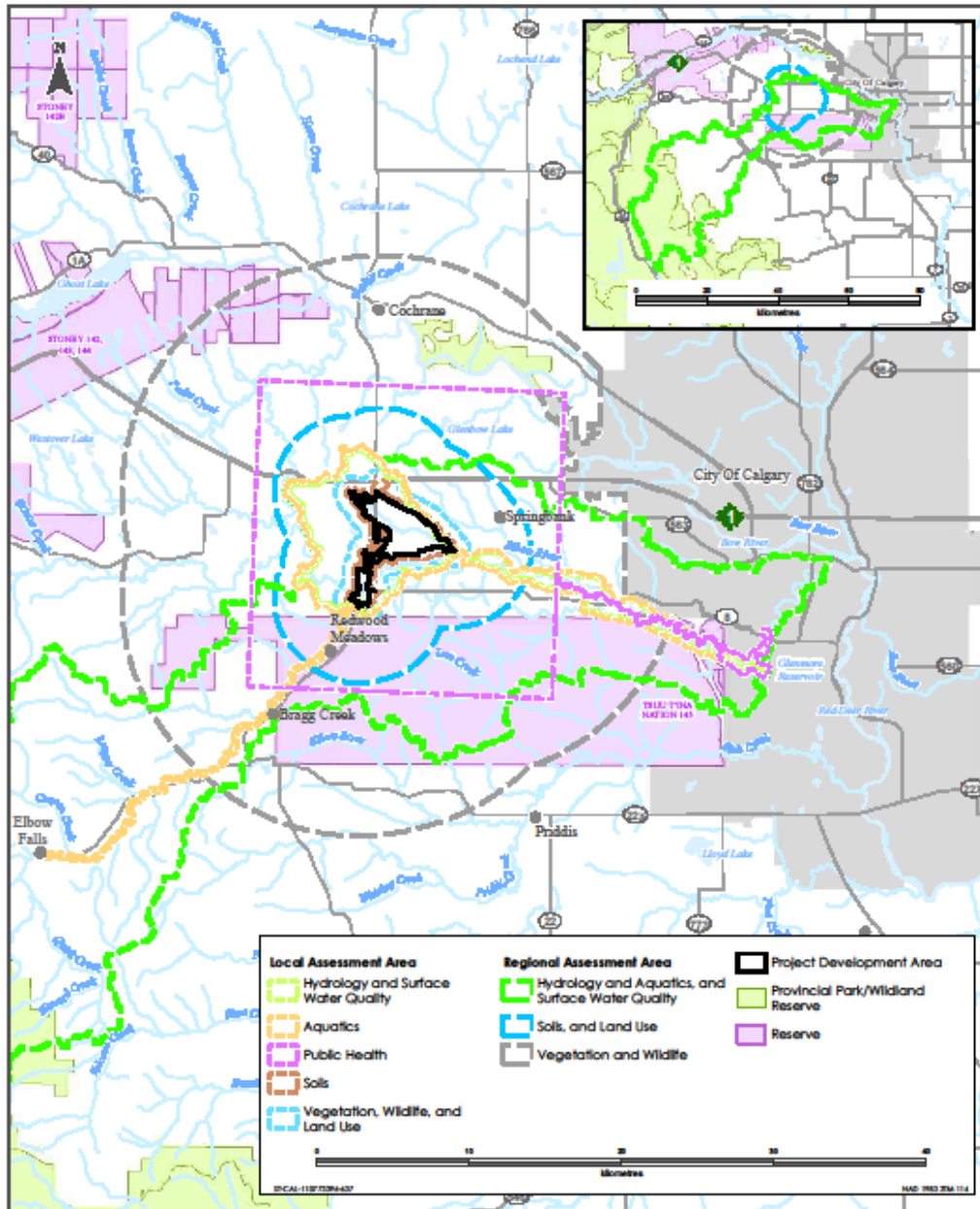
Parties Who Did Not Attend Hearing (but Made Submissions)

Flood and Water Management Council
Charles Hansen
Springbank Community Association
Louis Bull Tribe
Calgary River Valleys

NRCB Staff Who Attended the Hearing

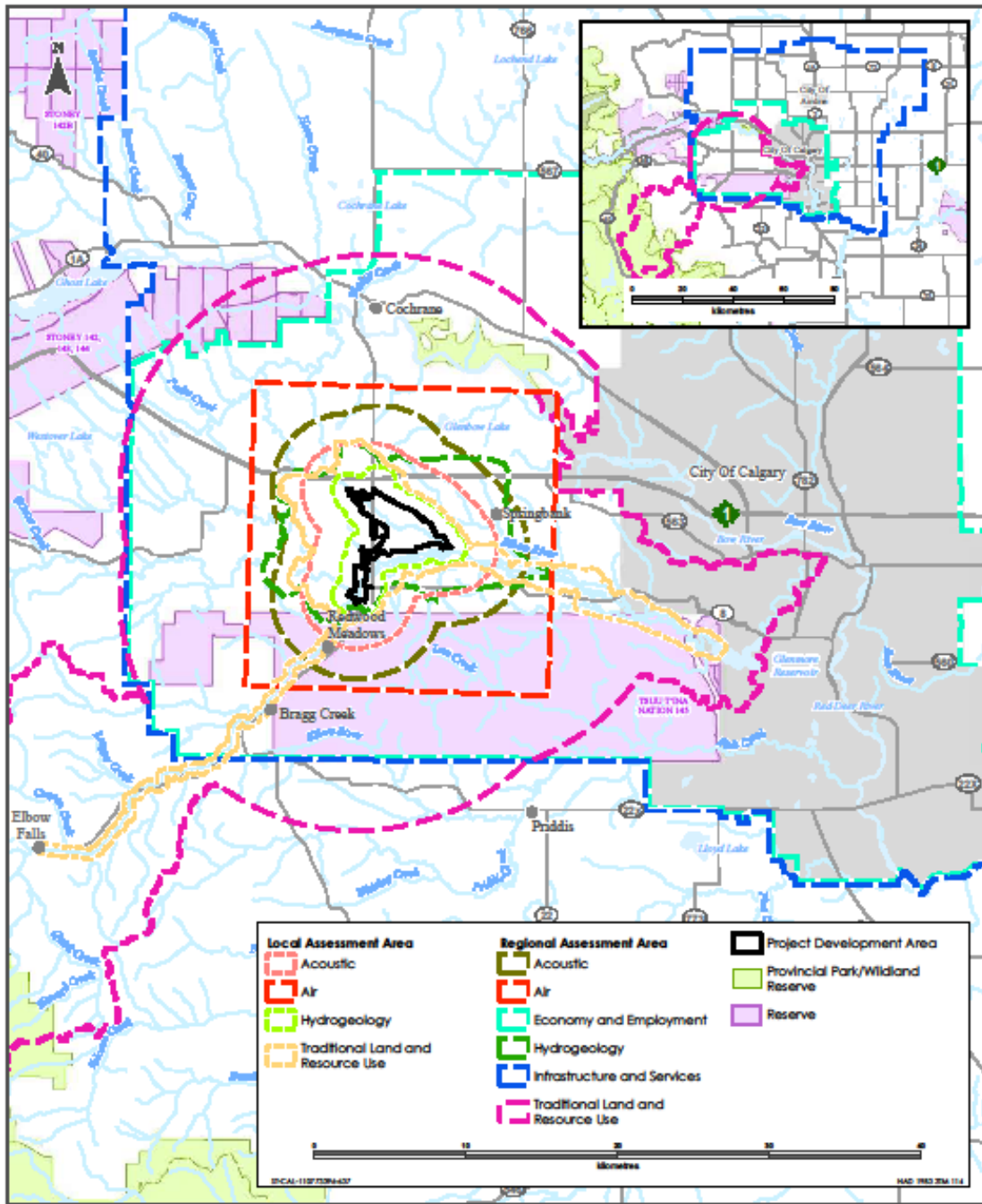
Bill Kennedy
Fiona Vance
Laura Friend
Mike Iwanyshyn
Scott Cunningham
Stephanie Fleck
Carina Weisbach
Sylvia Kaminski
Amanda Cundliffe
Carolyn Taylor
Nora Decosemo
Sharon Gagnon

APPENDIX C ASSESSMENT AREA FIGURES



Assessment Areas (Part 1)

Figure 6-1



Assessment Areas (Part 2)

Figure 6-2

APPENDIX D ACRONYMS AND ABBREVIATIONS

1:10 year flood	one in 10 year flood
1:100 year flood	one in 100 year flood
AAAQO	Alberta Ambient Air Quality Objective
AAD	average annual damage
ACMSW	Alberta Culture, Multiculturalism and Status of Women
ACO	Aboriginal Consultation Office
AEP	Alberta Environment and Parks
AT	Alberta Transportation
EIA	environmental impact assessment
FWMC	Flood and Water Management Council
FWMIS	Fisheries and Wildlife Management Information System
GoA	Government of Alberta
ha	hectare
HRIA	Historical Resources Impact Assessment
HRV	Historic Resource Value
kg	kilogram
km	kilometre
km ²	square kilometre
LAA	local assessment area
LUB	land use bylaw
MC1	McLean Creek option
m	metres
m ²	square metres
m ³	cubic metres
mm	millimetres
m ³ /day	cubic metres per day
m ³ /hr	cubic metres per hour
m ³ /s	cubic metres per second
MDP	municipal development plan
mg	milligrams
mg/kg	milligrams per kilogram
MNL	mitigation noise level
NPV	net present value
NRCB	Natural Resources Conservation Board
NRCBA	<i>Natural Resources Conservation Board Act</i>

PDA	project development area
PM	particulate matter (e.g. PM _{2.5} depicts particles of 2.5 micrometres)
RAA	regional assessment area
SARA	<i>Species at Risk Act</i>
the SNN	the Stoney Nakoda Nations
SOMC	species of management concern
SCLG	SR1 Concerned Landowners Group
SSRP	<i>South Saskatchewan Regional Plan</i>
SIR	supplemental information request
SR1	Springbank Off-Stream Reservoir Project
the Project	Springbank Off-Stream Reservoir Project
TLUA	traditional land use assessment
TSP	total suspended particulate

Contact the Natural Resources Conservation Board at the following offices:
Dial 310-0000 to be connected toll free.

Edmonton Office

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Edmonton, AB T5K 2N2
T 780-422-1977

Calgary Office

19th Floor, Centennial Place, 250 - 5 Street SW
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Copies of NRCB process guides are available by
contacting the NRCB.

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