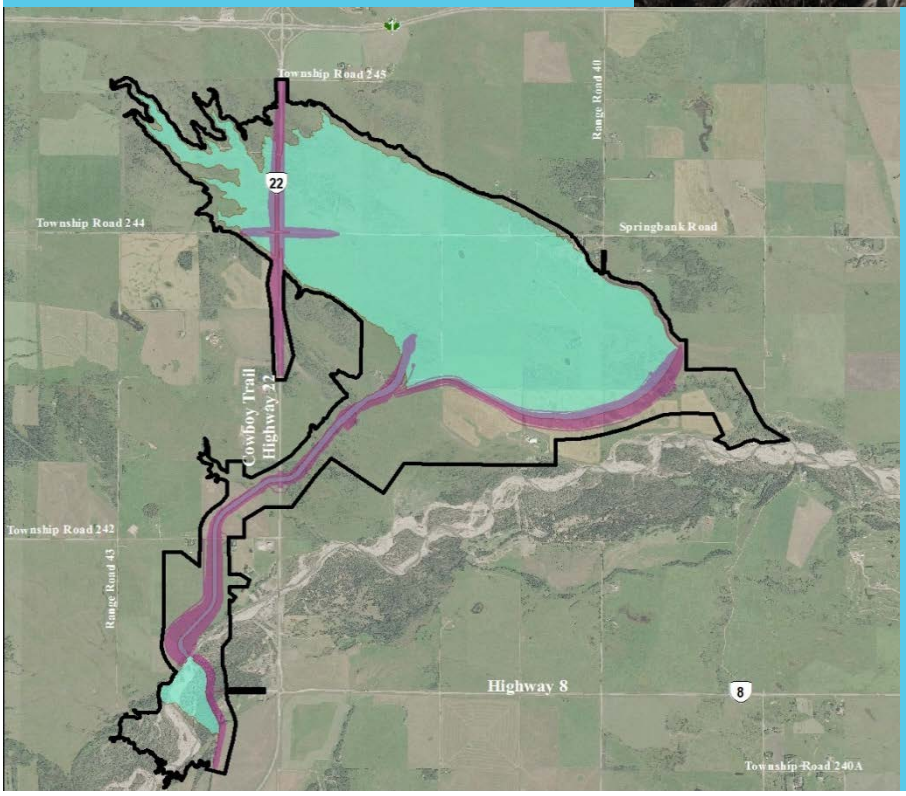
Springbank Off-stream Reservoir Project



Response to Agency Conformity Review of Round 1 Part 1, dated July 16, 2019

October 2019

Alberta Transportation

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List of Acronyms and Short Forms

AEP	Alberta Environment and Parks
AER	Alberta Energy Regulator
Agency	Canadian Environmental Assessment Agency
CDA	Canadian Dam Association
CEAA 2012	*Canadian Environmental Assessment Act, 2012*
DFO	Fisheries and Oceans Canada
ECCC	Environment and Climate Change Canada
ECO Plan	Environmental Construction Operations Plan
EIA	environmental impact assessment
EIS	environmental impact statement
EIS Guidelines	environmental impact statement guidelines
EMP	emergency management program
EPEA	*Environmental Protection and Enhancement Act*
EPZ	emergency planning zones
ERP	emergency response program
IR	information request
LAA	local assessment area
NEB	National Energy Board
PDA	Project development area
PMF	probable maximum flood
RAA	regional assessment area
RAP	restricted activity period
RoW	right of way
SARA	*Species at Risk Act*
SCADA	Supervisory Control and Data Acquisition
SOMC	species of management concern
TSB	Transportation Safety Board
TSS	total suspended solids
VC	valued component
WMMP	Wildlife Mitigation and Monitoring Plan

Conformity IR1-01

Topic: Accidents and Malfunctions – Worst Case Scenarios

Sources:

EIS Guidelines Part 2, Section 6.6.1

EIS Volume 3D

CEAA Annex 2: A) Early Technical Issues, December 19, 2017

Alberta Transportation Responses to CEAA Annex 2: A) Early Technical Issues, May 11, 2018

CEAA Information Requests Related to the Environmental Impact Statement Round 1 Part 1, IR1-01

Alberta Transportation Responses to IR Round 1, SR1 CEAA IR Package 1, June 14, 2019

Context and Rationale

In CEAA Information Requests Related to the Environmental Impact Statement Round 1 Part 1, IR1-01, the Agency required details on how the valued components would be affected by the worst case scenario for a diversion structure failure or breach, the associated environmental consequences (such as potential species affected), and the temporal and geographical extents of the effects. As noted in the information request, part 2, section 6.6.1 of the Environmental Impact Statement Guidelines (EIS Guidelines) require the proponent to identify the probability of potential accidents and malfunctions related to the project, including the plausible worst case scenarios.

In Alberta Transportation's response to IR1-01, Alberta Transportation provided a description of certain worst case scenarios and the potential effects associated with each scenario. The information request response does not appear to consider the full range of worst case scenarios associated with diversion structure failure or breach. For instance, the possibility of the diversion inlet gates failing to shut during flooding may pose a risk of causing adverse environmental effects and was not considered. Additional information is needed on potential worst case scenarios involving the diversion inlet gates.

In IR1-01, the Agency required details, such as volumes and locations, of the estimated worst case scenarios for a hazardous material spill and pipeline rupture. In Alberta Transportation Responses to IR Round 1, SR1 CEAA IR Package 1, Alberta Transportation provided information on what each worst case scenario would involve and the potential effects from the proposed scenarios; however, certain details, such as the volumes of potential spills and extent of potential effects are not discussed,

The worst case scenario for a potential pipeline rupture is described as rupture of an oil pipeline within the northwest portion of the off-stream reservoir during the release of water from a design flood; however, the estimated volume of a spill is not provided. Although it is mentioned that should this rupture occur during the release of water, the low-level outlet gates would be closed to contain the contaminated water within the reservoir and allow spill cleanup, it is unclear whether the appropriate spill response capacity is available to stop the spill and close the low-level outlet gates prior to contaminants being released into the Elbow River. Additionally, it is important to understand the care and control of the pipeline rupture to ensure that the spill is stopped and contained.

The worst case hazardous material spill is described as a tanker truck containing 50,000 litres of fuel overturning on the Highway 22 bridge. As mentioned in the response, the spill would enter the river. Although the likelihood of this occurring is low, it is unclear the potential extent of environmental effects and the measures that Alberta Transportation would take to contain or clean up the spill.

In IR1-01, the Agency required an updated assessment of potential effects to groundwater from a hazardous material spill or pipeline rupture, considering the worst case scenarios and response plans. In Alberta Transportation Responses to IR Round 1, SR1 CEAA IR Package 1, Alberta Transportation indicated that the assessment of potential effects to groundwater remains the same as presented in the EIS Volume 3D. Limited rationale is provided that describes how the information in the EIS responds to the information requirement. Additionally, the information provided in the EIS on the potential effects to groundwater from a hazardous material spill or pipeline rupture does not reflect the worst case scenarios as described in the response to IR1-01 part b. An assessment of potential effects to groundwater considering the worst-case scenarios for a hazardous material spill or pipeline rupture is still needed.

The *Canadian Environmental Assessment Act, 2012* (CEAA 2012) requires the consideration of accidents and malfunctions to support a complete understanding of the potential adverse environmental effects to areas of federal jurisdiction. To meet the information requirements, Alberta Transportation should systematically focus on each of the environmental effects listed in CEAA 2012 section 5 in responding to the information requests below.

<u>Information Requests:</u>

a) Describe additional worst case scenarios in relation to the diversion inlet gates. Provide details on how the valued components would be affected by the additional worst case scenario(s), the associated environmental consequences (such as potential species affected), and the temporal and geographical extents of the effects.

b) For the worst case scenario pipeline rupture, provide additional details including the estimated volume; care and control of the pipeline rupture; estimated timing required to stop and contain the spill; and extent of potential effects (including if the spill enters the Elbow River).

c) For the worst case hazardous material spill, describe the geographical extent of potential effects, proposed clean up and response measures.

d) Reassess the potential effects to groundwater considering the worst case scenarios for a hazardous material spill or pipeline rupture.

Response

a) The Springbank Off-Stream Reservoir (the Project) is regulated by Alberta Environment and Parks (AEP) *Dam and Canal Safety Guidelines* (1999) as well as the Canadian Dam Association (CDA) *Dam Safety Guidelines* (2007) and meets design standards established by these safety guidelines. A failure of the diversion inlet gates is considered a very low probability. These failures could only occur during spring and summer because these are the months where the Project would most likely be activated. Potential failure of the diversion inlet gates should be considered in the context that the likelihood of a design flood and 1:100 year flood occurring is approximately 0.5% and 1% in any given year respectively; therefore, the likelihood of a failure during these operating conditions would be even less.

There are two worse case scenarios related to the diversion inlet gates: failure of the diversion inlet gates to open once the Project has been activated (i.e., a flood is occurring and the diversion inlet gates are planned to be open but flood water is not able to enter the diversion channel and off-stream reservoir); and failure of the diversion inlet gates to close in order to prevent additional water from entering the off-stream reservoir because it has reached capacity. Additional details related to the dynamics of the scenario, geographical area of effects, and potentially affected valued components (VCs) are discussed below.

FAILURE TO OPEN DURING PROJECT ACTIVATION (OFF-STREAM RESERVOIR IS NOT FILLED)

This unlikely event occurs when the inlet gates fail to open during Project activation; that is, a flood event is occurring and the diversion inlet gates are scheduled to open but cannot, causing flood water to not be diverted into the off-stream reservoir. In the unlikely event of such a failure, flood water would continue to flow through the service spillway. The pneumatic system that raises the service spillway gates are designed to operate effectively if one or more key components are damaged; if the diversion inlet gates should fail, the service spillway gate may be lowered to the downward position (with or without power) for safe passage of flood water and upstream debris material within the flood flow.

If during this time, flood water flows exceed the design limits for the service spillway, activation of the auxiliary spillway would occur. The auxiliary spillway is designed to activate when inflow exceeds the capacity of both the service spillway and the diversion inlet gates. The structure itself is a full depth concrete structure designed to maintain its resiliency from frequent overtopping, and it has been designed to not raise the risk of flooding upstream of the diversion structure. At this point, flood water would proceed through both the service spillway and auxiliary spillway and down Elbow River in the same manner it would in the absence of the Project during a flood.

If this unlikely failure were to occur, effects on VCs would be similar to those during a flood in the absence of the Project. The following VCs could be adversely affected:

- hydrology
- surface water quality
- aquatic ecology
- vegetation and wetlands
- soils and terrain
- wildlife and wildlife habitat
- public health

The details on the potential effects on these seven VCs follows.

Activation of the auxiliary spillway would result in the loss and downstream deposition of cover materials (e.g., vegetation and soil) in the area between the auxiliary spillway and the Elbow River by means of erosion and upstream debris carried down the Elbow River by flood waters. The release of flood waters proceeding through the auxiliary spillway would not likely produce an increase in water volumes (hydrology) beyond what would occur in the absence of the Project during a flood. However, the transport of cover material and debris could cause short-term increases in sediment load. This change could result in short-term, localised adverse effects on surface water quality (e.g., turbidity, suspended sediment concentrations), which may also cause localised short-term effects on aquatic ecology (e.g., fish habitat or direct death of fish). Effects on public health in relation to drinking water quality is not likely and would be similar to what would occur in the absence of the Project during a flood.

Direct loss or alteration of soils and terrain, vegetation and wetlands as well as wildlife and wildlife habitat could occur from the passage of water and sediment deposition. The effects on soil and vegetation would be limited to the area between the auxiliary spillway and Elbow River and be moderate in duration because vegetation reestablishment would be dependent on the amount of soil removed/deposited within the area. This loss of vegetation would also result in a moderate duration for localised loss of wildlife habitat within the area. Between the auxiliary spillway and Elbow River, there is moderate-quality habitat for avian species and low-quality habitat for grizzly bear. During the failure event, direct mortality of wildlife (e.g., ungulates, small mammals) is a possibility from water insurgence and flood debris or sedimentation. There is also the possibility of nest intake, which would result in the direct mortality of avian species (including migratory birds and species at risk). However, the effects on these VCs would likely be similar to what would occur during a flood in the absence of the Project.

FAILURE TO CLOSE DURING PROJECT ACTIVATION (OFF-STREAM RESERVOIR IS OVERFILLED)

The second worse case scenario related to the diversion inlet gates would be an event where the Project has been activated successfully and the off-stream reservoir is being filled, but the diversion inlet gates do not close when the maximum capacity of the off-stream reservoir is reached (that is, the off-stream reservoir has reached its maximum capacity of 77,771,000 m^3 but water is still entering the off-stream reservoir). If this unlikely scenario were to occur, flood water would continue to fill the diversion channel and off-stream reservoir until water levels within the off-stream reservoir would be high enough to activate opening of the emergency spillway. The emergency spillway is designed to maintain a freeboard elevation of 1.5 m within the off-stream reservoir in order to prevent failure of the off-stream dam. The design capacity of the emergency spillway is 354 m^3/s for a scenario in which the diversion inlet gates fail to close. At this point, excess flood waters would exit the emergency spillway and travel overland into the Elbow River.

In the unlikely event of a closure failure of the diversion inlet gates, the following VCs could be adversely affected:

- hydrology
- surface water quality
- aquatic ecology
- vegetation and wetlands
- soils and terrain
- wildlife and wildlife habitat
- public health

The details on the potential effects on these seven VCs follows.

Activation of the emergency spillway would result in the loss and downstream deposition of cover materials (e.g., vegetation and soil) in the area between the emergency spillway and the Elbow River by means of erosion. Due to the smaller amount (354 m^3/s maximum release rate) of water flowing over the emergency spillway, excess water from the off-stream reservoir entering the emergency spillway would not likely produce an increase in water volumes beyond what would occur in a non-failure event; however, the transport of cover material could cause short-term increases in sediment load. This change could result in short-term, localised adverse effects on surface water quality (e.g., turbidity, suspended sediment concentrations), which may also cause localised short-term effects on aquatic ecology (e.g., fish habitat or direct death of fish). Effects on public health in relation to drinking water quality is not likely and would match what would occur in absence of the Project during a flood event.

Direct loss or alteration of soils and terrain, vegetation and wetlands as well as wildlife and wildlife habitat could occur from excess water from the off-stream reservoir and sediment deposition. The effects on soil and vegetation would be limited to the area between the emergency spillway and Elbow River and be moderate in duration because vegetation reestablishment would be dependent on the amount of soil removed/deposited within the area. This loss of vegetation would also result in a moderate duration and localised loss of wildlife habitat within the area. Between the emergency spillway and Elbow River, there is a range of very low to moderate quality habitat for avian species, high quality habitat for elk (summer and winter feeding habitat only) and a range of low to high quality habitat for grizzly bear (spring feeding habitat). During the unlikely failure event, direct mortality of wildlife (e.g., ungulates, small mammals) is a possibility from water insurgence and flood debris or sedimentation. There is also the possibility of nest intake, which would result in the direct mortality of avian species (including migratory birds and species at risk). However, the effects on these VCs would likely be similar to what would occur during a flood in the absence of the Project.

b) From initial Project design, a mitigation to reduce the likelihood of release has been the re-location of pipelines (i.e., realignment of a portion of the pipeline along a new right-of-way) and retrofitting of pipelines within the Project development area (PDA), as agreed with the third-party operators' specifications and agreements with Alberta Transportation.

The pipelines within the PDA are regulated by provincial (Alberta Energy Regulator, AER) or federal (National Energy Board, NEB) authorities. Under AER, pipeline incidences are rated as follows (AER 2018):

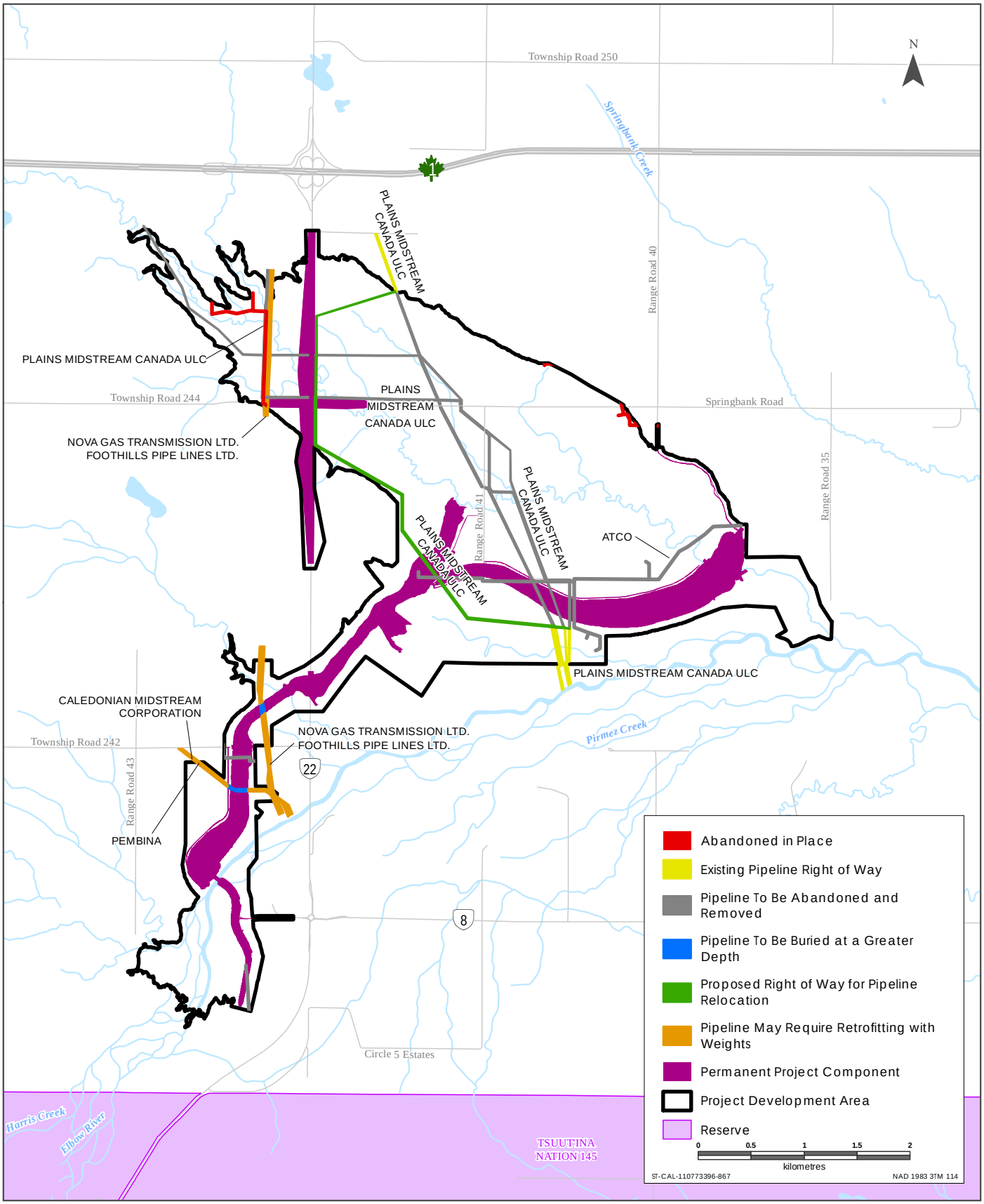
- *low consequence* are Incidents that involve little to no substance released and have little to no impact on the public, wildlife, and the environment (no impact on a waterbody).
- *medium consequence* are incidents that could have a moderate impact on the public, wildlife, or the environment, and no impact on a flowing waterbody.
- *high consequence* are incidents that could have significant impact on the public, wildlife, or the environment, or that involve the release of a substance that affects a large area or waterbody.

In 2018, approximately 94% of the pipeline incident recordings to AER were of low to medium consequence (total of 416 province wide) (AER 2019). Of those incidents, 67% had less than 1 m^3 of material released. In 2018, in the federally-regulated pipeline system, 40 companies transported 220 million cubic metres of oil through approximately 17,500 km of oil pipelines (including 19 companies that transported both oil and gas). Also, in 2018, 83 companies transported over 185 billion cubic metres of gas through approximately 51,900 km of gas pipelines (including 19 companies that transported both oil and gas). A total of 111 pipeline incidents were reported to the Transportation Safety Board (TSB), about half of which occurred on transmission pipelines (TSB 2019). Of those 111 incidents, 69 involved no release

of product. Most releases were related to natural gas and were relatively small (over 50% of releases were less than 100 m^3). There were only two low vapour pressure hydrocarbon releases greater than 1.5 m^3 (TSB 2019). There have been no fatal accidents on a federally regulated pipeline system directly resulting from the operation of a pipeline since the inception of the TSB in 1990 (TSB 2019).

These pipelines are not a physical works component or a physical activity of the Project. It is also the sole responsibility of those pipeline operators to develop appropriate emergency preparedness plans and emergency response plans to account for potential release during all phases of the Project. The *Environmental Protection and Enhancement Act* (EPEA) states that the entity that has control of a substance that is released is responsible for the reporting and clean-up associated with the substance if that substance may cause, is causing, or has caused an adverse effect. In the event of a third-party release within the PDA, Alberta Transportation (during construction) and AEP (during operation) will not be responsible for executing containment or clean-up activities; however, they would be available to assist the emergency's Incident Command or join part of the Unified Command to provide support or direction related to specific site conditions.

There are five third-party companies that operate pipelines within the PDA: four companies transport natural gas products and one transports crude oil. Alberta Transportation contacted all the pipeline operators in the PDA and received feedback from all of them. Figure 1-1 shows the existing locations and operators of the pipelines within the PDA. Plains Midstream Canada has three pipelines (a crude oil pipeline, a natural gas pipeline and an abandoned pipeline) that currently cross the PDA at the deepest part of the off-stream reservoir and beneath the proposed location of the off-stream dam. TransCanada Pipelines Ltd. (now TC Energy) operates natural gas pipelines under the entities of Foothills Pipelines Ltd. and NOVA Gas Transmission Ltd., located in the upper west reaches of the off-stream reservoir and crossing the diversion channel. Caledonian Midstream Corporation and Pembina Pipelines Corporation operate side-by-side natural gas pipelines that cross the diversion channel. ATCO has various natural gas service lines that run throughout the PDA to serve current residences. Alberta Transportation engaged with all pipeline operators in the PDA requesting information related to their operating conditions (e.g., pressures, pipeline contents), as well as care and control procedures during accidental releases. All operators provided information related to these topics to help support the response to this information request.



Sources: Base Data - ESRI, Natural Earth. Thematic Data - ERBC, GeoLOGIC (2015)

Stantec

ALBERTA TRANSPORTATION SPRINGBANK OFF-STREAM RESERVOIR PROJECT ENVIRONMENTAL IMPACT ASSESSMENT

Pipeline Modifications within the PDA

Conformity Response

Figure 1-1

Of the four operators carrying natural gas products, the diameter of the pipelines range from 2 cm (for gas service lines that currently run to existing residences) to 106 cm (for main service lines for the province), with operating pressures that range from 552 kPa (80 psi) to 5,825 kPa (845 psi). The contents of the natural gas pipelines are over 95% carbon, 1% nitrogen and the remaining 4% of various carbon-based additives. For the one operator carrying crude oil, the 32 cm line has an operating pressure of approximately 3,200 KPa (464 psi) for the segment running through the PDA.

Because the dynamics and potential effects of an accidental release of natural gas versus an oil product are different, they are discussed separately below.

NATURAL GAS

Natural gas operators monitor their pipelines using a Supervisory Control and Data Acquisition (SCADA) system, or equivalent. This system provides real time operation data (e.g., operating pressure and contents of the pipeline) on a 24-hours a day, 365 days per year basis, which allows for the detection of accidental releases in a short time frame (typically within two minutes). These operators also have integrity and inspection management programs for their pipelines, which includes annual monitoring/inspection and remediation (if required). These programs help to further reduce the potential of accidental release by confirming if the pipeline infrastructure is in proper working condition. In the unlikely event of a release, the SCADA system identifies the location of the release and an upstream and downstream section of the pipeline is isolated to limit the amount of natural gas flowing through the pipeline. Immediately after identification of the release, the operator will engage their emergency response program (ERP) or emergency management program (EMP), which includes such steps as:

- notification of stakeholders (which would include Alberta Transportation during the construction phase and AEP during Project operations within the identified emergency planning zones (EPZ)
- notification of nearby residents and Indigenous groups within the identified EPZ
- contacting local authorities and emergency services (e.g., fire department)
- establishment of evacuation zones
- contacting applicable government agencies as required

With the care and control measures currently in place for natural gas pipeline operators within the PDA, the effects associated with a release of natural gas are not considered the worst case and are not discussed further in this response.

CRUDE OIL

The worst-case scenario for the Project has been selected as one with the Plains Midstream pipeline carrying crude oil located along the west side of the PDA between the diversion channel and Highway 22. A discussion of the potential impacts during flood as well as construction/dry conditions is presented below. The remainder of this response focuses on the estimated geographical area, potential effects, and care and control of the release for this scenario.

Plains Midstream has an integrity and inspection management program for their pipelines, which includes annual monitoring/inspection and remediation (if required). However, in the event of a release and based on discussions with Plains Midstream, care and control for a release would involve the following actions. Immediately after a release event is identified through the remote monitoring system, that section of the pipeline would be remotely shut down. Once the incident is identified, pipeline isolation is estimated at 10 minutes by means of isolation upstream and downstream with remote valve closure (valves along this pipeline are located west of Cochrane and north of the Elbow River). The ERP would be activated directly after the release has been identified. Emergency response activities may include establishing an Emergency Response Structure, an Emergency Operation Centre or other initial response activities on the transportation routes to the site where the release has occurred. Notification of the release will be provided to Alberta Transportation (during construction) and AEP (during operation), and they will assist to the best of their ability for such aspects of access management to the site, limiting Project operations (if necessary), and closing the low-level outlet gate to isolate the materials that are present in the off-stream reservoir (during operation) to prevent materials from entering the Elbow River.

Alberta Transportation will appoint a Community Liaison during the construction phase that will serve as point of contact with surrounding stakeholders; they will primarily communicate through the local representation for Indigenous groups, community associations, local businesses, government administration and local government officials. Information regarding such events as a release will be communicated by the Community Liaison during this phase of the Project. The pipeline operator will also have a Community Liaison that will be the point of contact within the Operator's EPZ should any release occur during all phases of the Project. Given the proximity to Calgary, emergency response measures could be rapidly deployed by the pipeline operator to isolate the release. Initial response equipment (e.g., booms and absorbants), employees, and response contractors (aid/spill cooperatives) would arrive on site no more than six hours from release identification.

Release modelling results or aerial extents of a release event were not provided for the active crude oil pipeline; however, Plains Midstream indicated their modelled worst case scenario would be the release of approximately 900 barrels to 1,200 barrels of product from the pipeline (approximately 144,000 L to 192,000 L). This release of product would occur over an approximate 30-minute time frame before the pipeline segment would be isolated and shutdown.

CONSTRUCTION AND DRY OPERATIONS

During a worst case release of crude oil (192,000 L) when the off-stream reservoir is without water, overland flow of the oil would be contained to a localized area within the off-stream reservoir. This limited geographic area is due in part to a rapid response by the operator, as well as retardation of the crude oil through mixing and adsorption with soils and vegetation. Additionally, larger thicknesses of oil would collect in depressions and low-lying topographic areas along the course of the release, further constraining the area of dispersion.

Given the proximity to Calgary, emergency response measures would be rapidly deployed to isolate the release through the use of booms and absorbants, and measures such as wildlife deterrence could also be put in place within their response timing window to limit the potential area of the release.

FLOOD OPERATIONS

The worst case release of crude oil (192,000 L) during flood operations would occur when the off-stream reservoir is temporarily retaining flood water. In the unlikely event of a worst case crude oil release during operations of the off-stream reservoir, the release of crude oil is anticipated to migrate to the surface of the off-stream reservoir water and disperse across the top of the waterbody, as well as dissolve into the water column. Preliminary calculations using the release volume and operating pressure provided by the operator have been completed to assess potential conditions during this scenario. Based on the worst case volume of an oil release (192,000 L), the estimated thickness of oil on top of retained water would be 1 mm, resulting in an affected area of 192,000 m^2 (19.2 ha), or approximately 8% of the surface area of the off-stream reservoir during a flood. In the event of a crude oil release during operation of the Project, the low-level outlet gates would be closed to contain the contaminated water within the off-stream reservoir and allow for spill containment and cleanup.

Potential environmental effects would primarily be to the shoreline, where areas would be impacted by free-phase oil on top of the waterbody. These affected areas would be evaluated through a shoreline clean up and assessment program completed by the pipeline operator, in partnership with the Project operator during that phase of the Project, with remediation endpoints identified to mitigate impacts while managing net environmental benefit of treatment approaches. Given the proximity to Calgary, emergency response measures could be rapidly deployed to isolate the release through use of booms and absorbants in the off-stream reservoir, as well as measures such as aquadams and soil berms on land to cut off the areas of free-phase from the areas of unimpacted waters. Water would not be released back to the Elbow River until it met the Environmental Quality Guidelines for Alberta Surface Waters (GoA 2018).

It is not anticipated that impacts would reach Elbow River in either flood or dry conditions, based on the 1) potential worst-case location for a release from a pipeline, 2) limited anticipated geographic area of impact, 3) proximity to Calgary allowing for deployment of emergency response and containment activities in a short time period, and 4) low-level outlet gates would be closed to contain the contaminated water within the reservoir and allow for spill containment and cleanup.

If AEP or Alberta Transportation is the first to identify a release resulting from a third party incident, they may be responsible for making initial notifications. The following responding agencies may be notified by the Project operator:

- Emergency Services: 911
- Rocky View Country non-emergency line: 1-403-230-1401
- notification to the responsible party
- AEP: 1-800-222-6514

c) Because the Project is partially situated within a transportation right of way (RoW), there is a potential for a variety of substances to be released within the PDA related to materials being transported along transportation corridors (e.g., highways and roads). Bulk transport trucks travelling on provincial highways may be carrying refined or unrefined petroleum products, liquid or dry chemicals, dry cargo, biohazardous waste, or a variety of other substances and may be involved in a spill. Hazardous materials may include fuels (e.g., gasoline, diesel and propane), lubricants (e.g., engine oil, transmission or drive train oil, hydraulic oil, gear oil and lubricating grease), coolants (e.g., ethylene glycol and propylene glycol), paints, and solvents or other materials transported along the highway. Material release as a result of vehicle collision could also occur. Substances that may be released because of a vehicle collision are primarily fuel (e.g., gasoline or diesel); however, the introduction of additional contaminants are subject to what the vehicle is carrying at the time of collision (e.g., dust suppressants, domestic waste, lubricants).

In both scenarios, the amount of contaminant released would be a function of the size of the vehicle(s) involved (e.g., fuel tank size of a semi-truck can be up to 300 gallons, or 1,135 L). As a conservative assessment, the worst case scenario for a hazardous materials spill would be a vehicle-related event that resulted in the complete release of all materials found within a tanker truck with an average1,000 L capacity of fuel plus an approximate 50,000 L capacity of liquid materials (for a total of 51,000 L).

EPEA states that the entity that has control of a substance that is released is responsible for the reporting and clean-up associated with the substance if that substance may cause, is causing, or has caused an adverse effect. The responsible company for the release will dispatch emergency response personnel as part of a pre-established ERP, which are required for any company who transports hazardous materials in Alberta. Emergency response personnel may include local fire or police services, private emergency response contractors, or the company's internal emergency response personnel. Notification of

stakeholders (which would include Alberta Transportation during the construction phase and AEP during Project operations as stakeholders) would also occur. Hazardous materials transportation companies are qualified to handle and manage hazardous waste and may be engaged to assist in the clean-up of a spill. These contractors have specialized equipment, including personal protective equipment to work near spilled hazardous materials and can provide waste management and transportation services.

In this scenario, there is potential that the vehicle involved is under the care and control of a contractor working on Project construction. Contingency and response planning for hazardous material spills during Project construction will be required from all contractors as part of their Environmental Construction Operations Plan (ECO Plan) that must be submitted by the contractor to Alberta Transportation prior to commencing work. Spills will be immediately reported to the Environmental Response Line 1-800-222-6514. In the event of a spill, response measures would focus on containment of the spill to limit the effects, cleanup of the spill, and remediation of the affected areas as quickly as possible. These activities may include disposal of hazardous waste at approved facilities or engaging a third-party to support the spill response measures.

In the event of a third-party spill within the PDA, Alberta Transportation (during construction) and AEP (during operation) will not be responsible for executing containment or clean-up activities; however, they would be available to assist the emergency's Incident Command or join part of the Unified Command to provide support or direction related to specific site conditions. Support would include such actions as closing the low-level outlet to prevent the release of the material into the Elbow River. During construction Alberta Transportation will also appoint a Community Liaison that will serve as point of contact with surrounding stakeholders; they will primarily communicate through the local representation for Indigenous groups, community associations, local businesses, government administration and local government officials. Information regarding such events as a hazardous materials spill will be communicated by the Community Liaison. The transportation company would likely also have a Community Liaison that would serve as the point of contact should any spill occur during construction and operation phases of the Project.

When reporting a spill, the following information would be provided by the company responsible for the spill, if known:

- the location and time of the release
- a description of the circumstances leading to the release
- the type and quantity of substance released, reported in metric units of measurements
- the details of any action proposed or taken at the release site
- a description of the immediate surrounding area

In the event of a spill, the primary goal is the protection of human health. The safety of the public, responders, and employees is of utmost concern. If a spill occurs within the PDA, it is expected that the company will complete the following basic steps for clean up and response measures:

Initial Assessment

- If the area is unsafe, the area should be evacuated immediately.
- If it is safe to do so, confirm the substance spilled, the quantity spilled and remaining in the vessel, and the locations and circumstances of the spill.
- Identify and document the location and movement of, and area impacted by the spill.
- Assess the current and potential adverse effects of the spill on the environment, human health, and infrastructure.

Notification

- Notify the appropriate company contacts.
- All external notifications will be done in accordance to the company's communication strategy.
- Notification of applicable emergency response contractors, local health authority and other response personnel.
- Establishment of the incident command post, if required. This decision will be made by the company following the initial assessment of the spill.

Initial Spill Response

- Control the source, if possible, and when safe to do so.
- Remove and cleanup the accessible spilled substance(s).
- Install mitigative measures to protect potential valued components (e.g., installing booms, berms, or dams).
- Coordinate with applicable consultants and vendors as needed to assess the conditions of the site and continue clean-up operations.

The release of 51,000 L of liquid material within the PDA would be restricted to the areas along the road network (e.g., Highway 22, Springbank Road (Township Road 244), and Township Road 242) because these are the only means of intersecting with the PDA during all phases of the Project.

A discussion of the potential effects during construction/dry conditions as well as flood conditions at two locations within the PDA are presented below. The remainder of this response focuses on the estimated geographical extent, potential effects, and care and control of this scenario.

RELEASE ALONG HIGHWAY 22 OR SPRINGBANK ROAD

If the release were to occur within the PDA along Highway 22 or Springbank Road, the area most affected would be within the northern section of the off-stream reservoir. The terrain in this area is a mixture of agriculture, native grassland, shrubland, and wetland (see the Environmental Impact Assessment (EIA), Volume 3A, Section 10.2.2, Figure 10-3 for vegetation type found within the PDA). Due to the location, a release of materials onto land is the most likely scenario because conditions in this area remain dry for a majority of Project operation (i.e., construction, dry operations, floods less than 1:100 year event) (see the EIA, Volume 1, Section 3.2.4, Figure 3-7 for flood scenarios). In the event of a hazardous materials spill during dry conditions, the discharge of liquid materials has a low probability of impacting an area greater than 1 ha due to retardation of the migration of the hazardous materials through mixing/sorption with soils and vegetation. Additionally, hazardous materials would preferentially collect in low lying topographic features downstream of the release, further decreasing the overall area of effect from the hazardous materials on surface.

In the unlikely event of a release along these roads within the PDA during a 1:100 flood or larger, the discharge of 51,000 L of hazardous materials has the potential to cover a geographic extent of approximately 5 ha, or less than 0.1% of the surface area of the off-stream reservoir, due to contact with flood water. A release to flood waters has the potential to affect the shoreline at the margins of the wetted extent within the off-stream reservoir that has been in contact with spill material. These areas would be evaluated through a shoreline clean up and assessment program initiated by the operator involved in the spill with remediation endpoints identified to mitigate effects while managing net environmental benefit of treatment approaches.

RELEASE ALONG TOWNSHIP ROAD 242

An overpass will be constructed where Township Road 242 bisects the diversion channel. In the unlikely event of a release of hazardous materials along this stretch of road during construction, dry operations, flood (less than the design flood), or post flood, a discharge of materials to land (specifically directly into the diversion channel) could occur. If a release were to occur during flood operations, a discharge of materials to an aquatic (diversion channel) environment is the worst case.

During dry operating conditions (i.e., construction, dry operations, post-flood), a release would remain within the diversion channel and not reach the off-stream reservoir. An estimate of potential geographic extent of a release within the diversion channel is not possible because the migration of the hazardous material is dependent on the chemical properties of the materials released (e.g., volatility of products versus physical transport of contaminants on land) and the flow path of the release would be dependent on the viscosity of the material released and the terrain within the diversion channel. However, the diversion channel is a relatively small area and a release within the diversion channel would be considered a small geographic extent.

In the unlikely event of a 51,000 L spill at the Township Road 242 bridge during flood conditions, based on the design flow rate of the diversion channel, the release would travel through the diversion channel and reach the off-stream reservoir. In this scenario, the low-level outlet gates would be closed to contain the contaminated water within the off-stream reservoir and allow for spill containment and cleanup. Potential effects would be along the diversion channel and shoreline of the off-stream reservoir near the diversion channel where areas may be affected by the thickness of hazardous materials on top of the water. These areas would be evaluated through a shoreline clean up and assessment program initiated by the operator responsible, in partnership with the Project operator, for the spill with remediation endpoints identified to mitigate impacts while managing net environmental benefit of treatment approaches. Water would not be released back to the Elbow River until it met the Environmental Quality Guidelines for Alberta Surface Waters (GoA 2018).

For these spill scenarios, based on the proximity of the Project to Calgary, emergency response measures could be rapidly deployed by the company to isolate the release through the use of booms and adsorbants, as well as measures such as soil berms to contain the area of free-phase hazardous materials.

d) The geologic conditions along a particular area of the PDA where pipelines are located and along the roadway network will vary depending upon the hydrostratigraphic units locally present. In general, the hydrostratigraphic units present along these areas mostly consists of the following (in ascending order) (see Figure 1-2):

- Bedrock (various formations) generally consisting of varying interbedded thickness of alternating siltstones, sandstones, mudstones and claystones.
- Basal silt, sand and gravel consisting of a mixture of brown sand, silt and gravel with variable fines.
- Glacial till composed of a heterogeneous mixture of approximately equal parts clay and silt, a lower proportion of sand, and minor gravel. Silt and sand lenses are also present within the heterogeneous matrix.
- Glaciolacustrine deposits composed of 50% to 70% clay, 30% to 40% silt and a minor proportion of sand. Typical of a lacustrine deposit, the clay was found to be laminated with silt and fine sand.
- Recent fluvial deposits confined within the Elbow River valley, composed of silty gravel with minor sand, cobbles and boulders.

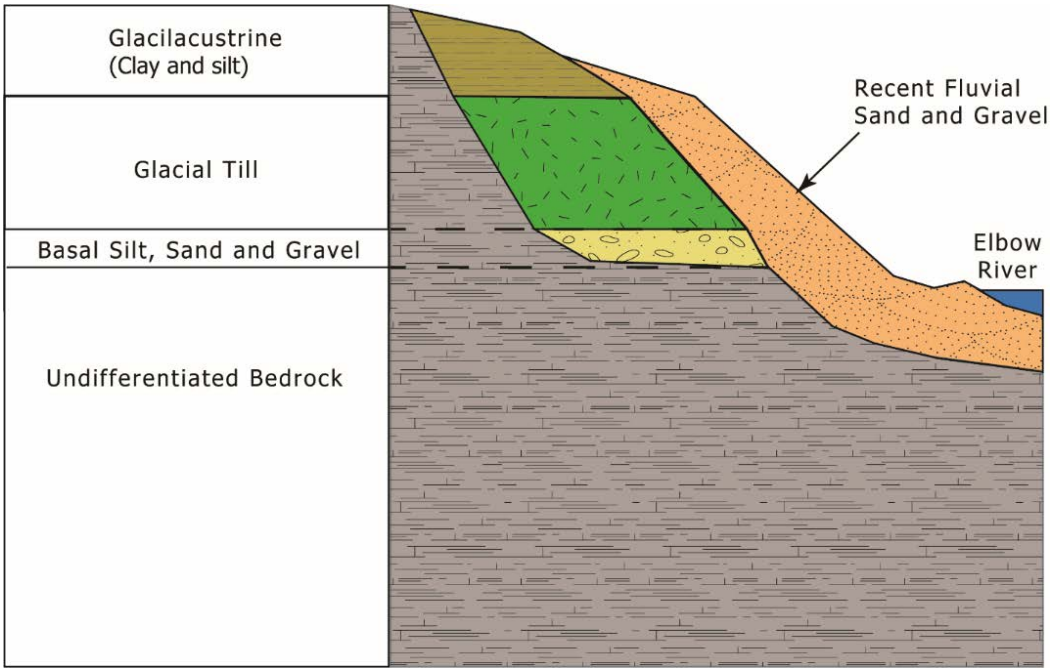


Figure 1-2 Generalized Stratigraphic Sequence in the Groundwater LAA

The depth to groundwater within the areas identified for the release and hazardous materials spill ranges from near zero by local drainage features or wetlands to more than 25 m below surface in upland areas along the west and east sides of the off-stream reservoir. Vertical groundwater flow conditions vary from discharge conditions near the off-stream reservoir area to recharge conditions in upland areas. General flow directions for groundwater are from upland areas toward the off-stream reservoir, and to the south toward Elbow River.

The mechanism for entering groundwater and potential effects for a release and hazardous materials spill are different and are, therefore, discussed separately below. In general, the potential for groundwater contamination following a spill or release from a pipeline would be more probable in locations where:

- a relatively shallow water table is present (as opposed to locations where a deeper, confined aquifer system is present)
- subsurface materials with high permeability (such as sands and gravels) are present throughout the unsaturated zone above the water table
- relatively high magnitude, downward directed vertical hydraulic gradients are present

HAZARDOUS MATERIALS SPILL

Hazardous material spills would have limited potential to affect groundwater because it would likely be confined to the soils, vegetation or surface water (if present) within the timeframe of a cleanup response and be appropriately contained and excavated before migrating into the groundwater table.

Potential effects of a spill to groundwater are highly dependent upon the site-specific hydrogeologic conditions. However, if a spill were to occur in an area with zero depth to groundwater (e.g., local drainage features or wetlands), adverse changes in groundwater quality in the vicinity of a spill are possible before and while remedial activities are ongoing. Hydrocarbon products would be the primary contaminants of potential concern. The potential concentration of these parameters in groundwater are highly dependent upon the local hydrogeologic conditions, volume and release rate from the pipeline, and immediate response actions implemented. Changes in groundwater quality would be temporary and reversible once remedial activities are completed. Groundwater assessment and monitoring will be performed by the operator as a follow-up action after completion of the initial response activities.

As discussed in the response to c), it is the sole responsibility of the transportation company to develop appropriate emergency preparedness plans and emergency response plans to account for potential hazardous material spills during all phases of the Project. If exposure to humans or ecological receptor would be possible from a hazardous material spill into groundwater, then regulatory requirements would mandate the scope of remedial actions, timeframe for remediation activities and cleanup levels. Risk based objectives would be established as a remedial target such that potential risks to human and/or ecological receptors are adequately mitigated.

RELEASE FROM A PIPELINE

In the unlikely event of a release from a pipeline, there is the potential for the hydrocarbon product to migrate laterally and vertically downward under the force of gravity into the subsurface, where it would impact subsurface sediment and groundwater quality.

Potential effects of a release to groundwater are highly dependent upon the site specific hydrogeologic conditions. Groundwater vulnerability to a release is primarily a function of the depth to groundwater, the rate of groundwater recharge, local topographic and geologic structural features, and the permeability of the overlying geologic materials. Movement of crude oil through soil is generally limited by the local permeability, sorption to sediment particles and by the water table (due to the immiscibility of oil). Dissolved crude oil constituents can form a plume if the crude oil remains in contact with groundwater for an extended period (i.e., months). If a plume forms, it will move in the direction of groundwater flow; however, its movement will be slower than the groundwater due to natural attenuation processes. Timely remediation of crude oil will eliminate the source of dissolved constituents

affecting the groundwater and will arrest further plume development. Thus, immediate and effective source control via emergency response is critical to avoid or to limit effects on groundwater.

The following is a conservative estimate of contaminant transport velocity at a hypothetical spill location has been developed based on hydrogeologic conditions near Highway 22, where the underlying unconsolidated deposits are absent (i.e., along the west side of the PDA near Highway 22 where bedrock is exposed at ground surface, representing a worst case scenario). Groundwater hydraulic gradients in this area are approximately 0.02 and a conservative estimate of hydraulic conductivity of the upper bedrock materials would be 6.5×10^{-5} m/s, based on field testing results. Based on these hydraulic parameters, an average linear flow velocity of groundwater in this area is approximately 0.6 m per day. Dissolved contaminants being advectively transported away from the spill with the flow of groundwater would conservatively migrate downgradient at a rate of 0.6 m per day (ignoring the retardation of contaminants that would be expected to occur due to sorption and other intrinsic processes in the subsurface). At this rate of movement through the subsurface, typical spill response activities would be able to control the movement of contaminants away from the spill location such that potential effects on receptors are mitigated.

Adverse changes in groundwater quality in the vicinity of a release are possible before and while remedial activities are ongoing. Hydrocarbon components would be the primary contaminants of potential concern. The potential concentration of these parameters in groundwater are highly dependent upon the local hydrogeologic conditions, volume and release rate from the pipeline, and immediate response actions implemented. Changes in groundwater quality would likely be considered to be high magnitude given the relatively low concentrations as which these contaminants potentially pose a risk to human and/or ecologic receptors. Changes in groundwater quality would be temporary and reversible once remedial activities are completed.

As discussed in the response to b), pipelines within the PDA are not a physical works component or a physical activity of the Project and it is the sole responsibility of those pipeline operators to develop appropriate emergency preparedness plans and emergency response plans to account for potential releases from pipelines during all phases of the Project. Effective emergency response requires evaluation of pipeline proximity to potential groundwater users and other features that could interact with groundwater (e.g., wetlands). If exposure to humans or ecological receptor would be possible from a crude oil release into groundwater, then regulatory requirements would mandate the scope of remedial actions, timeframe for remediation activities and cleanup levels. Risk based objectives would be established as a remedial target such that potential risks to human and/or ecological receptors are adequately mitigated.

REFERENCES

AEP (Alberta Environment and Parks). 1999. Dam and canal safety guidelines. Publication No. T/444, Revised March 1999.

AER (Alberta Energy Regulator). 2019. Pipeline Performance. Last accessed October 10, 2019. Available online: https://www.aer.ca/data-and-publications/pipeline-performance#footnote

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GoA (Government of Alberta). 2018. Environmental Quality Guidelines for Alberta Surface Waters. Water Policy Branch, Alberta Environment and Parks. Edmonton, Alberta.

TSB (Transportation Safety Board). 2019. Statistical Summary – Pipeline Occurrences 2018. Available on-line: : http://www.bst-tsb.gc.ca/eng/stats/pipeline/2018/ssep-sspo-2018.html

Conformity IR1-02

Topic: Surface Water Quality

Sources:

EIS Guidelines Part 2, Sections 6.2.2, Section 6.3.1, Section 8

EIS Volume 1, Attachment A: Water Management Plan, Section A5

EIS Volume 3C, Section 2.6

CEAA Annex 2: A) Early Technical Issues, December 19, 2017

Alberta Transportation Responses to CEAA Annex 2: A) Early Technical Issues, May 11, 2018

Environment and Climate Change Canada (ECCC) Technical Review, June 18, 2018

CEAA Information Requests Related to the Environmental Impact Statement Round 1 Part 1, IR1-02

Alberta Transportation Responses to IR Round 1, SR1 CEAA IR Package 1, June 14, 2019

ECCC Round 1 IR Completeness Review, July 3, 2019

Context and Rationale

In CEAA Information Requests Related to the Environmental Impact Statement Round 1 Part 1, IR1-02, ECCC noted that best option for water quality sampling is from the reservoir prior to discharge above the control structure, i.e. at the inlet to the low level outlet. If sampling plans differ from ECCC's proposed approach, the Agency requested Alberta Transportation provide a rationale as to the different approach. The EIS Guidelines require the proponent to present information on changes to surface water and describe project components and operations, including a detailed water management plan.

Alberta Transportation's response to IR1-02 incorrectly quotes the request and therefore does not provide a response to IR1-02 part b.

Information Request:

a) ECCC indicated that the best option is to sample from the reservoir above the control structure prior to discharge, i.e. at the inlet to the low level outlet. If sampling plans differ from ECCC's proposed approach, provide a rationale as to the different approach.

Response

a) Alberta Transportation recognizes that this question is identical to one made in their June 29, 2018 Package 1 questions. The response to this question was omitted in Alberta Transportation's response to Round 1 Canadian Environmental Assessment Agency (CEAA) Package 1, IR1-02 due to a copy error.

   Alberta Transportation's sampling plan is consistent with Environment Canada and Climate Change's (ECCC's) recommendation; Alberta Transportation will collect samples in the reservoir above the control structure prior to discharge, as indicated in the appendix to that response (Appendix IR2-1(Draft Surface Water Quality Monitoring Plan), Section 9.5.5 and Figure 9-2).

Conformity IR1-04

Topic: Hydrology – Reservoir retention, drawdown, and suspended sediments

Sources:

EIS Guidelines Part 2, Section 6.3.1

EIS Volume 3B, Section 7.4.4

EIS Volume 3B, Section 6.4.3.3

EIS Volume 1, Section 3.2.4 Table 3-3

DFO ANNEX 2 Technical Review, June 19, 2018

CEAA Information Requests Related to the Environmental Impact Statement Round 1 Part 1, IR1-04

Alberta Transportation Responses to IR Round 1, SR1 CEAA IR Package 1, June 14, 2019

DFO Round 1 IR Completeness Review Comments, June 28, 2019

ECCC Round 1 IR Completeness Review Comments, July 3, 2019

Context and Rationale

In CEAA Information Requests Related to the Environmental Impact Statement Round 1 Part 1, IR1-04, the Agency requested Alberta Transportation clarify and provide the minimum draw down time for each flood scenario (not considering the time it takes to settle sediment within the reservoir to meet relevant water quality guidelines). The EIS Guidelines require the proponent to describe multiple components of hydrology of the Elbow River watershed, and the effects of the environment on the Project.

In Alberta Transportation's response to IR1-04, Alberta Transportation indicated that the low-level outlet has the operational flexibility to release the retained water in the off-stream reservoir at a range of rates and the rate will be executed at the discretion of the AEP operator. It is expected that the minimum draw down time for each flooding scenario can still be estimated given the fastest release rate. Clarity and rationale for draw down times for each flood scenario are needed in order to inform minimum residence time in the reservoir, which could be used to potentially mitigate adverse effects to fish.

Information Request:

a) Not considering other factors that may influence release rates, e.g. water quality, provide the minimum draw down time for each flood scenario.

Response

a) The minimum drawdown time for each scenario is as follows:

- design flood, 32.5 days
- 1:100 year flood, 21.8 days
- 1:10 year flood, 5.3 days

The drawdown times for these three floods are based upon the hydraulic geometry of the low-level outlet works and the stage-storage relationship of the off-stream reservoir without considering environmental or operating constraints such as erosion, water quality, and river capacity. It assumes diversion to the off-stream reservoir has stopped, the gate is fully open and water freely drains. The starting water surface elevation and volume within the off-stream reservoir are based on the simulated diversion scenarios presented in the EIA, Volume 3B, Section 6.4.2.

Conformity IR1-05

Topic: Surface Water Quality – Suspended Sediment

Sources:

EIS Guidelines Part 2, Section 6.2.2; Section 6.3.1; and Section 6.4.4

EIS Volume 3B, Section 7

CEAA Annex 2: A) Early Technical Issues, December 19, 2017

Alberta Transportation Responses to CEAA Annex 2: A) Early Technical Issues, May 11, 2018

ECCC Technical Review, June 18, 2018

CEAA Information Requests Related to the Environmental Impact Statement Round 1 Part 1, IR1-05

Alberta Transportation Responses to IR Round 1, SR1 CEAA IR Package 1, June 14, 2019

DFO Round 1 IR Completeness Review Comments, June 28, 2019

Context and Rationale

The EIS Guidelines require that any changes to total suspended solids (TSS), turbidity, oxygen levels, water temperature, pH, dissolved oxygen, ice regime, water quality including metals, methyl mercury, nutrients, dissolved/total organic carbon, biological oxygen demand, carbonaceous biochemical oxygen demand, pesticides, aquatic indicators, and sediment quality be included in the EIS.

In CEAA Information Requests Related to the Environmental Impact Statement Round 1 Part 1, IR1-05, in the context of potential effects to water quality and fish and fish habitat due to high levels of suspended sediments, the Agency requested Alberta Transportation assess residual effects to water quality after the application of mitigation measures, and describe the uncertainty of the effectiveness of these mitigation measures.

In Alberta Transportation's response to IR1-05, Alberta Transportation indicated that the off-stream reservoir would act as a settling pond to settle out suspended sediments, which is a widely used and proven mitigation method to reduce TSS levels prior to release into a natural waterbody. However, it is unclear the level of uncertainty of the effectiveness of this mitigation measure and the potential residual effects to water quality.

Information Request:

a) In the context of potential effects to water quality and fish and fish habitat due to high levels of suspended sediments, provide an assessment of residual effects to water quality after the application of mitigation measures, and describe the uncertainty of the effectiveness of these mitigation measures.

Response

a) The off-stream reservoir will capture sediments from retained flood water and function in a manner similar to a storm pond. This will reduce the suspended sediment load returned to Elbow River and mitigate the effects of turbidity during the larger part of reservoir drawdown. The mechanisms causing sediment deposition are understood; however, due to potential variability in any predicted flood scenario (e.g., suspended sediment concentrations, precipitation and runoff, watershed sediment supply), initial sediment input concentrations and subsequent sediment release are uncertain. Monitoring and adaptive management of the release can mitigate the effects of uncertainty.

Suspended sediments and increased water temperature in water released from the reservoir are the two main water quality effects of concern to Elbow River resident fish communities. Below includes a discussion on the effectiveness of the reservoir in capturing sediments, uncertainties in predicting sediment concentrations during drawdown, monitoring and potential mitigations, and effects of water temperature and sediment on fish.

EFFECT OF MITIGATIONS

Waterbodies, reservoirs, storm ponds and other water impoundments remove suspended sediment from runoff water through particle settling. The impoundments create areas of low velocity where particles settle in accordance to Stokes' law which governs how larger, heavier particles settle out faster and the smaller, lighter particles slower.

As turbid, sediment laden water moves from an area of high velocity (the river channel), to low velocity (the reservoir) the sediment particles begin to settle-out of suspension with their distributed gradations varying with the water velocities they experience within the reservoir. As time passes, progressively finer particles settle and the longer the water is held in the impoundment, the less turbid the water becomes. The largest mass of total suspended sediment settles out at the beginning of retention because the combined volume of these coarser particles is very large; the finer particles have less combined mass, but they have

more importance to water quality. The settling of progressively finer and finer particles is achieved by increasing the retention time.

The effectiveness of reservoirs at removing suspended sediment from runoff water through particle settling is well documented in the literature. Thiessen et al. (2011) evaluated the effectiveness of small-scale headwater storage dams and reservoirs on stream water quality and quantity in the Canadian Prairies. While the focus of the study was on headwater systems, they found that the impoundments were effective in reducing annual loads of sediment and nutrient loading to receiving waters. Striegl (1987) reported Ellyn Lake (4.1 ha artificial lake created using an earthen dam with a volume of 55,280 m^2) was effective in reducing suspended sediments between 91% and 95%.

The off-stream reservoir will retain diverted flood waters for different periods of time, depending on the size of the flood. For example, flood water from the design flood is retained for 20 days, compared with the 43 days of retention related to the 1:100 year or 1:10 year floods (see the EIA, Volume 3B, Section 6.4.2, Table 6-4). When water is retained, sediment suspended in the water column settles in the reservoir, causing the total suspended sediments (TSS) to decrease. The information provided in Table 5-1 (derived from the EIA, Volume 3B, Section 6, Table 6-6, Volume 3B) can be used to estimate effectiveness of the off-stream reservoir in reducing suspended sediment in the impounded water. Using this analysis, 96% of the suspended sediment is predicted to settle out during retention of the design flood. For the 1:100 year flood, 82.6% is predicted to settle; and 15% is predicted to settle out for the 1:10 year flood. The reason for the decreasing efficiency of the sedimentation is that the large floods carry a larger percentage of coarse sediments that settle more quickly than smaller sediment.

Table 5-1 Estimated Suspended Sediment Concentrations and Yields in the Elbow River, With and Without Diversion

Flood	Elbow River Suspended Sediment Mass Non-Diversion (kt)	Diversion Suspended Sediment Mass (kt)	Suspended Sediment Mass Released into the Low-level Outlet (kt)	Effectiveness of Settling Based on the Reduction of Sediment Load due to Retention in Reservoir (%)
Design[1]	4,819	2,389	90	96.2%
1:100 Year[2]	1,943	1,268	220	82.6%
1:10 Year[3]	24	1.3	1.1	15.4%

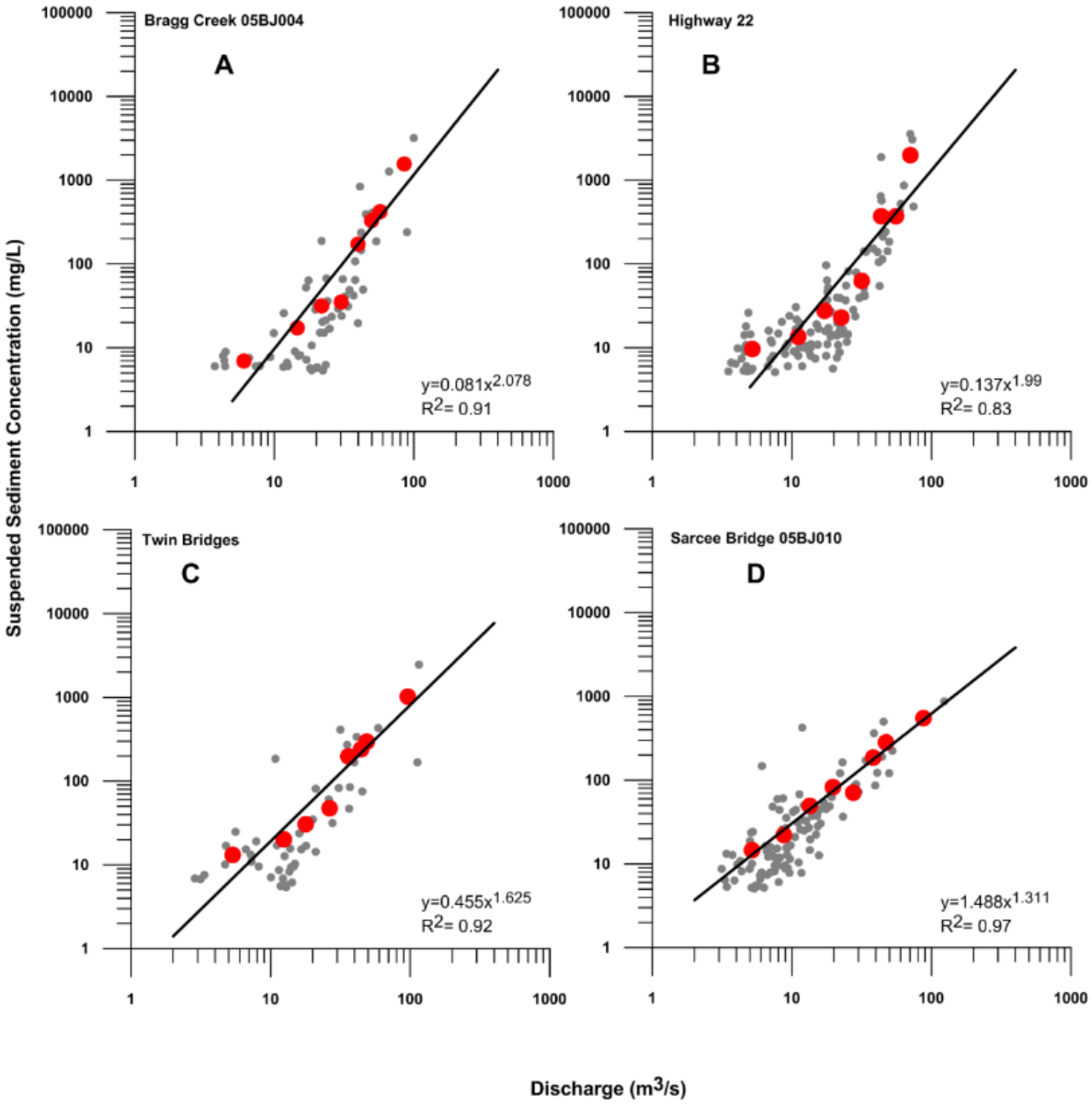
NOTES:
[1] Period of diversion: 06/20/2013 04:00 h to 06/23/2013 22:00 h; Residence time: 06/24/2013 to 07/14/2013
[2] Period of diversion: 05/31/2100 05:00 h to 06/02/2100 02:00 h; Residence time: 06/02/2100 to 07/15/2100
[3] Period of diversion: 05/24/2008 15:00 h to 05/24/2008 23:00 h; Residence time: 05/25/2008 to 07/07/2008

The main source of uncertainty regarding the effectiveness of the off-stream reservoir acting as a settling pond is related to understanding what the actual TSS concentrations and particle size distributions will be in Elbow River flood water entering the reservoir. There is uncertainty in predicting the concentration and distribution of grain size in the major floods of Elbow River because there is no measured field data for Elbow River during these large flood events. This uncertainty carries through the analysis as it affects how sediments are brought to the reservoir, deposited in the reservoir, and potentially remobilized during reservoir drawdown. Ultimately, this introduces uncertainty in the average and peak TSS concentrations in water released during drawdown.

The suspended sediment data for the Elbow River that was used in the modelling are based on an extrapolation of the discharge-suspended sediment rating curves (see Figure 5-1). Several reasonable and conservative assumptions were used to estimate suspended sediment behaviour and suspended sediment concentration and the predicted concentrations are likely overestimated.

The following discussion provides additional detail related to the estimated TSS concentrations during flood conditions and the subsequent modelled sediment deposition and off-stream reservoir TSS release rates.

The relationship between TSS and river discharge may differ as the flood levels change; this is due to hysteresis (i.e., the TSS concentration at a certain flow rate early in the flood [as the hydrograph increases] may be different than the TSS concentration at the same flow rate late in the flood [as the hydrograph decreases]). For instance, the rate of sediment runoff during a flood may change over time due to variability in rainfall intensity, spatially distribution of sediment sources (within the watershed); and availability of sediment supply (Vercruysse et al. 2017; Kruger et al. 2009; Eder et al. 2010). Hudson (1983) demonstrated that sediment sources and erosional processes varied in Elbow River watershed (e.g., montane vs foothill areas) and that the location of precipitation events in the watershed affects sediment runoff supply. Hudson (1983) also demonstrated that, in Elbow River, the "*Maximum concentrations occur at the time of the annual peak discharge or on the previous day….. Following peak discharge concentrations decreases dramatically. The suspended sediment concentration and loads tend to be far greater on the rising limb of the hydrograph than following the peak discharge*." (page 124)



NOTES:

Gray circle – Suspended sediment concentration for associated discharge rate.

Red circle – Average suspended sediment concentration for associated average discharge rate.

Figure 5-1 Suspended Sediment Concentration, Discharge Rating Curves

Sediment-discharge curves illustrating the relationship between suspended sediment concentrations and Elbow River flow levels were used to model TSS concentration for each flood scenario (see Figure 5-1, which is duplicated from the EIA, Volume 4, Appendix J, Section 3, Figure 3-12). Uncertainty exists in this relationship for different flow levels. The sediment-discharge relationship derived from available Elbow River data (i.e., river flow less than 100 m^3/s and TSS concentrations of generally less than 1,200 mg/L) may not reflect the relationship under flood conditions. The modelled results included TSS of 138,600 mg/L at flows greater than 1,200 m^3/s (design flood scenario, as presented in the EIA, Volume 3B, Section 6.4.3, Table 6-6 page 6.28); 77,649 mg/L at flows greater than 760 m^3/s (1:100 year flood); and 4,818 mg/L at flows of 200 m^3/s (1:10 year flood).

Based on Hudson's work on sediment erosion and transport in the Elbow River watershed, modelled suspended sediment concentrations for each flood may be higher than the actual flood level concentrations. Consequently, the maximum actual amount of sediment deposited in the reservoir during a flood may be considerably lower than that which was predicted by the model. As a result, the actual TSS concentrations available to be released from the low-level outlet may be lower than modelled values. The minimum TSS level that can be reached in the reservoir due to wind action and temperature is between 200 mg/L and 300 mg/L (see the EIA, Volume 3B, Section 6.4.3. page 6.29). Therefore, the minimum exposure TSS level may be underestimated.

The predicted maximum TSS concentration (see Table 5-2, derived from the EIA, Volume 3B, Section 6, Table 6-6, Table 6-7, Table 6-8 and Table 6-9) released from the reservoir is a function of the rate which water is released and subsequent shear stress expected to remobilize deposited sediments. The highest velocities are expected to occur during the last days of drawdown. The variability in sediment particle size and spatial deposition patterns in the reservoir will affect how remobilisation and release from the reservoir occurs and, ultimately, the TSS concentrations at the low-level outlet. The uncertainty introduced from estimates of sediment concentrations in the Elbow River flood water carried through the analysis have an effect on the estimates of TSS concentrations released from the low-level outlet and conveyed through the unnamed creek and into Elbow River downstream of the PDA.

The uncertainties discussed here are reflected in the water quality and fisheries responses below.

EFFECTS ON WATER QUALITY

SUSPENDED SEDIMENTS

Suspended sediment concentrations released from the off-stream reservoir are provided in Table 5-2. The predicted TSS concentrations released from the off-stream reservoir are well below the modeled TSS concentrations for Elbow River estimated for each flood.

Water will be released from the off-stream reservoir after the water flow in Elbow River has subsided; predicted peak and average TSS concentrations at the confluence of the unnamed creek with Elbow River and 1 km downstream of the confluence are presented in Table 5-2.

Table 5-2 Modeled Total Suspended Sediment Concentrations at the End of the Release Period of Water from the Off-Stream Reservoir

Flood	At the Confluence of Elbow River and the Unnamed Creek		Elbow River 1 km Downstream from the Confluence with the Unnamed Creek		Elbow River without the Project
	Peak	Average	Peak	Average	Peak
Design	17,955 mg/L	2,173 mg/L	5,666 mg/L	754 mg/L	139,682 mg/L
1:100 year	20,692 mg/L	7,285 mg/L	4,704 mg/L	1,576 mg/L	77,649 mg/L
1:10 year	1,798 mg/L	1,657 mg/L	99 mg/L	81 mg/L	4,818 mg/L
Background during summer clear flow period	50 mg/L[1]	16 mg/L[2]	50 mg/L[1]	16 mg/L[2]	--

NOTES:
-- not applicable
[1] Approximate TSS concentration in Elbow River for a flow of 20 m3/s when the reservoir drawdown begins
[2] Average TSS concentration in Elbow River during the drawdown period

To address the uncertainty in TSS conditions (as discussed above), the suspended sediment levels will be routinely monitored during the flood and post-flood operations to inform reservoir drawdown management decisions (e.g., application of mitigations to adaptively manage TSS release). Water samples will be collected and analyzed for TSS at the following four locations:

- the reservoir before the outlet gate
- the unnamed creek downstream of the outlet gate
- Elbow River upstream of the PDA at the highway 22 bridge (permanent AEP monitoring station)
- the Elbow River downstream of PDA at Sarcee Bridge (permanent AEP monitoring station)

Details of the draft surface water monitoring plan are provided in Alberta Transportation's response to Round 1 CEAA Package 1-02, Appendix 2-1.

Operational management of the low-level outlet gate will be used to control water velocities leaving the reservoir and mitigate physical forces (i.e., shear stress) that disturb reservoir substrates and generate suspended sediments. Water monitoring and TSS level results from the monitoring locations will be used to inform the reservoir operator when to adjust the gates to lower the release rate or when conditions permit increasing the rate.

Alberta Transportation is continuing to develop operational procedures and evaluate effectiveness of relevant mitigations to expand on options to adaptively manage TSS. The use of sediment fences and silt curtains are being considered to control sediment movement around depositional areas in the reservoir during drawdown (e.g., reduce erosion of deposited sediments as reservoir water levels are lowered). These mitigations will be used in a manner that addresses site conditions as they develop and are unique to each flood scenario.

WATER TEMPERATURE

Historic water temperatures (upper 75th percentiles) in the receiving water (i.e., Elbow River near the PDA at Highway 22) for July and August have been approximately 13˚C and 14˚C, respectively (see Figure 5-2). As an analog for a reservoir, upper water column water temperatures in small shallow lakes in Alberta may reach the low 20˚Cs during the mid-summer months (Prepas and Mitchell 1990; ALMS 2016, 2017, 2018a, b, c). Historical Glenmore Reservoir water temperatures have reached the low 20˚C (see Figure 5-2).

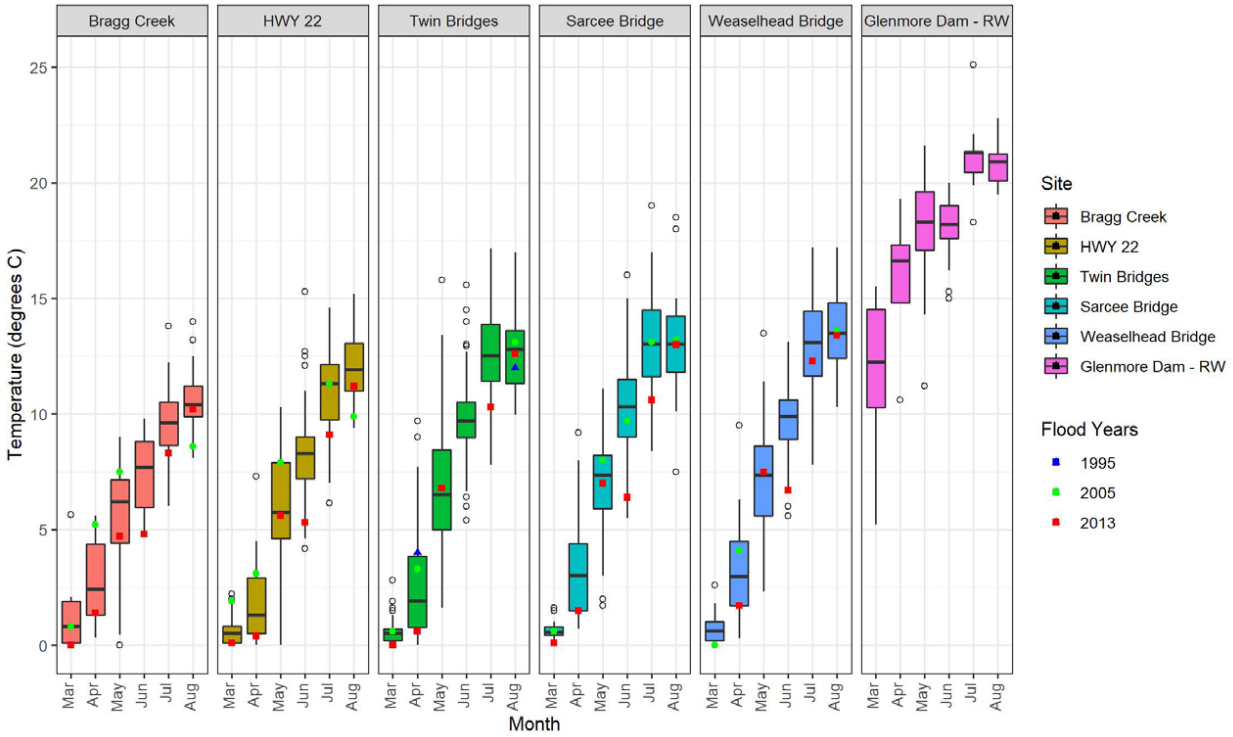
Releasing reservoir water into Elbow River during the summer months may increase the thermal load on the river; however, dilution rates in the river are great enough to mitigate warm water inputs. Dilution rates in Elbow River (see the EIA, Volume 3B, Section 7.4.3, page 7.25) are predicted to be as follows:

- For the design flood, released water would contribute 29% to 59% of total flow in Elbow River (i.e., dilution would result in reduction of reservoir constituent concentrations of 40% to 70%).
- For the 1:100 year flood, released water would contribute 5% to 35% of total flow in Elbow River (i.e., dilution would result in reduction of reservoir constituent concentrations of 65% to 95%).
- For the 1:10 year flood, released water would contribute less than 5% of total flow in Elbow River (i.e., dilution would result in reduction of reservoir constituent concentrations greater than 95%).

Based on these dilution rates, an estimated reservoir water temperature of 22˚C and receiving water temperature of 14˚C, the water temperature once fully mixed in the Elbow River would be approximately:

- design flood scenario, 16.3˚C to 18.7˚C
- 1:100 year flood scenario, 14.4˚C to 16.8˚C
- 1:10 year flood scenario, below 14.4˚C

Water temperatures may increase slightly from these predicted values in a downstream manner as illustrated in Figure 5-2. Historically, the median water temperatures in Elbow River rise between 1˚C and 2˚C between Highway 22 to the Weaselhead Bridge.



NOTE: Blue, green and red symbols represent maximum concentrations during 1995, 2005 and 2013 flood years.

Figure 5-2 Historical Temperatures in the Upper Elbow River Mainstem Sites and at Glenmore Reservoir Dam from 1979 to 2016

EFFECTS OF TSS ON FISH

The sediment modelling results described above suggest that a sediment plume will form at the confluence with the Elbow River and the unnamed creek from which the reservoir water will be released. The associated sediment plume that will result from the release will allow some opportunity for fish to avoid turbid water in the vicinity of the unnamed creek, by moving to areas of the Elbow River that experience slower water, and areas of cover and that are likely to have lower levels of suspended sediment.

Mixing will occur as sediment moves downstream, and it is anticipated that the effects of increased suspended sediment cannot be entirely avoided by resident fish populations in Elbow River. The modelled average TSS concentrations are uncertain, as discussed in detail under the heading "Effect on Mitigations". This uncertainty, subsequently, presents a range of potential effects on fish as a result of sediment exposure. These potential effects will be dictated by particle size, distribution through the water column and across the river (i.e., how much refuge is available to fish), and TSS concentration.

Empirical modelling has demonstrated that a correlation exists between suspended sediment concentrations and adverse behavioral and physiological effects on salmonid species (Newcombe and Jensen 1996; Newcombe and MacDonald 1991; Newcombe 2003; Kjelland et al. 2015). This relationship between sediment and effects on fish is commonly qualified through the Severity of Ill Effects (SEV) Index (Newcombe and Jensen 1996), which was developed through modelling the association of TSS levels with categories of physiological and metabolic stress related effects. In general, TSS presents a variety of adverse effects on fish physiology and behavior, and these effects are compounded by the duration of TSS exposure.

Due to the uncertainty in the predicted TSS levels discussed above, predicted severity of ill effect levels would be similarly uncertain. However, the estimated TSS concentrations described in Table 5-2 have the potential to cause sublethal and lethal effects on fish during the release period.

Behavioral, sublethal, or lethal effects on fish that may result from a release from the reservoir may be caused by decreasing light penetration, primary and benthic productivity, and fish swimming and feeding behavior. If the release overlaps with fall-spawning activities (e.g., early spawning of brown trout and mountain whitefish), the estimated concentrations presented in Table 5-2 may also create a physical barrier to incubating eggs by limiting dissolved oxygen concentrations that are available within gravel substrates as a result of sediment that settles along the riverbed. Increased sediment concentrations may also create a physical barrier to fish by reducing gill permeability (Rombough 1987). Reduced respiration rates can result in hypoxic conditions in fish that subsequently lead to premature fry emergence, decreased growth rate and tissue mass, and overall decreased survival rate (Rombough 1987).

The effect of suspended sediments on fish will depend on conditions at the time of release and the corresponding life histories of fish that are present in the downstream reaches (e.g., presence of juvenile fish). Suspended sediment concentrations will be monitored in the reservoir and Elbow River to mitigate for these potential uncertainties and inform operational management decisions (i.e., adaptively manage the release and implement mitigations as discussed above).

EFFECTS OF TSS ON FISH HABITAT

The effect of suspended sediments on Elbow River will depend on conditions at the time of release (e.g., release rate, flow in the Elbow River at the time of release, and turbulence of flow). Alteration of substrate composition in the Elbow River (i.e., higher proportions of fines relative to the existing predominance of cobble) is possible; however, the Project has been designed to maintain river channel forming flows up to 160 m^3/s. As discussed above, the predicted flood level suspended sediment concentrations in Elbow River are conservative and, therefore, modelled TSS levels released to Elbow River during drawdown are expected to be overestimated. Channel forming flows will maintain habitat complexity upon construction of the Project, such that sediment levels do not accumulate to a level that would destroy habitat for salmonid species that rely on gravel and cobble substrate for spawning and refuge. It is expected that scour pools, deeper runs for trout species, as well as suitable spawning substrates for salmonids will be maintained in Elbow River through channel forming flows of 160 m^3/s.

EFFECTS OF TEMPERATURE ON FISH

Salmonid temperature tolerance is species-specific, region-specific, and dependent on individual size. Available literature on temperature tolerance in salmonid species is generally driven through controlled laboratory studies and limited to a few select species (DFO 2012; Fowler et al. 2009; Elliott 1991). These studies provide insight into the ranges of tolerance for qualitative purposes, but their application is limited. Studies suggest that adults have lower temperature thresholds relative to juveniles (Fowler et al. 2009), and adverse temperature effects are experienced for freshwater fish in the low 20°Cs. For example, adult Atlantic salmon have been shown to experience sublethal effects at temperatures of 25ºC, and behavioral changes were noted at 20°C (i.e., decreased feeding) (DFO 2012). Warm water temperatures are also recognized by the Government of Alberta as a parameter that can induce stress on the fish communities of Alberta. Local sport fishing closures are implemented during temperature spikes in the local waterways so as to reduce additional stress to fish during warmer temperatures.

The temperature ranges in Elbow River that are estimated to be experienced upon releasing water from the reservoir are within ranges that can be tolerated by salmonid species that are resident to the Elbow River between Bragg Creek and Glenmore Reservoir. Elbow River temperatures generally begin to warm as water moves downstream, with historical temperatures near Highway 22 reaching 11°C to 13ºC, with the Glenmore Reservoir

temperatures reaching the low 20°C. Fish that reside near the Project are likely adapted to a range of water temperatures that are represented through estimates for Elbow River near Highway 22, rather than temperatures experienced within Glenmore Reservoir. However, the general pattern of increased temperature within Elbow River, as water flows downstream, suggests that fish within the Project area are tolerant of a subtle increase in temperature.

While the estimated temperature ranges upon release from the reservoir are likely within a range of tolerance for fish, some indirect physiological stress may be experienced at the temperatures estimated during a release from the reservoir because of the compounded effects of suspended sediments. The extent to which these effects are compounded is unknown, any reliance on controlled studies to estimate the synergistic effect of sediment and temperature on fish as a result of a release from the reservoir would also present uncertainties in terms of measuring the extent of physiological effects on fish.

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Conformity IR1-06

Topic: Surface Water Quality – Methylmercury

Sources:

EIS Guidelines Part 2, Section 6.2.2; Section 6.3.1; and Section 6.4.4

EIS Volume 3B, Section 7

CEAA Annex 2: A) Early Technical Issues, December 19, 2017

Alberta Transportation Responses to CEAA Annex 2: A) Early Technical Issues, May 11, 2018

ECCC Technical Review, June 18, 2018

CEAA Information Requests Related to the Environmental Impact Statement Round 1 Part 1, IR1-06

Alberta Transportation Responses to IR Round 1, SR1 CEAA IR Package 1, June 14, 2019

ECCC Round 1 IR Completeness Review Comments, July 3, 2019

Context and Rationale

In CEAA Information Requests Related to the Environmental Impact Statement Round 1 Part 1, IR1-06, the Agency requested Alberta Transportation provide data that supports the statement that mercury methylation currently occurs during floods on the Elbow River and to include number of samples and sampling locations. As noted in the information request, section 6.3.1 of the EIS Guidelines require the identification of any potential adverse effects to fish and fish habitat, including the potential risk of production, increase, interaction, and accumulation of contaminants, including methylmercury. In the EIS, Alberta Transportation states that after release of water into the Elbow River, the reservoir area would not contribute methylmercury; however, ECCC is of the view that the proponent has not demonstrated this with the data presented.

Alberta Transportation's response to IR1-06 incorrectly quotes the request and therefore does not provide a response to IR1-06 part e.

Information Requests:

a) Provide data and information and methodology that supports the statement that mercury methylation currently occurs during floods on the Elbow River; include number of samples and sampling locations.

Response

a) Alberta Transportation recognizes that this question is identical to one made in their June 29, 2018 Package 1 questions. The response to this question was omitted in the Alberta Transportation's response to Round 1 CEAA Package 1, IR1-06 due to a copy error.

CLARIFICATION:

The context for the statement quoted in the Context and Rationale is clarified as follows:

Total mercury concentrations in sediments from Elbow River and Glenmore Reservoir are similar to total mercury concentrations in soils within the off-stream reservoir area. However, methylmercury concentrations in the aquatic sediments were higher than in the proposed off-stream reservoir area soils. Biologically mediated processes that increase mercury methylation rates (i.e., sulfate reduction) currently occur in suitable aquatic environments throughout the watershed (as suggested in Figure 6-1 that illustrates Elbow River sediment methylmercury concentrations are similar to Glenmore Reservoir sediment levels (see the EIA, Volume 3B, Section 7.4.4, page 7-27).

The statement "mercury methylation currently occurs during floods on the Elbow River" cannot be proven with the EIA sediment results (Volume 4, Appendix K; includes seven sediment samples collected in Elbow River; five sediment samples collected in Glenmore Reservoir and 15 samples taken in the proposed off-stream reservoir; locations provided in Volume 4, Section 2.2.3, Figure 2-2; data provided in Volume 4 Attachment Figures A-3 and A-4).

Mercury methylation rates are predicted to increase in the off-stream reservoir when the reservoir area is inundated with floodwater (i.e., the period of time when water is diverted from Elbow River to the off-stream reservoir until the reservoir is empty and off-stream reservoir soils are dry). Mercury methylation is a natural process that occurs in low oxygen conditions. When soil is inundated with water, sulfur reducing bacteria metabolize labile carbon and sulfur for energy; carbon and hydrogen (i.e., a methyl group) is attached to a mercury atom as a bioproduct. The EIA used a conservative assumption and assessed methylation rates based on:

> "Mercury methylation, and mercury levels in water, would begin to increase immediately upon reservoir filling (Hall et al. 2005; St. Louis et al. 2004; Montgomery et al. 2000)" (from the EIA, Volume 3B, Section 7.4.4, page 7.29).

However, the rate mercury is methylated depends on several factors including the presence of sulfur reducing bacteria, the amount of available sulfur and labile carbon, and how quickly oxygen is used up in the environment. It is possible suitable conditions for mercury methylation may be present in small locations in the reservoir as it is being filled but in may take much longer for suitable conditions to develop throughout most of the reservoir area.

The EIA predicted results are based on the conservative assumption methylation rates begin immediately upon filling the reservoir; however, methylation rates will actually take some time to begin throughout the reservoir area. Therefore, the methylmercury levels are expected to be lower than predicted. Methylmercury is expected to be generated at lower rates than predicted in the EIA.

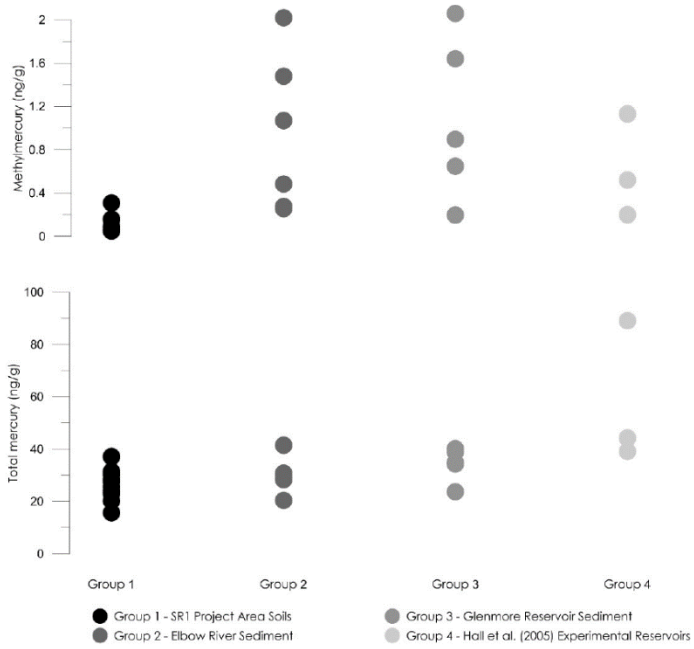

Figure 6-1 Total Mercury and Methylmercury in Existing Soil: Off-stream Reservoir, Elbow River, and Glenmore Reservoir Sediment (experimental reservoir data from Hall et al. 2005)

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Conformity IR1-07

Topic: **Migratory Birds and Species at Risk – Risks During Operations**

Sources:

EIS Guideline Part 2, Section 6.3.2; Section 6.3.3; Section 6.4

EIS Volume 3B, Section 11.3.4.1; Section 11.3.4.2

ECCC Technical Review, June 18, 2018

CEAA Information Requests Related to the Environmental Impact Statement Round 1 Part 1, IR1-07

Alberta Transportation Responses to IR Round 1, SR1 CEAA IR Package 1, June 14, 2019

Context and Rationale:

In CEAA Information Requests Related to the Environmental Impact Statement Round 1 Part 1, IR1-07, the Agency required details on potential effects to migratory birds and to species at risk, including information on flood and post-flood mitigation for migratory birds and species at risk, and nesting areas of importance for migratory birds. As noted in the information request, section 6.3.2 of the EIS Guidelines requires the proponent to identify any potential direct and indirect adverse effects to migratory birds or their habitat, including staging and nesting areas, foraging grounds, and landing sites.

Alberta Transportation's response to IR1-07describes the importance of riparian habitat for nesting and the effects a flood could have on this habitat in the absences of the Project and that no migratory bird mitigations are proposed during flood operations. Additionally, Volume 4, Appendix H is referenced, which summarizes habitat types within the off-stream reservoir area. Both the EIS and the information request responses acknowledge that flooding of the off-stream reservoir will result in direct habitat loss or alteration and increase mortality of ground-nesting birds. Neither the EIS nor the information request response include information regarding important nesting areas for migratory birds within the project area.

Given that nests present during flood operations will be disrupted, understanding the presence and importance of nesting areas in the project area is necessary to fully understand the potential adverse effects of the Project on migratory birds and the significance of these effects.

Information Request:

a) Present the methods and results of advanced surveys to identify important areas for migratory bird nesting throughout the project area. Taking these results into account, present a revised assessment of potential effects to migratory birds. Information provided should take into account all migratory birds (not limited to migratory bird species at risk) that may be present in the area during their nesting and breeding periods.

- **Provide details on observed nesting areas and nests.**
- **Correlate habitat types identified with preferred nesting habitat features and present a discussion of the likely presence and distribution of migratory bird nests in the off-stream reservoir area throughout all possible flood operation periods.**

Response

a) ***BREEDING BIRD DENSITY BY HABITAT TYPE - BASELINE***

The baseline breeding bird survey methods and results are presented in the EIA, Volume 4, Appendix H, Section 2.1 and Section 3.1, respectively. The objective of the breeding bird point-count survey was to detect presence of breeding birds in the wildlife and wildlife habitat local assessment area (LAA) rather than to determine the locations of bird nests. Therefore, details related to specific locations of bird nests are not known.

However, nests were recorded if they were incidentally observed such as the cliff swallow colony within the main building of Kamp Kiwanis and a barn swallow nest near a culvert along Highway 22, north of Township Road 242; these locations are outside the PDA (see the EIA, Volume 4, Appendix H, Figure 3-1). In addition, although not a migratory bird, a magpie nest was identified within the middle of the PDA, east of the proposed diversion channel during a Piikani Nation site visit (Piikani Nation 2016).

Although the breeding bird survey results are limited to the identification of breeding bird territories, the location of nests will be identified during advanced surveys (i.e., bird nest surveys prior to construction) and post-flood maintenance activities). If an active nest is identified, site-specific mitigation (e.g., appropriate setback buffer) will be developed, as discussed in the EIA, Volume 3A, Section 11.4.2.2 and Volume 3B, Section 11.3.4.2. Site-specific mitigation for migratory bird nests is also discussed in Alberta Transportation's response to Conformity IR1-09 (see applicable tables for migratory birds).

Advanced surveys prior to construction will include non-intrusive passive point count or transect surveys in appropriate habitat and low intensity nest searches that involve walking transects through an entire area to be cleared/disturbed. When a nest is found, the species and location is recorded, and a species-specific setback buffer is placed around the nest. Nesting can be determined through the discovery of an actual nest, or through behavioural evidence (e.g., defensive calling and displays, carrying nest material, food, or fecal sacs)

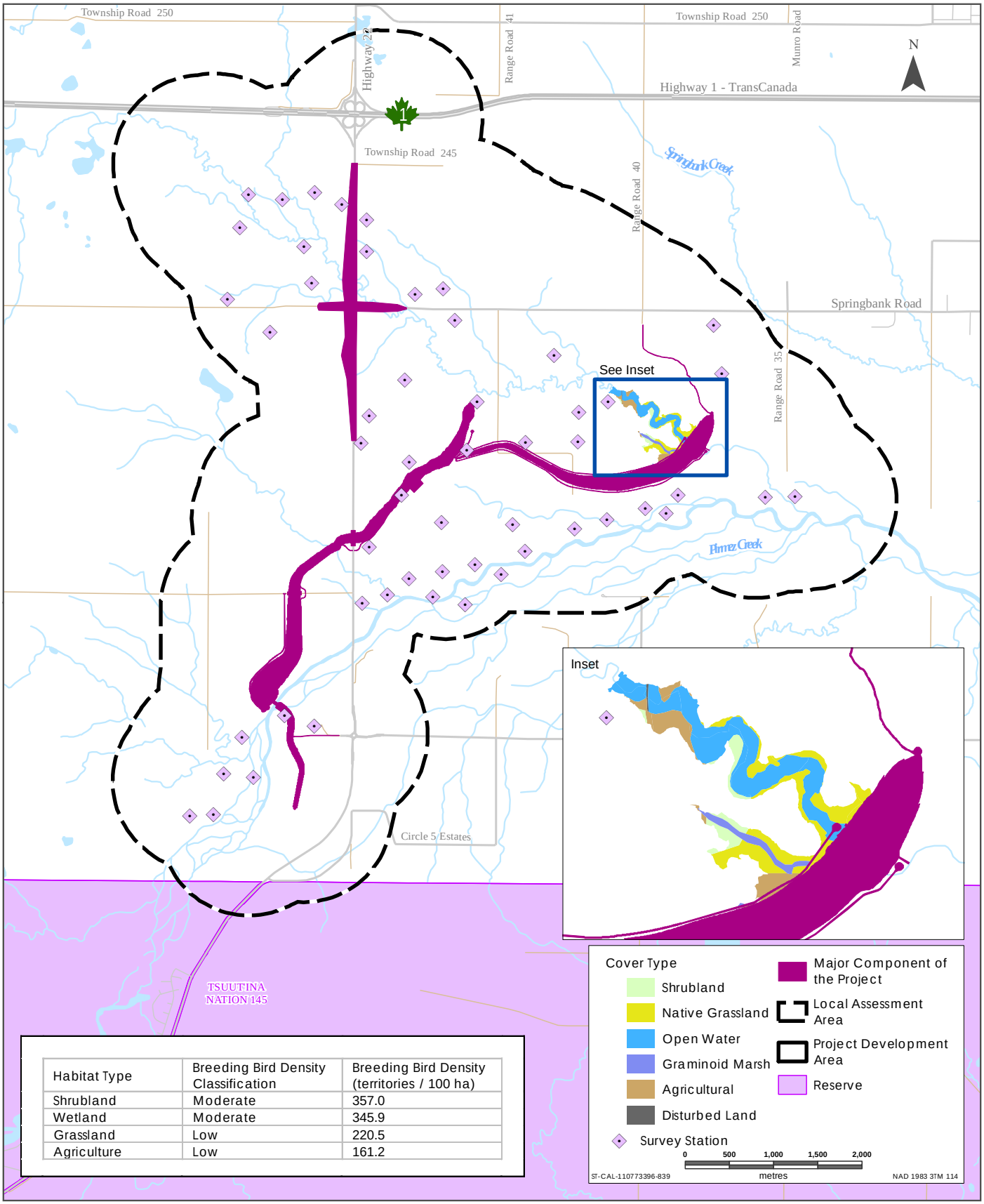
and professional judgement. Advanced surveys are not planned prior to flood events because it is not safe to do so and there is limited time available to collect nests and eggs once the advance warning of the potential flooding has been issued. In addition, the likelihood of successfully moving and transporting eggs and nestlings to an area that is safe and where adults could find them again is considered to be very low (see Alberta Transportation's response to Conformity IR1-09 for further details).

The following discussion provides an analysis of potential migratory bird nesting areas. The discussion also presents a revised assessment of the breeding bird survey result and a revision to the assessment for change in habitat (calculated in ha) during each flood scenario. The revised assessment for change in migratory bird habitat now includes three figures that identify potential nesting areas (based on habitat types) temporarily inundated during each flood scenario (see Figures 7-1 to 7-3 and Table 7-1).

The relative importance of each habitat type to support nesting migratory birds was based on breeding bird densities presented in the EIA, Volume 4, Appendix H, Table 3.1- and Table 3-2. These tables are duplicated in this response to support the identification of potential nesting areas by habitat type. Specifically, Table 7-2 provides a summary of total breeding bird density by habitat type and Table 7-3 provides a summary of species density for each migratory bird species and occurrence by habitat type.

Broad habitat types are classified into three breeding bird density classes: high (greater than 400 territories/100 ha); moderate (250-400 territories/100 ha); and low (less than 250 territories per 100/ha). Breeding bird densities are estimated using all survey stations (see Figure 7-4) because the primary purpose of the breeding bird survey was to estimate relative abundance of breeding birds for representative habitat types in the LAA. In addition, because the areas of flood inundation were not known at the time of the surveys, the presence of survey stations within each flood scenario varies.

Overall, based on the results of the breeding bird surveys, breeding bird density was highest in mixed forest and broadleaf (deciduous) forest followed by coniferous forest, shrubland, and wetlands, which had similar but moderate breeding bird densities (see Figure 7-4). Grassland had relatively lower breeding bird densities compared to other native vegetation communities and agricultural lands had the lowest density of breeding birds. The potential migratory bird nesting areas (habitat types) temporarily inundated are shown in Figures 7-1, 7-2 and 7-3 for a 1:10 year, 1:100 year and design floods, respectively.

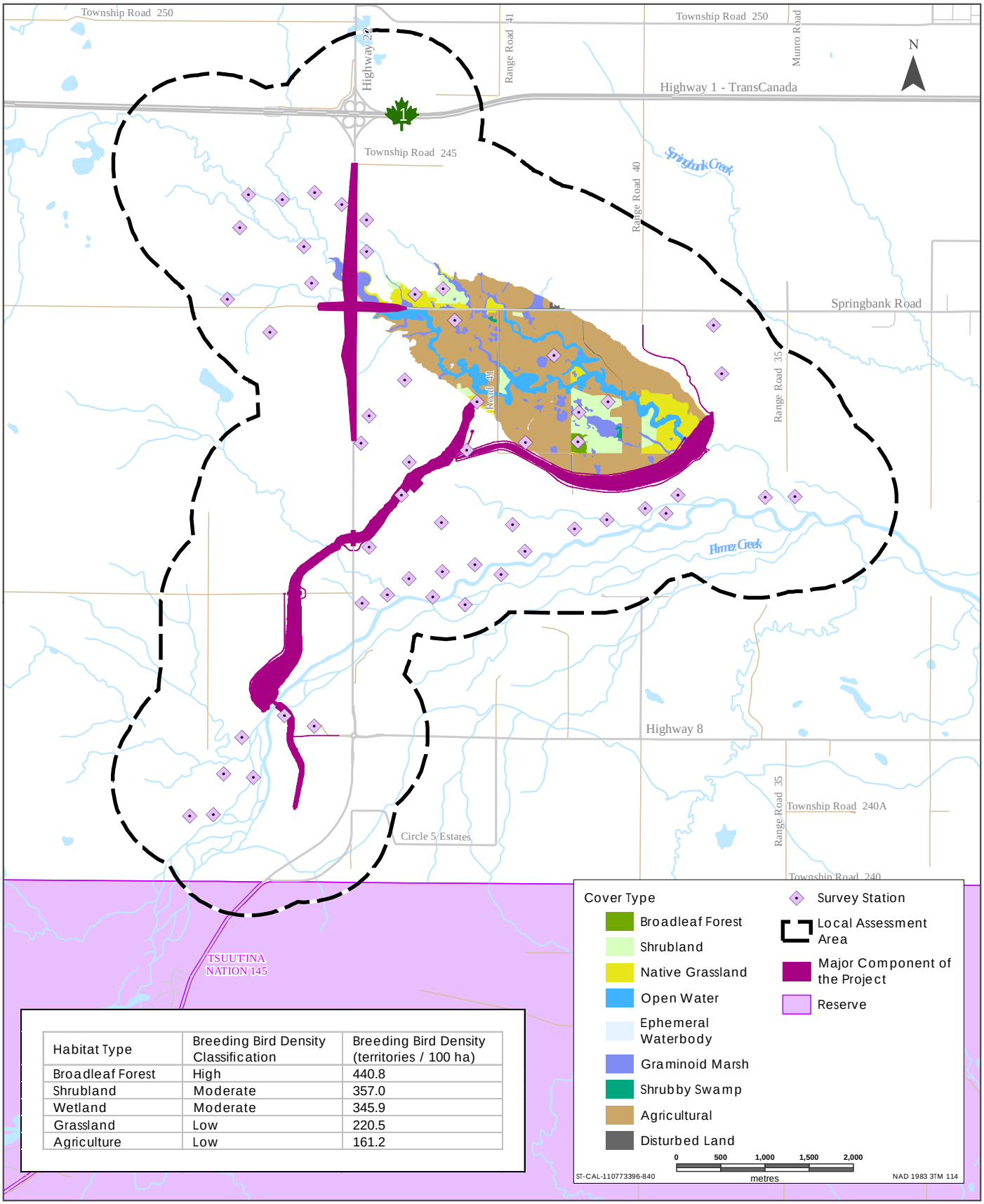


Habitat Type	Breeding Bird Density Classification	Breeding Bird Density (territories / 100 ha)
Shrubland	Moderate	357.0
Wetland	Moderate	345.9
Grassland	Low	220.5
Agriculture	Low	161.2

Sources: Base Data - Government of Alberta, Government of Canada, Thematic Data - Stantec Ltd.

Potential Nesting Areas (Breeding Bird Density/Habitat Types)
Temporarily Inundated during a 1:10 Year Flood

Conformity Response
Figure 7-1

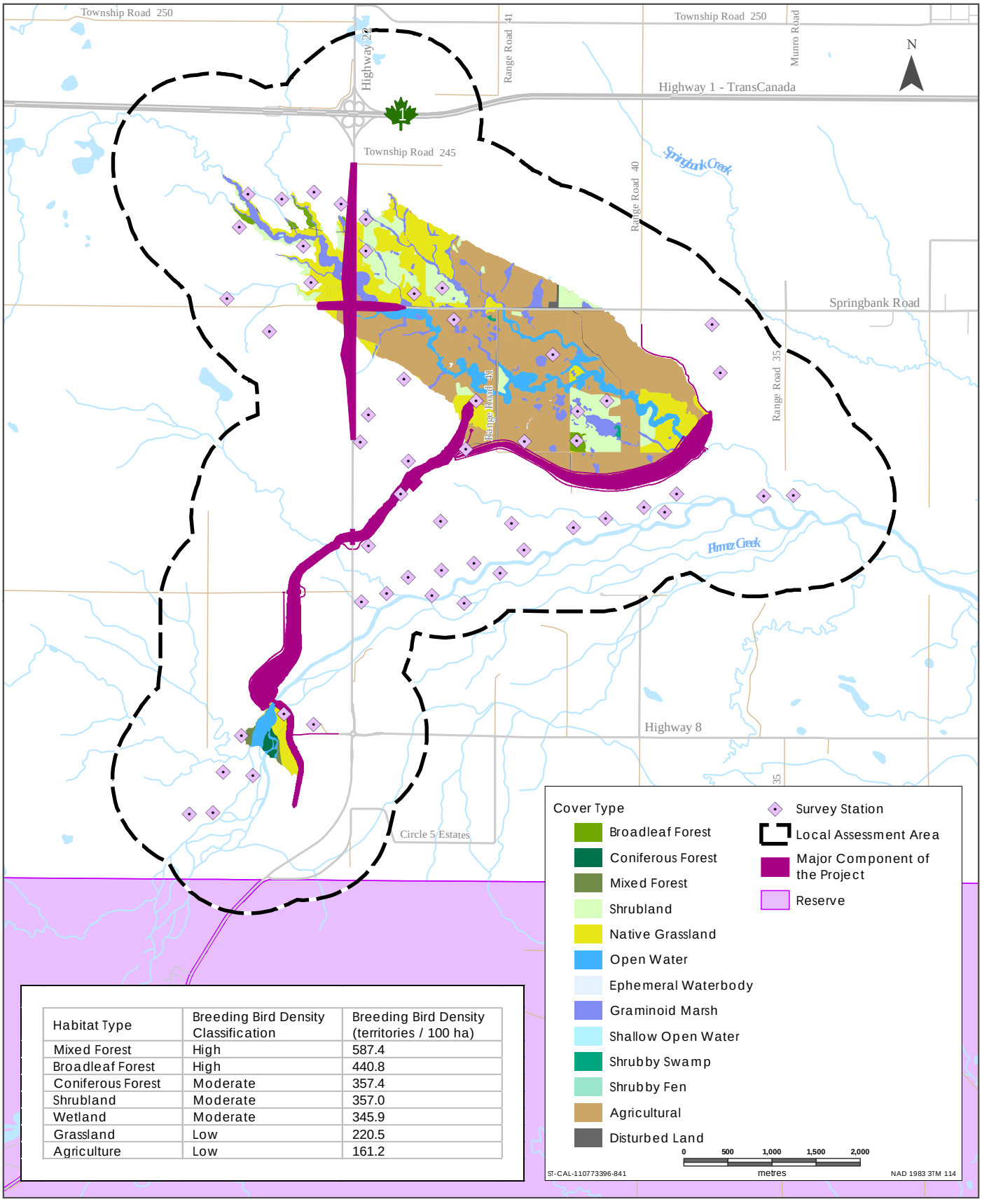


Habitat Type	Breeding Bird Density Classification	Breeding Bird Density (territories / 100 ha)
Broadleaf Forest	High	440.8
Shrubland	Moderate	357.0
Wetland	Moderate	345.9
Grassland	Low	220.5
Agriculture	Low	161.2

Sources: Base Data - Government of Alberta, Government of Canada, Thematic Data - Stantec Ltd.

Potential Nesting Areas (Breeding Bird Density/Habitat Types)
Temporarily Inundated during a 1:100 Year Flood

Conformity Response
Figure 7-2



Habitat Type	Breeding Bird Density Classification	Breeding Bird Density (territories / 100 ha)
Mixed Forest	High	587.4
Broadleaf Forest	High	440.8
Coniferous Forest	Moderate	357.4
Shrubland	Moderate	357.0
Wetland	Moderate	345.9
Grassland	Low	220.5
Agriculture	Low	161.2

Sources: Base Data - Government of Alberta, Government of Canada, Thematic Data - Stantec Ltd.

Potential Nesting Areas (Breeding Bird Density/Habitat Types)
Temporarily Inundated during a Design Flood (2013)

Conformity Response
Figure 7-3

Table 7-1 Change in Vegetation and Wetland Cover Types Temporarily Inundated by Floods

Cover Type	Land Unit [1,2]	Area of Vegetation and Wetland Cover Types in the LAA (ha)				Change from Baseline					
						Design Flood		1:100 Year Flood		1:10 Year Flood	
		Baseline	Design Flood	1:100 Year Flood	1:10 Year Flood	ha	%	ha	%	ha	%
Broadleaf Forest	b2 Hairy wild rye Aw	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0
	d1 Pine grass Aw	21.3	21.3	21.3	21.3	0.0	0.0	0.0	0.0	0.0	0.0
	e1 Snowberry-silverberry Aw-Pb	88.6	88.6	88.6	88.6	0.0	0.0	0.0	0.0	0.0	0.0
	f2 Red osier dogwood Pb-Aw	65.3	58.2	61.8	65.3	-7.1	-10.9	-3.5	-5.4	0.0	0.0
	g2 Horsetail Aw-Pb	73.4	73.4	73.4	73.4	0.0	0.0	0.0	0.0	0.0	0.0
Coniferous Forest	b4 Hairy wild rye Sw	59.1	59.1	59.1	59.1	0.0	0.0	0.0	0.0	0.0	0.0
	d3 Pine grass-Sw	6.8	6.8	6.8	6.8	0.0	0.0	0.0	0.0	0.0	0.0
	g1 Horsetail Sw	168.3	165.2	168.3	168.3	-3.1	-1.9	0.0	0.0	0.0	0.0
Mixed Forest	b3 Hairy wild rye Aw-Sw-Pl	101.0	101.0	101.0	101.0	0.0	0.0	0.0	0.0	0.0	0.0
	d2 Pine grass-Sw-Pl-Aw	2.5	2.5	2.5	2.5	0.0	0.0	0.0	0.0	0.0	0.0
	e2 Snowberry-silverberry Sw	79.0	79.0	79.0	79.0	0.0	0.0	0.0	0.0	0.0	0.0
	e4 Snowberry-silverberry Sw-Aw	9.6	8.1	9.6	9.6	-1.6	-16.1	0.0	0.0	0.0	0.0
	f1 Red osier dogwood Sw	69.1	68.1	69.1	69.1	-0.9	-1.3	0.0	0.0	0.0	0.0
Shrubland	e3 Shrubland - mesic/rich	81.9	75.0	78.3	81.1	-6.9	-8.4	-3.6	-4.4	-0.9	-1.1
	f3 Shrubland - subhygric/rich	243.1	163.4	204.0	242.4	-79.7	-32.8	-39.0	-16.1	-0.6	-0.3

Table 7-1 Change in Vegetation and Wetland Cover Types Temporarily Inundated by Floods

Cover Type	Land Unit [1,2]	Area of Vegetation and Wetland Cover Types in the LAA (ha)				Change from Baseline					
						Design Flood		1:100 Year Flood		1:10 Year Flood	
		Baseline	Design Flood	1:100 Year Flood	1:10 Year Flood	ha	%	ha	%	ha	%
Grassland	b5 Grassland - submesic/medium	41.9	35.5	36.5	40.3	-6.3	-15.2	-5.4	-13.0	-1.6	-3.8
	c1 Rough fescue	372.9	294.9	360.7	372.9	-78.0	-20.9	-12.2	-3.3	0.0	0.0
	d0 Grassland - mesic/medium [3]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	e0 Grassland - mesic/medium [3]	21.8	9.8	15.1	19.8	-12.0	-55.1	-6.7	-30.7	-2.1	-9.4
	f4 Grassland - subhygric/rich	70.3	35.1	55.4	68.2	-35.2	-50.0	-14.9	-21.2	-2.2	-3.1
	g0 Grassland - hygric/rich [3]	8.7	5.4	8.7	8.7	-3.3	-37.7	0.0	0.0	0.0	0.0
Upland Subtotal		***1,584.8***	***1,350.6***	***1,499.4***	***1,577.5***	***-234.2***	***-14.8***	***-85.4***	***-5.4***	***-7.3***	***-0.5***
Open Water	Open water	279.9	218.8	227.1	270.6	-61.2	-21.8	-52.8	-18.9	-9.4	-3.3
Open Water Subtotal		***279.9***	***218.8***	***227.1***	***270.6***	***-61.2***	***-21.8***	***-52.8***	***-18.9***	***-9.4***	***-3.3***
Ephemeral Waterbody	Ephemeral waterbody	4.9	4.5	4.6	4.9	-0.4	-8.0	-0.3	-6.7	0.0	0.0
Graminoid Marsh	Temporary graminoid marsh	87.4	63.7	76.1	86.4	-23.7	-27.1	-11.3	-12.9	-1.1	-1.2
	Seasonal graminoid marsh	98.1	66.4	80.9	98.1	-31.7	-32.3	-17.2	-17.6	0.0	0.0
	Semi-permanent graminoid marsh	30.4	17.1	18.2	30.4	-13.3	-43.7	-12.2	-40.1	0.0	0.0

Table 7-1 Change in Vegetation and Wetland Cover Types Temporarily Inundated by Floods

Cover Type	Land Unit [1,2]	Area of Vegetation and Wetland Cover Types in the LAA (ha)				Change from Baseline					
						Design Flood		1:100 Year Flood		1:10 Year Flood	
		Baseline	Design Flood	1:100 Year Flood	1:10 Year Flood	ha	%	ha	%	ha	%
Shallow Open Water	Shallow open water with submersed and/or floating aquatic vegetation	7.2	7.0	7.2	7.2	-0.2	-2.1	0.0	0.0	0.0	0.0
	Saline shallow open water with submersed and/or floating aquatic vegetation	0.9	0.9	0.9	0.9	0.0	0.0	0.0	0.0	0.0	0.0
Shrubby Swamp	Seasonal shrubby swamp	5.0	3.9	3.9	5.0	-1.1	-21.9	-1.1	-21.9	0.0	0.0
Wooded Mixedwood Swamp	Seasonal wooded mixedwood swamp	20.3	20.3	20.3	20.3	0.0	0.0	0.0	0.0	0.0	0.0
Shrubby Fen	Moderate-rich shrubby fen	41.8	41.8	41.8	41.8	0.0	0.0	0.0	0.0	0.0	0.0
Graminoid Fen	Moderate-rich graminoid fen	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Wetland Subtotal		***296.3***	***226.0***	***254.1***	***295.2***	***-70.3***	***-23.7***	***-42.2***	***-14.2***	***-1.1***	***-0.4***
Agricultural	Annual crop	408.6	408.6	408.6	408.6	0.0	0.0	0.0	0.0	0.0	0.0
	Dugout	1.9	1.5	1.5	1.9	-0.4	-21.0	-0.4	-21.0	0.0	0.0
	Hayland	386.6	386.6	386.6	386.6	0.0	0.0	0.0	0.0	0.0	0.0
	Tame pasture	1,488.1	1,115.0	1,210.2	1,485.4	-373.1	-25.1	-277.9	-18.7	-2.7	-0.2

Table 7-1 Change in Vegetation and Wetland Cover Types Temporarily Inundated by Floods

Cover Type	Land Unit [1,2]	Area of Vegetation and Wetland Cover Types in the LAA (ha)				Change from Baseline					
						Design Flood		1:100 Year Flood		1:10 Year Flood	
		Baseline	Design Flood	1:100 Year Flood	1:10 Year Flood	ha	%	ha	%	ha	%
Disturbed Land	Disturbed land [4]	413.7	336.9	391.9	412.7	-76.8	-18.6	-21.8	-5.3	-1.0	-0.2
	Flood	0.0	816.0	480.5	21.4	816.0	-	480.5	-	21.4	-
Anthropogenic Subtotal		***2,699.0***	***3,064.6***	***2,879.3***	***2,716.7***	***365.7***	***13.5***	***180.3***	***6.7***	***17.7***	***0.7***
Grand Total		**4,860**	**4,860**	**4,860**	**4,860**	**-**	**-**	**-**	**-**	**-**	**-**

NOTES:

Calculations completed on non-rounded numbers. Values presented in table have been rounded

Aw – aspen (*Populus tremuloides*)

Pb – balsam poplar (*Populus balsamifera*)

Pl – lodgepole pine (*Pinus contorta*)

Sw – white spruce (*Picea glauca*)

[1] Upland land units (ecosites) were classified using Range Plant Communities and Range Health Assessment Guidelines for the Foothills Parkland Subregion of Alberta (ESRD 2012)

[2] Wetland land units classified using the Alberta Wetland Classification System (ESRD 2015)

[3] A zero ecosite phase indicates that the overstorey vegetation has been cleared, but ecosite moisture and nutrient regime remain unchanged

[4] Disturbed land includes industrial facilities, disturbed land, transportation and rural residential land unit types

Table 7-2 Breeding Bird Survey Sampling Effort, Richness, and Density by Habitat Type in the LAA

Cover Type	Land Unit	Area in LAA (ha)	Area Surveyed (ha)	Number of Species Detected (richness)	Density of Territories (territories/ 100 ha)	Number of SOMC
Grassland	b5: Grassland – submesic/medium	37.9	0.4	0	0.0	0
	c1: Rough fescue	381.8	18.3	9	224.5	0
	f4: Grassland - subhygric/rich	5.4	0.4	1	243.3	0
Grassland Subtotal		**425.1**	**19.0**	**10**	**220.5**	**0**
Shrubland	e3: Shrubland - mesic/rich	99.0	2.9	10	699.6	0
	f3: Shrubland - subhygric/rich	309.5	40.3	23	332.7	0
Shrubland Subtotal		**408.5**	**43.2**	**26**	**357.0**	**0**
Broadleaf Forest	b2: Hairy wild rye Aw	0.2	<0.01	0.0	0.0	0
	d1: Pine grass-Aw	21.3	0.6	4	1,079.3	0
	e1: Snowberry-silverberry Aw-Pb	89.8	4.5	12	417.6	2
	f2: Red osier dogwood Pb-Aw	67.1	12.5	14	423.6	0
	g2: Horsetail Aw-Pb	73.4	6.2	11	435.4	0
Broadleaf Forest Subtotal		**251.8**	**23.8**	**21**	**440.8**	**2**
Mixed Forest	b3: Hairy wild rye Aw-Sw-Pl	109.9	12.8	26	657.4	4
	d2: Pine grass-Sw-Pl-Aw	2.5	2.2	14	1,015.2	2
	e2: Snowberry-silverberry Sw	81.9	13.0	28	555.5	2
	e4: Snowberry-silverberry Sw-Aw	16.1	3.6	14	525.8	2
	f1: Red osier dogwood Sw	85.7	10.4	25	473.1	0
Mixed Forest Subtotal		**296.1**	**41.9**	**45**	**587.4**	**4**

Table 7-2 Breeding Bird Survey Sampling Effort, Richness, and Density by Habitat Type in the LAA

Cover Type	Land Unit	Area in LAA (ha)	Area Surveyed (ha)	Number of Species Detected (richness)	Density of Territories (territories/ 100 ha)	Number of SOMC
Coniferous Forest	b4: Hairy wild rye Sw	59.1	2.7	5	185.9	0
	d3: Pine grass-Sw	6.8	0.0	N/A	N/A	N/A
	g1: Horsetail Sw	179.3	4.0	11	471.9	2
Coniferous Forest Subtotal		**245.2**	**6.7**	**15**	**357.4**	**2**
Upland Subtotal		**1,627.2**	**134.6**	**52**	**424.2**	**4**
Wetland	FSmr: Moderate-rich shrubby fen	42.6	3.4	10	437.1	1
	l: Ephemeral waterbody	5.0	0.01	0	0.0	0
	MGII: Temporary graminoid marsh	92.9	0.8	0	0.0	0
	MGIII: Seasonal graminoid marsh	102.7	2.7	3	366.1	0
	MGIV: Semi-permanent graminoid marsh	34.7	0.2	0	0.0	1
	SSIII: Seasonal shrubby swamp	5.3	0.0	N/A	N/A	N/A
	SWmIII: Seasonal wooded mixedwood swamp	20.3	0.0	N/A	N/A	N/A
	WAV: Shallow open water with submersed and/or floating aquatic vegetation	7.2	0.0	N/A	N/A	N/A
	WAVs: Saline shallow open water with submersed and/or floating aquatic vegetation	0.9	0.0	N/A	N/A	N/A
Wetland Subtotal		**311.6**	**7.2**	**11**	**345.9**	**2**
Water	Open water	283.5	4.4	0	0.0	0
Water Subtotal		**283.5**	**4.4**	**0**	**0.0**	**0**

Table 7-2 Breeding Bird Survey Sampling Effort, Richness, and Density by Habitat Type in the LAA

Cover Type	Land Unit	Area in LAA (ha)	Area Surveyed (ha)	Number of Species Detected (richness)	Density of Territories (territories/ 100 ha)	Number of SOMC
Agriculture	CR: Annual Crop	547.2	4.1	1	48.5	0
	DgRe: Dugout	2.0	0.0	N/A	N/A	N/A
	HY: Hayland	1,325.2	0.0	N/A	N/A	N/A
	TM: Tame Pasture	469.5	18.2	4	186.7	
Agriculture Subtotal		**2,343.9**	**22.3**	**4**	**161.2**	**0**
Disturbed land [1]		294.5	1.1	0	0.0	0
Total		**4,860.0**	**169.6**	**52**	**372.5**	**4**

NOTES:

SOMC – species of management concern

Aw – aspen (*Populus tremuloides*)

Pb – balsam poplar (*Populus balsamifera*)

Pl – lodgepole pine (*Pinus contorta*)

Sw – white spruce (*Picea glauca*)

[1] Disturbed land includes industrial facilities, disturbed land, transportation and rural residential land unit types

Table 7-3 Breeding Bird Densities and Species Occurrence by Habitat Type

Name	Scientific Name	Number of Territories Detected	Density (territories/ 100 ha)	Land Unit (ecosite)	Land Cover Type
Yellow-bellied sapsucker	*Sphyrapicus varius*	3	1.8	b3, d2	Mixed Forest
Downy woodpecker	*Picoides pubescens*	2	1.2	b3, d2	Mixed Forest
Hairy woodpecker	*Leuconotopicus villosus*	2	1.2	e2, e4	Mixed Forest
Northern flicker	*Colaptes auratus*	1	0.6	e1	Broadleaf Forest
Olive-Sided flycatcher	*Contopus cooperi*	2	1.2	b3, e4	Mixed Forest
Western wood-pewee	*Contopus sordidulus*	19	11.2	b3, d2, e1, e2, e4, f1, f3, g1, g2	Mixed Forest, Broadleaf Forest, Shrubland, Coniferous Forest
Alder flycatcher	*Empidonax alnorum*	17	10.0	e1, e3, e4, f1, f2, f3, FSmr	Broadleaf Forest, Shrubland, Mixed Forest, Shrubby Fen
Least flycatcher	*Empidonax minimus*	35	20.6	b3, d2, e1, e2, f1, f3, g1, g2, FSmr	Mixed Forest, Broadleaf Forest, Shrubland, Coniferous Forest, Wetland (Shrubby Fen)
Hammond's flycatcher	*Empidonax hammondii*	2	1.2	b3, d2	Mixed Forest
Eastern kingbird	*Tyrannus tyrannus*	3	1.8	f3	Shrubland
Cassin's vireo	*Vireo cassinii*	1	0.6	e4	Mixed Forest
Warbling vireo	*Vireo gilvus*	8	4.7	b3, e3, f1, f2, g2	Mixed Forest, Shrubland Broadleaf Forest,
Red-eyed vireo	*Vireo olivaceus*	2	1.2	e3	Shrubland
Tree swallow	*Tachycineta bicolor*	1	0.6	b3	Mixed Forest
Black-capped chickadee	*Poecile atricapillus*	15	8.8	b3, d2, e2, e4, f1, f2, f3, g1, g2, FSmr	Mixed Forest, Broadleaf Forest, Shrubland, Coniferous Forest, Wetland (Shrubby Fen)
Boreal chickadee	*Poecile hudsonicus*	5	2.9	b4, e1, e2, f1	Coniferous Forest, Broadleaf Forest, Mixed Forest

Table 7-3 Breeding Bird Densities and Species Occurrence by Habitat Type

Name	Scientific Name	Number of Territories Detected	Density (territories/ 100 ha)	Land Unit (ecosite)	Land Cover Type
Red-breasted nuthatch	*Sitta canadensis*	2	1.2	e1, e2	Broadleaf Forest, Mixed Forest
White-breasted nuthatch	*Sitta carolinensis*	1	0.6	b3	Mixed Forest
House wren	*Troglodytes aedon*	55	32.4	b3, c1, d2, e2, e4, f1, f2, f3, g1, g2	Mixed Forest. Grassland, Broadleaf Forest, Shrubland, Coniferous Forest
Golden-crowned kinglet	*Regulus satrapa*	1	0.6	f1	Mixed Forest
Ruby-crowned kinglet	*Regulus calendula*	17	10.0	e1, e2, e4, f1, g1	Broadleaf Forest, Mixed Forest, Coniferous Forest
Mountain bluebird	*Sialia currucoides*	3	1.8	f3, TM	Shrubland, Wetland (Temporary Graminoid Marsh)
Swainson's thrush	*Catharus ustulatus*	3	1.8	e2, f1, g1	Mixed Forest, Coniferous Forest
American robin	*Turdus migratorius*	28	16.5	b3, b4, d2, e2, e4, f1, f2, f3, g1, g2, FSmr	Mixed Forest, Coniferous Forest, Broadleaf Forest, Shrubland, Wetland (Shrubby Fen)
Gray catbird	*Dumetella carolinensis*	3	1.8	e2, f3, g1	Mixed Forest, Shrubland, Coniferous Forest
European starling	*Sturnus vulgaris*	6	3.5	b3, d2, e2	Mixed Forest
Cedar waxwing	*Bombycilla cedrorum*	22	13.0	b3, c1, d1, d2, e1, e2, e3, e4, f1, f2, f3, g2	Mixed Forest, Grassland, Broadleaf Forest, Shrubland,
Ovenbird	*Seiurus aurocapilla*	1	0.6	f1	Mixed Forest
Northern waterthrush	*Parkesia noveboracensis*	4	2.4	e2, e4	Mixed Forest
Tennessee warbler	*Leiothlypis peregrina*	21	12.4	b3, b4, e2, e4, f1, f3, FSmr	Mixed Forest, Coniferous Forest, Shrubland, Wetland (Shrubby Fen)

Table 7-3 Breeding Bird Densities and Species Occurrence by Habitat Type

Name	Scientific Name	Number of Territories Detected	Density (territories/ 100 ha)	Land Unit (ecosite)	Land Cover Type
MacGillivray's warbler	*Geothlypis tolmiei*	1	0.6	f1	Mixed Forest
Yellow warbler	*Setophaga petechia*	42	24.8	b3, d2, e1, e2, e3, e4, f1, f2, f3, g2, FSmr	Mixed Forest, Broadleaf Forest, Shrubland, Wetland (Shrubby Fen)
Yellow-rumped warbler	*Setophaga coronata*	6	3.5	b3, e2, f1	Mixed Forest
Wilson's warbler	*Cardellina pusilla*	3	1.8	b3, e2, f2	Mixed Forest, Broadleaf Forest
Chipping sparrow	*Spizella passerina*	3	1.8	b3, c1	Mixed Forest, Grassland
Clay-colored sparrow	*Spizella pallida*	116	68.4	b3, b4, c1, d1, d2, e1, e2, e3, e4, f1, f2, f3, g2, FSmr, MGIII, TM	Mixed Forest, Coniferous Forest, Broadleaf Forest, Shrubland, Grassland, Wetland (Shrubby Fen, Seasonal and Temporary Graminoid Marsh)
Savannah sparrow	*Passerculus sandwichensis*	53	31.2	CR, c1, e1, e2, e3, f2, f3, MGIII, TM	Agriculture (crop), Grassland, Mixed Forest, Broadleaf Forest, Shrubland, Wetland (Seasonal and Temporary Graminoid Marsh)
Le Conte's sparrow	*Ammodramus leconteii*	3	1.8	c1, e2, f3	Grassland, Mixed Forest, Shrubland
Nelson's sparrow	*Ammodramus nelsoni*	1	0.6	f3	Shrubland
Song sparrow	*Melospiza melodia*	9	5.3	b4, d1, e1, e2, f1, f3, FSmr	Coniferous Forest, Broadleaf Forest, Mixed Forest, Shrubland, Wetland (Shrubby Fen)
Lincoln's sparrow	*Melospiza lincolnii*	31	18.3	b3, c1, e2, e3, f1, f2, f3, g2, FSmr, MGIII	Mixed Forest, Grassland, Shrubland, Broadleaf Forest, Wetland (Shrubby Fen, Seasonal Graminoid Marsh)
White-throated sparrow	*Zonotrichia albicollis*	18	10.6	b3, e2, f1, f2, f3, g1, g2	Mixed Forest, Broadleaf Forest Shrubland, Coniferous Forest

Table 7-3 Breeding Bird Densities and Species Occurrence by Habitat Type

Name	Scientific Name	Number of Territories Detected	Density (territories/ 100 ha)	Land Unit (ecosite)	Land Cover Type
Dark-eyed junco	*Junco hyemalis*	5	2.9	e2, f1, f3	Mixed Forest, Shrubland
Rose-breasted grosbeak	*Pheucticus ludovicianus*	9	5.3	b3, d2, e2, f1, f2	Mixed Forest, Broadleaf Forest
Red-winged blackbird	*Agelaius phoeniceus*	7	4.1	b3, e3, f3, f4	Mixed Forest, Shrubland, Grassland
Western meadowlark	*Sturnella neglecta*	3	1.8	c1, TM	Grassland, Wetland (Temporary Graminoid Marsh)
Brewer's blackbird	*Euphagus cyanocephalus*	2	1.2	f1, f3	Mixed Forest, Shrubland
Baltimore oriole	*Icterus galbula*	7	4.1	b3, d2, f3	Mixed Forest, Shrubland
House finch	*Haemorhous mexicanus*	2	1.2	e2, g1	Mixed Forest, Coniferous Forest
Purple finch	*Haemorhous purpureus*	1	0.6	e2	Mixed Forest
Pine siskin	*Spinus pinus*	1	0.6	g1	Coniferous Forest
American goldfinch	*Spinus tristis*	24	14.1	b3, c1, d1, e3, f1, f2, f3, FSmr	Mixed Forest, Grassland, Broadleaf Forest, Shrubland, Wetland 9Shrubby Fen)
Total	**52**	**632**	**372.5**	**N/A**	

NOTE:
Bolded species represent species of management concern

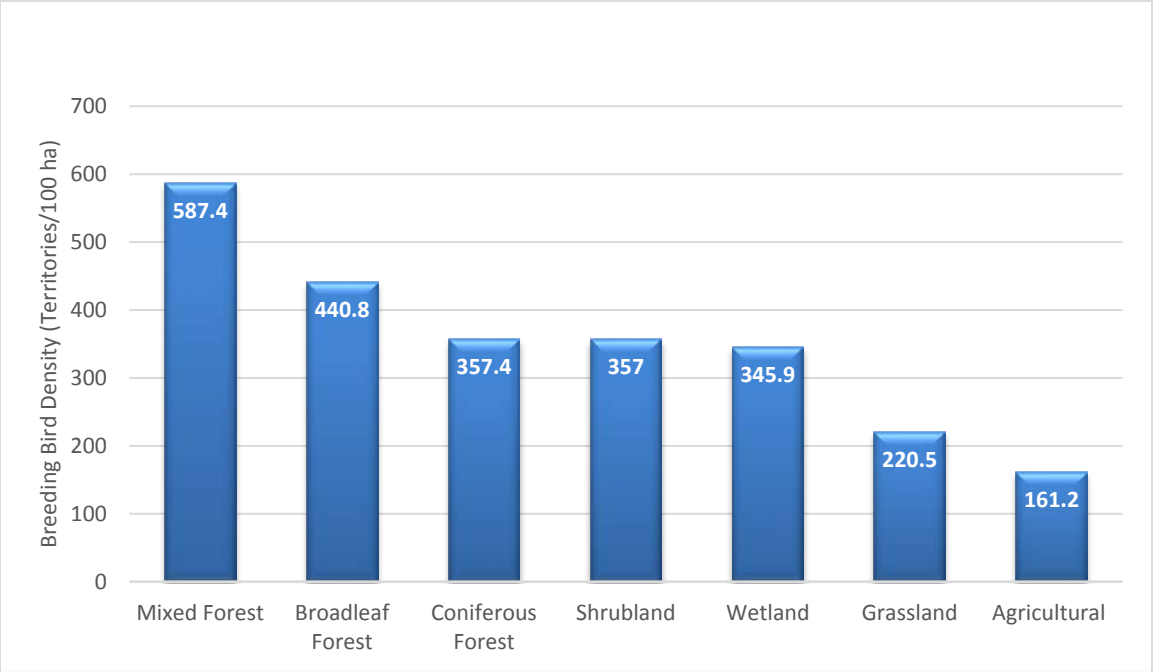


Figure 7-4 Breeding Bird Density by Habitat Type in the LAA

REVISED ASSESSMENT ON PROJECT EFFECTS ON MIGRATORY BIRDS

The following section provides a revised assessment to address the request to identify important areas where all migratory birds (not limited to migratory bird species at risk) may be present in the reservoir area during their nesting and breeding periods. The revised assessment correlates habitat types with breeding bird density, which reflects the likely presence and distribution of migratory bird nests in the off-stream reservoir area during the 1:10 year, 1:100 and design floods.

1:10 YEAR FLOOD

During a 1:10 year flood, no inundation of nesting habitats that support high densities of breeding birds (i.e., mixed forest, broadleaf forest) is anticipated. However, a 1:10 year flood would result in the temporary inundation of very small areas of habitat that support low to moderate breeding bird densities: shrubland (1.5 ha), wetland (1.1 ha); grassland (5.9 ha); and agricultural land (2.7 ha) (see Table 7-1). The potential migratory bird nesting areas (habitat types) temporarily inundated during a 1:10 year flood are shown in Figure 7-1.

1:100 YEAR FLOOD

Agricultural land (tame pasture), which supports relatively low breeding bird densities, would be the dominant land cover type (287 ha) temporarily inundated during a 1:100 year flood. Areas that support moderate breeding bird densities, shrubland (42.6 ha) and wetland (42.2 ha), would also be affected. Some of these potential nesting areas were also identified as part of the Blood Tribe/Káínai Traditional Knowledge, Land, and Resource Use Study, which identified migratory bird habitat within the off-stream reservoir (Káínai First Nation 2018). Although a small area of broadleaf forest (3.5 ha), which supports high breeding bird densities would also be temporarily inundated, nests located in trees are higher above ground and are more likely to escape nest submergence compared to ground-nesting birds, depending on flood water depth and nest height. Approximately 39.2 ha of grassland, which supports relatively low breeding bird densities, would also be affected (see the EIA, Volume 3B, Section 11, Table 11-5). The potential migratory bird nesting areas (habitat types) temporarily inundated during a 1:100 year flood are shown in Figure 7-2.

DESIGN FLOOD (2013)

During a design flood, agricultural land (tame pasture), which supports relatively low densities of breeding birds, would be the dominant land cover type temporarily inundated (373 ha). Relatively small areas that provide potentially high densities of breeding birds would be temporarily inundated: mixed forest (9.4 ha) and broadleaf forest (7.1 ha). However, as mentioned above, nests in trees may escape nest submergence depending on depth of flood water and nest height. Habitats that support moderate breeding bird densities would also be affected: coniferous forest (3.1 ha), shrubland (87.7 ha) and wetland (70.3 ha). Approximately 134.9 ha of grassland, which supports relatively low breeding bird densities would also be affected (see the EIA, Volume 3B, Section 11, Table 11-5). The potential migratory bird nesting areas (habitat types) temporarily inundated during a design flood are shown in Figure 7-3.

The revised assessment presented in this response does not change the conclusions regarding Project residual effects on change in habitat or change in mortality risk for migratory birds or species at risk (see the EIA, Volume 3B, Section 11.3.2.3).

REFERENCES

ESRD (Alberta Environment and Sustainable Resource Development), 2012. Range Plant Communities and Range Health Assessment Guidelines for the Foothills Parkland Subregion of Alberta. Lands Division, Pincher Creek, AB.

ESRD. 2015. Alberta Wetland Classification System. Water Policy Branch, Policy and Planning Division, Edmonton, AB.

Káinai First Nation. 2018. Blood Tribe/Káinai Traditional Knowledge, Land, and Resource Use Study. Springbank Off-Stream Reservoir Project. Prepared for the Blood Tribe/Káinai. Prepared by Dermot O'Connor, Oak Road Concepts Inc.

Piikani Nation. 2016. Piikani Report on Proposed Springbank Reservoir and Dam. Prepared for Piikani Consultation. Prepared by William Big Bull.

Conformity IR1-09

Topic: Follow-up and Monitoring

Sources:

EIS Guidelines Part 2, Sections 8.0, 8.1, 8.2

EIS Volume 3C, Section 2.0

CEAA Information Requests Related to the Environmental Impact Statement Round 1 Part 1, IR1-09

Alberta Transportation Responses to IR Round 1, SR1 CEAA IR Package 1, June 14, 2019

Context and Rationale:

In CEAA Information Requests Related to the Environmental Impact Statement Round 1 Part 1, IR1-09, the Agency required site- and species- specific mitigation measures and associated follow-up and monitoring programs for certain valued components, as well as a description of how the effectiveness of these mitigation measures would be monitored and evaluated.

In Alberta Transportation's response to IR1-09, Alberta Transportation references a Draft Wildlife Mitigation and Monitoring Plan (Appendix IR9-1) and states that following Project approval, the plan will be finalised in consultation with regulators. The majority of mitigation measures described in the Draft Wildlife Mitigation and Monitoring Plan are listed in Tables 6-1, 6-2, and 6-3 and not attributed to specific species nor do the tables provide information on where the mitigation measures would be applied. Additionally, the tables refer to large areas rather than specific sites. While the response provides information on how the proponent intends to monitor the effectiveness of mitigation designed to reduce predicted changes in wildlife habitat, wildlife movement, and mortality risk, site- and species-specific follow-up and monitoring programs are not described.

IR1-09 specified the need for information pertaining to:

i. birds listed under the Migratory Birds Convention Act

ii. birds listed under the Species at Risk Act

iii. amphibian species at risk

iv. wildlife species at risk

The Agency requires sufficient specific information to understand environmental effects as per CEAA 2012 section 5, in addition to the proponent's more broad characterization of effects to wildlife and biodiversity. Information on mitigation, follow-up, and monitoring specific to wildlife under federal jurisdiction is required.

Information Request:

a) Provide site- and species-specific mitigation measures, and information on the purpose, objectives, and actions of the Project follow-up and monitoring programs for the following valued components of the environment, and describe how the effectiveness of these mitigation measures will be monitored and evaluated:

v. birds listed under the Migratory Birds Convention Act

vi. birds listed under the Species at Risk Act

vii. amphibian species at risk

viii. wildlife species at risk

Response

a) A summary of site- and species-specific mitigation for birds listed under the *Migratory Birds Convention Act, Species at Risk Act* (SARA) as well as other wildlife species at risk listed under Schedule 1 of SARA is provided in Table 9-1 to Table 9-28 for construction, dry operations, flood and post-flood operations.

The list of mitigation measures for migratory birds (including bird species at risk) focus on change in mortality risk because no tall structures will be erected that might affect bird movement during construction and dry operations (see the EIA, Volume 3A, Section 11.4.7.2), and because bird movement is less likely to be restricted during post-flood operations, as described in the EIA, Volume 3B, Section 11.3.8.2.

The primary purpose, objectives and actions of mitigation monitoring for species listed in Table 9-1 to Table 9-28 will be to determine the effectiveness of site-specific mitigation measures.

As described in the EIA, Volume 3C, Section 2, the purpose and objective of the follow-up and monitoring program is to confirm EIA predictions and determine whether permanent features of the Project, such as the diversion channel, act as a barrier to wildlife movement in the LAA, especially for ungulates. Specifically, the follow-up and monitoring program will

be designed to: verify predictions made for Project effects on wildlife movement in the LAA during construction and dry operation; monitor wildlife use of the diversion channel during dry operation; and, where appropriate, determine effectiveness of mitigation to reduce Project effects on wildlife movement. Because the follow-up and monitoring program is designed to monitor movement of large mammals within the LAA including species at risk, the follow-up and monitoring program will determine whether Project components affect grizzly bear habitat use and movement in the LAA. However, other species at risk (e.g., American badger) may be detected as part of the remote camera monitoring program.

Table 9-1 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Construction – Site-wide (All Wildlife Species)

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Site-wide (all wildlife species)	N/A	• change in habitat	Purpose • To reduce potential Project effects on habitat including bird nesting and breeding habitat, amphibian breeding wetlands. Objectives • Reduce direct habitat loss or alteration due to vegetation removal. • Reduce indirect habitat loss (habitat effectiveness) due to sensory disturbance.	• Where possible, temporary workspaces and access roads will avoid wildlife features and native vegetation (shrublands, treed areas, wetlands) that contain potential habitat for migratory birds and wildlife species at risk. • Temporary workspaces will be reclaimed using methods outlined in the Vegetation and Wetland Mitigation, Monitoring and Revegetation Plan (see Alberta Transportation's response to Round 1 CEAA Package 2, IR2-19, Appendix IR19-1. • Pre-construction surveys will be conducted to identify wildlife features (e.g., nests) and appropriate site-specific mitigation developed including but not limited to avoidance of restricted activity periods and implementation of recommended setback distances.	• Mitigation will be applied where wildlife habitat features (e.g., nests, wetlands) or suitable habitat (species-specific) occurs within the Project construction footprint or recommended setback distances. • Overall, mitigation will be applied where there are relatively higher densities of breeding birds (see Figure 7-4) and areas identified as high and moderate habitat suitability for key indicator species (see the EIA, Volume 3A, Figures 11-3 to 11-10).	• Site-specific monitoring will occur at remote camera stations deployed during the remote camera monitoring program (e.g., specific sites along the Elbow River). • The amount (ha) of native land cover types affected will be monitored during each construction year. • The amount (ha) of wetland habitat affected will be monitored as part of the *Wetland Assessment and Impact Report.* • The amount (ha) of wetland habitat reclaimed will be monitored as part of the Vegetation and Wetland Mitigation, Monitoring and Revegetation Plan.	• Site-specific monitoring locations (i.e., camera placement) related to the remote camera monitoring program will be determined in consultation with regulators and Indigenous groups.
		• change in mortality risk	Purpose • To reduce potential Project effects on mortality risk. Objectives • Reduce animal-vehicle collisions. • Reduce wildlife-human conflict.	• Implement Traffic Accommodation Strategy. • All construction traffic will adhere to safety, road closure regulations and other access measures and guidelines for the construction area and access roads. • Waste will be stored in wildlife-proof containers and located away from high suitability bear habitats.	• Mitigation to reduce potential animal-vehicle collisions and wildlife-human conflicts will be focused along Highway 22, Springbank Road, Township Road 242 and 244, access roads as well as temporary workspaces within the construction footprint. • Construction traffic will adhere to safety, road closure regulations and other access measures and guidelines for the construction area and associated access roads.	• An Environmental Monitor will be on site continuously during construction activities to report any wildlife encounters and identify any issues related to wildlife mortality risk.	• The effectiveness of site-specific mitigation and monitoring will be evaluated as part of the Wildlife Mitigation and Monitoring Plan (WMMP); see Alberta Transportation's response to Round 1 CEAA Package 1, IR1-09, Appendix IR9-1.

Table 9-2 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Construction – Water and Wetland Nesting Birds

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Migratory birds (including migratory and non-migratory bird species at risk) **Water and Wetland Nesting Birds**	• horned grebe (*special concern)* • western grebe (*special concern*) • yellow rail *(special concern*) • red knot (*endangered*) • rusty blackbird (*special concern*)	• change in mortality risk	Purpose • To reduce potential Project effects on mortality risk. Objectives • Reduce number of active migratory bird nests destroyed or disturbed.	• Pre-construction surveys will be conducted to identify wildlife features (e.g., nests) and appropriate site-specific mitigation developed including but not limited to avoidance of restricted activity periods and implementation of recommended setback distances. • If construction activities are planned during the restricted activity period (RAP) for migratory birds including species at risk (April 1 to August 31), pre-construction nest surveys will be conducted, and the appropriate setback distance (30 m to 1,000 m) applied to protect any active nests.	• In areas of suitable habitat for specific species. Although nest searches would be conducted in all habitat types, the location and number of migratory bird nests are expected to occur in areas where there are relatively higher densities of breeding birds (see Figure 7-4). • Mitigation for water or wetland birds will be applied where active nests are in graminoid marsh or open shallow water.	• Active nests will only be monitored to determine nest status as appropriate (i.e., determine if nesting/fledging is complete). • The effectiveness of site-specific mitigation will be evaluated using nest completion as an indicator of success.	• Some of the species at risk have a relatively low probability of occurrence due to low suitability staging habitat in the LAA including western grebe and red knot. There are no historical observations of western grebe or red knot in the regional assessment area (RAA). • The location of migratory bird nests within the construction footprint and adjacent habitats that include the recommended setback distances will be identified during pre-construction surveys. • Although the exact locations of future migratory bird nests are not known as the majority of migratory birds observed in the LAA do not re-use nests on an annual basis, it is expected that site-specific mitigation (i.e., recommended setback distances for active nests) will be applied more frequently in habitats that have relatively higher densities of breeding birds as shown in Figure 7-4.

Table 9-3 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Construction – Ground Nesting Upland Birds

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Migratory birds (including migratory and non-migratory bird species at risk) **Ground Nesting Upland Birds**	• long-billed curlew (*special concern*) • short-eared owl (*special concern*) • common nighthawk (*special concern)* • sprague's pipit (*threatened*) • baird's sparrow (*special concern*) • bobolink (*threatened*)	• change in mortality risk	Purpose • To reduce potential Project effects on mortality risk. Objectives • Reduce number of active migratory bird nests destroyed or disturbed.	• Pre-construction surveys will be conducted to identify wildlife features (e.g., nests) and appropriate site-specific mitigation developed including but not limited to avoidance of restricted activity periods and implementation of recommended setback distances. • If construction activities are planned during the RAP for migratory birds including species at risk (April 1 to August 31), pre-construction nest surveys will be conducted, and the appropriate setback distance (30 m to 350 m) applied to protect any active nests.	• In areas of suitable habitat for specific species. Although nest searches would be conducted in all habitat types, the location and number of migratory bird nests are expected to occur in areas where there are relatively higher densities of breeding birds (see Figure 7-4).	• Active nests will only be monitored to determine nest status as appropriate (i.e., determine if nesting/fledging is complete). • The effectiveness of site-specific mitigation will be evaluated using nest completion as an indicator of success.	• Some of the species at risk have a relatively low probability of occurrence due to low suitability habitat in the LAA including Sprague's pipit and bobolink. • The location of migratory bird nests within the construction footprint and adjacent habitats that include the recommended setback distances will be identified during pre-construction surveys. • Although the exact locations of future migratory bird nests are not known as the majority of migratory birds observed in the LAA do not re-use nests on an annual basis, it is expected that site-specific mitigation (i.e., recommended setback distances for active nests) will be applied more frequently in habitats that have relatively higher densities of breeding birds as shown in Figure 7-4.

Table 9-4 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Construction – Tree or Shrub Nesting Birds

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Migratory birds (including migratory and non-migratory bird species at risk) **Tree or shrub nesting birds**	• **olive-sided flycatcher** (*threatened*) • loggerhead shrike (*threatened*)	• change in mortality risk	Purpose • To reduce potential Project effects on mortality risk. Objectives • Reduce number of active migratory bird nests destroyed or disturbed.	• Pre-construction surveys will be conducted to identify wildlife features (e.g., nests) and appropriate site-specific mitigation developed including but not limited to avoidance of restricted activity periods and implementation of recommended setback distances. • If construction activities are planned during RAP for migratory birds including species at risk (April 1 to August 31), pre-construction nest surveys will be conducted, and the appropriate setback distance (30 m to 1,000 m) applied to protect any active nests.	• In areas of suitable habitat for specific species. Although nest searches would be conducted in all habitat types, the location and number of migratory bird nests are expected to occur in areas where there are relatively higher densities of breeding birds (see Figure 7-4).	• Active nests will only be monitored to determine nest status as appropriate (i.e., determine if nesting/fledging is complete). • The effectiveness of site-specific mitigation will be evaluated using nest completion as an indicator of success.	• Some of the species at risk have a relatively low probability of occurrence due to low suitability habitat in the LAA including the peregrine falcon. • The location of migratory bird nests within the construction footprint and adjacent habitats that include the recommended setback distances will be identified during pre-construction surveys. • Although the exact locations of future migratory bird nests are not known as the majority of migratory birds observed in the LAA do not re-use nests on an annual basis, it is expected that site-specific mitigation (i.e., recommended setback distances for active nests) will be applied more frequently in habitats that have relatively higher densities of breeding birds as shown in Figure 7-4.

NOTE:
Bolded species represent wildlife species at risk observed in the LAA during wildlife baseline surveys

Table 9-5 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Construction – Other Nesters

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Migratory birds (including migratory and non-migratory bird species at risk) **Other nesters (e.g., cliffs, anthropogenic structures)**	• **bank swallow** (*threatened*) • **barn swallow** (*threatened*) • peregrine falcon (*special concern*)	• Change in Mortality Risk	Purpose • To reduce potential Project effects on mortality risk. Objectives • Reduce number of active migratory bird nests destroyed or disturbed.	• Pre-construction surveys will be conducted to identify wildlife features (e.g., nests) and appropriate site-specific mitigation developed including but not limited to avoidance of restricted activity periods and implementation of recommended setback distances. • If construction activities are planned during the RAP for migratory birds including species at risk (April 1 to August 31), pre-construction nest surveys will be conducted, and the appropriate setback distance (30-1000 m) applied to protect any active nests.	• In areas of suitable habitat for specific species. Although nest searches would be conducted in all habitat types, the location and number of migratory bird nests are expected to occur in areas where there are relatively higher densities of breeding birds (see Figure 7-4).	• Active nests will only be monitored to determine nest status as appropriate (i.e., determine if nesting/fledging is complete). • The effectiveness of site-specific mitigation will be evaluated using nest completion as an indicator of success.	• Some of the species at risk have a relatively low probability of occurrence due to low suitability habitat in the LAA including the peregrine falcon. • The location of migratory bird nests within the construction footprint and adjacent habitats that include the recommended setback distances will be identified during pre-construction surveys. • Although the exact locations of future migratory bird nests are not known as the majority of migratory birds observed in the LAA do not re-use nests on an annual basis, it is expected that site-specific mitigation (i.e., recommended setback distances for active nests) will be applied more frequently in habitats that have relatively higher densities of breeding birds as shown in Figure 7-4.

NOTE:
Bolded species represent wildlife species at risk observed in the LAA during wildlife baseline surveys

Table 9-6 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Construction – Amphibian Species at Risk

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Amphibian species at risk	• northern leopard frog (*special concern*) • western toad (*special concern*) • western tiger salamander (*special concern*)	• change in mortality risk	Purpose • To reduce potential Project effects on amphibian mortality risk. Objectives • Reduce mortality risk (i.e., physical destruction) to amphibian breeding wetlands due to ground disturbance and vegetation removal.	• Pre-construction surveys will be conducted to identify amphibian breeding wetlands and appropriate site-specific mitigation developed including but not limited to avoidance of amphibian active periods (April 15-September 30) periods and implementation of recommended setback distances (100 m). • If construction activities occur within 100 m of an amphibian SOMC breeding wetland during the breeding season April 15 to September 30), install silt fencing around the perimeter of the wetlands to prevent amphibians from moving into active construction areas.	• Mitigation will be applied where amphibian breeding wetlands occur within the Project construction footprint or recommended setback distance (100 m). • Graminoid marsh wetlands are relatively more abundant between the proposed off-stream dam and Springbank Road as well as west of Highway 22 north of Township Road 244 and north of Township Road 242 (see the EIA, Volume 3A, Section 10.2.2., Figure 10-3).	• An Environmental Monitor will be on site continuously during construction activities to investigate the fencing and relocate any amphibians trapped by the silt fencing, as directed by a qualified wildlife biologist.	• None of the amphibian species at risk were observed during nocturnal or diurnal amphibian surveys (see the EIA, Volume 4, Appendix H). • A total of 3% of the LAA represents high and moderate suitability habitat for northern leopard frog (see the EIA, Volume 3A, Section 11.2.2.4, Table 11-8). • Moderate potential for western toad and western tiger salamander to occur in the LAA.

Table 9-7 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Construction – Mammal Species at Risk

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Mammal species at risk	• **grizzly bear** (*special concern*)	• change in mortality risk • change in movement	<u>Purpose</u> • To reduce potential Project effects on mortality risk grizzly bear movement. <u>Objectives</u> • Reduce mortality risk (i.e., physical destruction) of key habitat features (i.e., dens) due to ground disturbance and vegetation removal. • Reduce potential barrier effects due to major project structures (diversion channel, floodplain berm, off-stream reservoir).	• Where possible, temporary workspaces and access roads will avoid wildlife features (e.g., dens) and native vegetation (shrublands, treed areas, wetlands) that contain potential habitat for grizzly bear. • Pre-construction surveys will be conducted to identify wildlife features (e.g., dens) and appropriate site-specific mitigation developed including but not limited to avoidance of restricted activity periods (October 1 to April 30) and implementation of recommended setback distances (200 m to 750 m) as appropriate. • Sections of side slopes and bottom of the diversion channel, and side slopes of the floodplain berm and off-stream dam will be vegetated. • Vegetated areas will provide a more conducive material for wildlife movement. • The diversion channel and off-stream dam will be built with side slopes of 3H:1V, and 3.5H:1V respectively. • Where fencing is proposed around the PDA, wildlife-friendly fencing will be installed to allow wildlife passage (except for fencing around the diversion structure control building).	• Mitigation will be applied where wildlife habitat features (e.g., dens) or suitable habitat (species-specific) occurs within the Project construction footprint or recommended setback distances. • Mitigation to facilitate wildlife movement including mammal species at risk (e.g., grizzly bear) will occur along sections of the diversion channel including the underpass design for the Highway 22 bridge over the diversion channel as well as wildlife friendly fencing locations.	• Site-specific monitoring will occur at remote camera stations deployed during the remote camera monitoring program (e.g., specific sites along Elbow River). • Active dens will only be monitored to determine den status as appropriate (i.e., determine if denning is complete). • The effectiveness of site-specific mitigation will be evaluated using den abandonment as an indicator, where required. • Grizzly bear movement will be monitored as part of the remote camera monitoring program to determine whether wildlife-friendly fences are effective or permanent features of the Project, such as the diversion channel, or floodplain berm act as a barrier to grizzly bear movement in the LAA.	• The LAA contains a total of 9.6% of high and moderate suitability feeding habitat for grizzly bear and only 1.1% of moderate suitability summer feeding habitat (see the EIA, Volume 3A, Section 11.2.2.4, Table 11-8). • Grizzly bear was detected at two of six remote camera stations deployed along the Elbow River during the remote camera program (see the e.g.EIA, Volume 4, Appendix H, Figure 2-1). • If an active den (i.e., grizzly bear,) is identified, site-specific mitigation will be developed in consultation with regulators.

Table 9-7 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Construction – Mammal Species at Risk

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Mammal species at risk (cont'd)	• American badger (*special concern*)	• change in mortality risk • change in movement	<u>Purpose</u> • To reduce potential Project effects on mortality risk and badger movement. <u>Objectives</u> • Reduce mortality risk (i.e., physical destruction) of key habitat features (e.g., dens) due to ground disturbance and vegetation removal. • Reduce potential barrier effects due to major project structures (diversion channel, floodplain berm, off stream reservoir).	• Where possible, temporary workspaces and access roads will avoid wildlife features (e.g., dens) and native vegetation (shrublands, treed areas, wetlands) that contain potential habitat for American badger. • Pre-construction surveys will be conducted to identify wildlife features (e.g., dens) and appropriate site-specific mitigation developed including but not limited to avoidance of restricted activity periods and implementation of recommended setback distances.	• Mitigation will be applied where wildlife habitat features (e.g., dens) or suitable habitat (species-specific) occurs within the Project construction footprint or recommended setback distances. • Mitigation to facilitate wildlife movement including mammal species at risk (e.g., American badger) will occur along sections of the diversion channel including the underpass design for the Highway 22 bridge over the diversion channel as well as wildlife friendly fencing locations.	• Site-specific monitoring will occur at remote camera stations deployed during the remote camera monitoring program (e.g., specific sites along the Elbow River). • Active dens will only be monitored to determine den status as appropriate (i.e., determine if denning is complete). • The effectiveness of site-specific mitigation will be evaluated using den abandonment (i.e., no longer occupied) as an indicator, where required.	• No badger dens were identified during wildlife baseline surveys. • If an active den (i.e., American badger) is identified, site-specific mitigation will be developed in consultation with regulators.
	• little brown myotis (*endangered*)	• change in mortality risk	<u>Purpose</u> • To reduce potential Project effects on mortality risk. <u>Objectives</u> • Reduce mortality risk (i.e., physical destruction) of key habitat features (e.g., dens, roosting sites) due to ground disturbance and vegetation removal.	• Where possible, temporary workspaces and access roads will avoid wildlife features (e.g., dens) and native vegetation (shrublands, treed areas, wetlands) that contain potential habitat for little brown myotis. • Pre-construction surveys will be conducted to identify wildlife features (e.g., roosts) and appropriate site-specific mitigation developed including but not limited to avoidance of restricted activity periods and implementation of recommended setback distances.	• Mitigation will be applied where wildlife habitat features (e.g., hibernacula, roosting sites occurs within the Project construction footprint or recommended setback distances.	• Site-specific monitoring will occur where active bat features are identified. • The effectiveness of site-specific mitigation will be evaluated using criteria developed in consultation with regulators, where required.	• No bat hibernacula were identified during wildlife baseline surveys. • If bat roosting site or hibernacula are identified, site-specific mitigation will be developed in consultation with regulators.
NOTE: Bolded species represent wildlife species at risk observed in the LAA during wildlife baseline surveys							

Table 9-8 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Dry Operations – Site-wide (All Wildlife Species)

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Site-wide (all wildlife species)	N/A	• change in habitat	<u>Purpose</u> • To reduce potential Project effects on habitat including nesting and breeding habitat. <u>Objectives</u> • Reduce indirect habitat loss (habitat effectiveness) due to sensory disturbance during maintenance activities.	• If maintenance activities are planned during the RAP for migratory birds including species at risk (April 1 to August 31), a bird nest search will be conducted, and the appropriate setback distance (30 m to 1,000 m) applied to protect any active nests.	• Mitigation will be applied where wildlife habitat features (e.g., nests, wetlands) or suitable habitat (species-specific) occurs within the Project construction footprint or recommended setback distances. • Overall, mitigation will be applied where there are relatively higher densities of breeding birds (see Figure 7-4) and areas identified as high and moderate habitat suitability for key indicator species (see the EIA, Volume 3A, Figures 11-3 to 11-10).	• Site-specific monitoring will occur at remote camera stations deployed during the remote camera monitoring program (e.g., specific sites along the diversion channel and Elbow River). • The amount (ha) of native land cover types affected will be monitored during each construction year. • The amount (ha) of wetland habitat affected will be monitored as part of the *Wetland Assessment and Impact Report.* • The amount (ha) of wetland habitat reclaimed will be monitored as part of the Vegetation and Wetland Mitigation, Monitoring and Revegetation Plan.	• Site-specific monitoring locations (i.e., camera placement) related to the remote camera monitoring program will be determined in consultation with regulators and Indigenous groups.
		• change in mortality risk	<u>Purpose</u> • To reduce potential Project effects on mortality risk. <u>Objectives</u> • Reduce animal-vehicle collisions. • Reduce wildlife-human conflict.	• If maintenance activities are planned during RAP for migratory birds including species at risk (April 1 to August 31), a bird nest search will be conducted, and the appropriate setback distance (30 m to 1,000 m) applied to protect any active nests.	• In areas of suitable habitat for specific species.	• Site-specific monitoring will occur where species-specific habitat use data are required to meet broader monitoring objectives (e.g., remote camera program).	• Some of the species at risk have a relatively low probability of occurrence due to low suitability habitat in the LAA.

Table 9-9 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Dry Operations – Water and Wetland Nesting Birds

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Migratory birds (including migratory and non-migratory bird species at risk) **Water and Wetland Nesting Birds**	• horned grebe (*special concern*) • western grebe (*special concern*) • yellow rail (*special concern*) • red knot (*endangered*) • rusty blackbird (*special concern*)	• change in mortality risk	Purpose • To reduce potential Project effects on mortality risk. Objectives • Reduce number of active migratory bird nests destroyed or disturbed.	• If maintenance activities are planned during the RAP for migratory birds including species at risk (April 1 to August 31), a bird nest search will be conducted, and the appropriate setback distance (30 m to 1,000 m) applied to protect any active nests.	• In areas of suitable habitat for specific species. Although nest searches would be conducted in all habitat types, the location and number of migratory bird nests are expected to occur in areas where there are relatively higher densities of breeding birds (see Figure 7-4). • Mitigation for water or wetland birds will be applied where active nests are in graminoid marsh or open shallow water.	• Active nests will only be monitored to determine nest status as appropriate (i.e., determine if nesting/fledging is complete). • The effectiveness of site-specific mitigation will be evaluated using nest completion as an indicator of success.	• Some of the species at risk have a relatively low probability of occurrence due to low suitability staging habitat in the LAA including western grebe and red knot. There are no historical observations of western grebe or red knot in the RAA. • The location of migratory bird nests within the construction footprint and adjacent habitats including the recommended setback distances will be identified during pre-construction surveys. • Although the exact locations of future migratory bird nests are not known as the majority of migratory birds observed in the LAA do not re-use nests on an annual basis, it is expected that site-specific mitigation (i.e., recommended setback distances for active nests) will be applied more frequently in habitats that have relatively higher densities of breeding birds as shown in Figure 7-4.

Table 9-10 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Dry Operations – Ground Nesting Upland Birds

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Migratory birds (including migratory and non-migratory bird species at risk) **Ground Nesting Upland Birds**	• long-billed curlew (*special concern*) • short-eared owl (*special concern)* • common nighthawk (*special concern*) • Sprague's pipit (*threatened*) • Baird's sparrow (*special concern*) • bobolink (*threatened*)	• change in mortality risk	Purpose • To reduce potential Project effects on mortality risk. Objectives • Reduce number of active migratory bird nests destroyed or disturbed.	• If maintenance activities are planned during the RAP for migratory birds including species at risk (April 1 to August 31), a bird nest search will be conducted, and the appropriate setback distance (30 m to 1,000 m) applied to protect any active nests.	• In areas of suitable habitat for specific species. Although nest searches would be conducted in all habitat types, the location and number of migratory bird nests are expected to occur in areas where there are relatively higher densities of breeding birds (see Figure 7-4).	• Active nests will only be monitored to determine nest status as appropriate (i.e., determine if nesting/fledging is complete). • The effectiveness of site-specific mitigation will be evaluated using nest completion as an indicator of success.	• Some of the species at risk have a relatively low probability of occurrence due to low suitability habitat in the LAA including Sprague's pipit and bobolink. • The location of migratory bird nests within the construction footprint and adjacent habitats, including the recommended setback distances, will be identified during pre-construction surveys. • Although the exact locations of future migratory bird nests are not known as the majority of migratory birds observed in the LAA do not re-use nests on an annual basis, it is expected that site-specific mitigation (i.e., recommended setback distances for active nests) will be applied more frequently in habitats that have relatively higher densities of breeding birds as shown in Figure 7-4.

Table 9-11 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Dry Operations – Tree or Shrub Nesting Birds

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Migratory birds (including migratory and non-migratory bird species at risk) **Tree or Shrub Nesting Birds**	• **olive-sided flycatcher** (*threatened*) • loggerhead shrike (*threatened*)	change in mortality risk	Purpose • To reduce potential Project effects on mortality risk. Objectives • Reduce number of active migratory bird nests destroyed or disturbed.	• If maintenance activities are planned during the RAP for migratory birds including species at risk (April 1 to August 31), a bird nest search will be conducted, and the appropriate setback distance (30 m to 1,000 m) applied to protect any active nests.	• In areas of suitable habitat for specific species. Although nest searches would be conducted in all habitat types, the location and number of migratory bird nests are expected to occur in areas where there are relatively higher densities of breeding birds (see Figure 7-4).	• Active nests will only be monitored to determine nest status as appropriate (i.e., determine if nesting/fledging is complete). • The effectiveness of site-specific mitigation will be evaluated using nest completion as an indicator of success.	• Some of the species at risk have a relatively low probability of occurrence due to low suitability habitat in the LAA including the peregrine falcon. • The location of migratory bird nests within the construction footprint and adjacent habitats including the recommended setback distances will be identified during pre-construction surveys. • Although the exact locations of future migratory bird nests are not known as the majority of migratory birds observed in the LAA do not re-use nests on an annual basis, it is expected that site-specific mitigation (i.e., recommended setback distances for active nests) will be applied more frequently in habitats that have relatively higher densities of breeding birds as shown in Figure 7-4.

NOTE:
Bolded species represent wildlife species at risk observed in the LAA during wildlife baseline surveys

Table 9-12 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Dry Operations – Other Nesters

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Migratory birds (including migratory and non-migratory bird species at risk) **Other Nesters (e.g., cliffs, anthropogenic structures)**	• **bank swallow** (*threatened*) • **barn swallow** (*threatened*) • peregrine falcon (*special concern*)	change in mortality risk	Purpose • To reduce potential Project effects on mortality risk. Objectives • Reduce number of active migratory bird nests destroyed or disturbed.	• If maintenance activities are planned during the RAP for migratory birds including species at risk (April 1 to August 31), a bird nest search will be conducted, and the appropriate setback distance (30 m to 1,000 m) applied to protect any active nests.	• In areas of suitable habitat for specific species. Although nest searches would be conducted in all habitat types, the location and number of migratory bird nests are expected to occur in areas where there are relatively higher densities of breeding birds (see Figure 7-4).	• Active nests will only be monitored to determine nest status as appropriate (i.e., determine if nesting/fledging is complete). • The effectiveness of site-specific mitigation will be evaluated using nest completion as an indicator of success.	• Some of the species at risk have a relatively low probability of occurrence due to low suitability habitat in the LAA including the peregrine falcon. • The location of migratory bird nests within the construction footprint and adjacent habitats including the recommended setback distances will be identified during pre-construction surveys. • Although the exact locations of future migratory bird nests are not known as the majority of migratory birds observed in the LAA do not re-use nests on an annual basis, it is expected that site-specific mitigation (i.e., recommended setback distances for active nests) will be applied more frequently in habitats that have relatively higher densities of breeding birds as shown in Figure 7-4.

NOTE:
Bolded species represent wildlife species at risk observed in the LAA during wildlife baseline surveys

Table 9-13 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Dry Operations – Amphibian Species at Risk

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Amphibian species at risk	• northern leopard frog (*special concern*) • western toad (*special concern*) • western tiger salamander (*special concern*)	• change in mortality risk	Purpose • To reduce potential Project effects on amphibian mortality risk. Objectives • Reduce mortality risk to amphibians during maintenance activities.	• If maintenance activities are planned to occur within 100 m of an amphibian SOMC breeding wetland during the breeding season (approximately April 15 to September 30), install silt fencing around the perimeter of the wetlands to prevent amphibians from moving into disturbance footprint.	• Mitigation will be applied where amphibian breeding wetlands occur within the Project construction footprint or recommended setback distance (100 m). • Graminoid marsh wetlands are relatively more abundant between the proposed off-stream dam and Springbank Road as well as west of Highway 22 north of Township Road 244 and north of Township Road 242 (see the EIA, Volume 3A, Section 10.2.2., Figure 10-3).	• An environmental monitor will be on site continuously during construction activities to investigate the fencing and relocate any amphibians trapped by the silt fencing, as directed by a qualified wildlife biologist.	• None of the amphibian species at risk were observed during nocturnal or diurnal amphibian surveys (see the EIA, Volume 4, Appendix H). • A total of 3% of the LAA represents high and moderate suitability habitat for northern leopard frog (see the EIA, Volume 3A, Section 11.2.2.4, Table 11-8). • Moderate potential for western toad and western tiger salamander to occur in the LAA.

Table 9-14 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Dry Operations – Mammal Species at Risk

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Mammal species at risk	• **grizzly bear** (*special concern*)	• change in mortality risk • change in movement	<u>Purpose</u> • To reduce potential Project effects on mortality risk and grizzly bear movement. <u>Objectives</u> • Reduce mortality risk due to human-bear conflict during maintenance activities. • Reduce potential barrier effects due to major project structures (diversion channel, floodplain berm, off stream reservoir).	• Waste will be stored in wildlife-proof containers and located away from high suitability bear habitats. • Sections of side slopes and bottom of the diversion channel, and side slopes of the floodplain berm and off-stream dam will be vegetated. • Vegetated areas will provide a more conducive material for wildlife movement. • The diversion channel and off-stream dam will be built with side slopes of 3H:1V, and 3.5H:1V respectively. • Where fencing is proposed around the PDA, wildlife-friendly fencing will be installed to allow wildlife passage (except for fencing around the diversion structure control building).	• Mitigation will be applied where wildlife habitat features (e.g., dens) or suitable habitat (species-specific) occurs within the Project construction footprint or recommended setback distances. • Mitigation to facilitate wildlife movement including mammal species at risk (e.g., grizzly bear) will occur along sections of the diversion channel including the underpass design for the Highway 22 bridge over the diversion channel as well as wildlife friendly fencing locations.	• Site-specific monitoring will occur at remote camera stations deployed during the remote camera monitoring program (e.g., specific sites along Elbow River). • Active dens will only be monitored to determine den status as appropriate (i.e., determine if denning is complete). • The effectiveness of site-specific mitigation will be evaluated using den abandonment (i.e., no longer occupied) as an indicator, where required. • Grizzly bear movement will be monitored as part of the remote camera monitoring program to determine whether wildlife-friendly fences are effective or permanent features of the Project, such as the diversion channel, or floodplain berm act as a barrier to grizzly bear movement in the LAA.	• The LAA contains a total of 9.6% of high and moderate suitability feeding habitat for grizzly bear and only 1.1% of moderate suitability summer feeding habitat (see the EIA, Volume 3A, Section 11.2.2.4, Table 11-8). • Grizzly bear was detected at two of six remote camera stations deployed along the Elbow River during the remote camera program (see the EIA, Volume 4, Appendix H, Figure 2-1). • If an active den (i.e., grizzly bear,) is identified, site-specific mitigation will be developed in consultation with regulators.

Table 9-14 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Dry Operations – Mammal Species at Risk

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Mammal species at risk (cont'd)	• American badger (*special concern*)	• change in mortality risk • change in movement	Purpose • To reduce potential Project effects on mortality risk and badger movement. Objectives • Reduce mortality risk to badger dens during maintenance activities. • Reduce potential barrier effects due to major project structures (diversion channel, floodplain berm, off stream reservoir).	• If an active den (i.e., American badger) is identified, site-specific mitigation will be developed in consultation with regulators. • Where fencing is proposed around the PDA, wildlife-friendly fencing will be installed to allow wildlife passage (except for fencing around the diversion structure control building).	• Mitigation will be applied where wildlife habitat features (e.g., dens) or suitable habitat (species-specific) occurs within the Project construction footprint or recommended setback distances. • Mitigation to facilitate wildlife movement including mammal species at risk (e.g., American badger) will occur along sections of the diversion channel including the underpass design for the Highway 22 bridge over the diversion channel as well as wildlife friendly fencing locations.	• Site-specific monitoring will occur where species-specific habitat use data are required to meet broader monitoring objectives (e.g., remote camera program). • Active dens will only be monitored to determine den status as appropriate (i.e., determine if denning is complete). • The effectiveness of site-specific mitigation will be evaluated using den abandonment as an indicator of success, where required.	• No badger dens were identified during wildlife baseline surveys.
	• little brown myotis (*endangered*)	• change in mortality risk • change in movement	Purpose • To reduce potential Project effects on mortality risk. Objectives • Reduce mortality risk (i.e., physical destruction) of key habitat features (e.g., roosting sites) due to ground disturbance and vegetation removal. • Reduce potential barrier effects due to major project structures (diversion channel, floodplain berm, off stream reservoir).	• Pre-construction surveys will be conducted to identify wildlife features such as roosts. • If a bat roosting site or hibernacula is identified, site-specific mitigation will be developed in consultation with regulators.	• Mitigation will be applied where wildlife habitat features (e.g., roosts) or suitable habitat (species-specific) occurs within the Project construction footprint or recommended setback distances.	• Site-specific monitoring will occur where active bat features are identified. • The effectiveness of site-specific mitigation will be evaluated using criteria developed in consultation with regulators, where required.	• No bat hibernacula or roost sites were observed during wildlife baseline surveys.
NOTE: Bolded species represent wildlife species at risk observed in the LAA during wildlife baseline surveys							

Table 9-15 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Flood Operations – Site-wide (All Wildlife Species)

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Site-wide (all wildlife species)	N/A	• change in habitat	• See Context and Rationale.	• See Context and Rationale.	• See Context and Rationale.	• See Context and Rationale.	• There is no mitigation proposed during flood operations. As stated in the draft WMMP, a post-flood habitat assessment will be conducted to assess change in habitat (i.e., habitat suitability).
		• change in mortality risk	• See Context and Rationale.	• See Context and Rationale.	• See Context and Rationale.	• See Context and Rationale.	• There is no mitigation proposed during flood operations. As stated in the draft WMMP, a post-flood habitat assessment will be conducted to identify habitat features that may be affected and record observations of wildlife species.

Table 9-16 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Flood Operations – Water and Wetland Nesting Birds

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Migratory birds (including migratory and non-migratory bird species at risk) **Water and Wetland Nesting Birds**	• horned grebe (*special concern*) • western grebe (*special concern*) • yellow rail (*special concern*) • red knot (*endangered*) • rusty blackbird (*special concern*)	• change in mortality risk	• See Context and Rationale.	• See Context and Rationale.	• See Context and Rationale.	• See Context and Rationale.	There is no mitigation proposed to reduce mortality risk to water or wetland nesting birds during flood operations for the following reasons: • As stated in Alberta Transportation's response to Round 1 CEAA Package 1, IR1-07, salvage of eggs and nestlings in the off-stream reservoir immediately before flooding will not be possible because of safety concerns. • There will be limited advance warning for potential flooding, which is estimated to be between 30 and 49 hours. At that time, public warnings will be issued and, as part of the emergency response procedures, human access to the PDA will be limited to AEP Operations and staff. • Flow rates in Elbow River can change rapidly during rain or other flooding events; therefore, the decision to open the diversion inlet gates will occur quickly. Furthermore, salvage of bird nests and eggs is not practical or feasible for the following reasons: • As stated above, there is limited time available to collect nests and eggs once the advance warning of the potential flooding has been issued. • The likelihood of successfully moving and transporting eggs and nestlings to an area that is safe and where adults could find them again is considered to be very low. • Other potential mitigations such as bird deterrents are also considered not practical given the potential for habituation (i.e., reduced effectiveness). • As stated in Alberta Transportation's response to Round 1 CEAA Package 1, IR1-07, placing deterrents (e.g., decoys, decals, noise makers) in the off-stream reservoir during dry operations as suggested by ECCC would reduce the availability of suitable nesting and foraging habitat for migratory birds in the PDA during non-flood years, which could extend for relatively long time periods, given the probability of floods. • In addition, the use of bird deterrents is incompatible with the land use principles that Alberta Transportation is trying to establish for the PDA in consultation with First Nations.

NOTE:
Flood operations refers to water diversion from the Elbow River to the diversion channel and off-stream reservoir (i.e., reservoir filling) and the draining of the reservoir

Table 9-17 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Flood Operations – Ground Nesting Upland Birds

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Migratory birds (including migratory and non-migratory bird species at risk) **Ground Nesting Upland Birds**	• long-billed curlew (*special concern*) • short-eared owl (*special concern*) • common nighthawk (*special concern*) • Sprague's pipit (*threatened*) • baird's sparrow (*special concern*) • bobolink (*threatened*)	• change in mortality risk	• See Context and Rationale.	• See Context and Rationale.	• See Context and Rationale.	• See Context and Rationale.	There is no mitigation proposed to reduce mortality risk to ground nesting upland birds during flood operations for the following reasons: • As stated in Alberta Transportation's response to Round 1 CEAA Package 1, IR1-07, salvage of eggs and nestlings in the off-stream reservoir immediately before flooding will not be possible because it is a safety concern to do so. • There will be limited advance warning for potential flooding, which is estimated to be between 30 hours and 49 hours. At that time, public warnings will be issued and, as part of the emergency response procedures, human access to the PDA will be limited to AEP Operations and staff. • Flow rates in Elbow River can change rapidly during rain or other flooding events; therefore, the decision to open the diversion inlet gates will occur quickly. Furthermore, salvage of bird nests and eggs is not practical or feasible for the following reasons: • As stated above, there is limited time available to collect nests and eggs once the advance warning of the potential flooding has been issued. • The likelihood of successfully moving and transporting eggs and nestlings to an area that is safe and where adults could find them again is considered to be very low. Other potential mitigations such as bird deterrents are also considered not practical given the potential for habituation (i.e., reduced effectiveness). • As stated in response to Round 1 CEAA Package 1, IR1-07, placing deterrents (e.g., decoys, decals, noise makers) in the off-stream reservoir during dry operations as suggested by ECCC would reduce the availability of suitable nesting and foraging habitat for migratory birds in the PDA during non-flood years, which could extend for relatively long time periods, given the probability of floods. • In addition, the use of bird deterrents is incompatible with the land use principles that Alberta Transportation is trying to establish for the PDA in consultation with First Nations.

NOTE:
Flood operations refers to water diversion from the Elbow River to the diversion channel and off-stream reservoir (i.e., reservoir filling) and the draining of the reservoir

Table 9-18 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Flood Operations – Tree or Shrub Nesting Birds

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Migratory birds (including migratory and non-migratory bird species at risk) **Tree or Shrub Nesting Birds**	• **olive-sided flycatcher** (*threatened*) • loggerhead shrike (*threatened*)	• change in mortality risk	• See Context and Rationale.	• See Context and Rationale.	• See Context and Rationale.	• See Context and Rationale.	There is no mitigation proposed to reduce mortality risk to tree or shrub nesting birds or species dependent on other features (e.g., cliffs, ledges, anthropogenic structures) during flood operations for the following reasons: • As stated in response to Round 1 CEAA Package 1, IR1-07, salvage of eggs and nestlings in the off-stream reservoir immediately before flooding will not be possible because it is a safety concern to do so. • There will be limited advance warning for potential flooding, which is estimated to be between 30 hours and 49 hours. At that time, public warnings will be issued and, as part of the emergency response procedures, human access to the PDA will be limited to AEP Operations and staff. • Flow rates in Elbow River can change rapidly during rain or other flooding events; therefore, the decision to open the diversion inlet gates will occur quickly. Furthermore, salvage of bird nests and eggs is not practical or feasible for the following reasons: • As stated above, there is limited time available to collect nests and eggs once the advance warning of the potential flooding has been issued. • The likelihood of successfully moving and transporting eggs and nestlings to an area that is safe and where adults could find them again is considered to be very low. • Other potential mitigations such as bird deterrents are also considered not practical given the potential for habituation (i.e., reduced effectiveness). • As stated in response to Round 1 CEAA Package 1, IR1-07, placing deterrents (e.g., decoys, decals, noise makers) in the off-stream reservoir during dry operations as suggested by ECCC would reduce the availability of suitable nesting and foraging habitat for migratory birds in the PDA during non-flood years, which could extend for relatively long time periods, given the probability of floods. • In addition, the use of bird deterrents is incompatible with the land use principles that Alberta Transportation is trying to establish for the PDA in consultation with First Nations.

NOTES:
Flood operations refers to water diversion from the Elbow River to the diversion channel and off-stream reservoir (i.e., reservoir filling) and the draining of the reservoir
Bolded species represent wildlife species at risk observed in the LAA during wildlife baseline surveys

Table 9-19 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Flood Operations – Other Nesters

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Migratory birds (including migratory and non-migratory bird species at risk) **Other Nesters (e.g., cliffs, anthropogenic structures)**	• **bank swallow** (*threatened*) • **barn swallow** (*threatened*) • peregrine falcon (*special concern*)	• change in mortality risk	• See Context and Rationale.	• See Context and Rationale.	• See Context and Rationale.	• See Context and Rationale.	There is no mitigation proposed to reduce mortality risk to tree or shrub nesting birds or species dependent on other features (e.g., cliffs, ledges, anthropogenic structures) during flood operations for the following reasons: • As stated in response to Round 1 CEAA Package 1, IR1-07, salvage of eggs and nestlings in the off-stream reservoir immediately before flooding will not be possible because it is a safety concern to do so. • There will be limited advance warning for potential flooding, which is estimated to be between 30 hours and 49 hours. At that time, public warnings will be issued and, as part of the emergency response procedures, human access to the PDA will be limited to AEP Operations and staff. • Flow rates in Elbow River can change rapidly during rain or other flooding events; therefore, the decision to open the diversion inlet gates will occur quickly. Furthermore, salvage of bird nests and eggs is not practical or feasible for the following reasons: • As stated above, there is limited time available to collect nests and eggs once the advance warning of the potential flooding has been issued. • The likelihood of successfully moving and transporting eggs and nestlings to an area that is safe and where adults could find them again is considered to be very low. • Other potential mitigations such as bird deterrents are also considered not practical given the potential for habituation (i.e., reduced effectiveness). • As stated in response to Round 1 CEAA Package 1, IR1-07, placing deterrents (e.g., decoys, decals, noise makers) in the off-stream reservoir during dry operations as suggested by ECCC would reduce the availability of suitable nesting and foraging habitat for migratory birds in the PDA during non-flood years, which could extend for relatively long time periods, given the probability of floods. • In addition, the use of bird deterrents is incompatible with the land use principles that Alberta Transportation is trying to establish for the PDA in consultation with First Nations.

NOTES:
Flood operations refers to water diversion from the Elbow River to the diversion channel and off-stream reservoir (i.e., reservoir filling) and the draining of the reservoir
Bolded species represent wildlife species at risk observed in the LAA during wildlife baseline surveys

Table 9-20 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Flood Operations – Amphibian Species at Risk

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Amphibian species at risk	• northern leopard frog (*special concern*) • western toad (*special concern*) • western tiger salamander (*special concern*)	• change in mortality risk	• See Context and Rationale.	• See Context and Rationale.	• See Context and Rationale.	• See Context and Rationale.	There is no mitigation proposed to reduce mortality risk to amphibian species at risk during flood operations for the following reasons: • As stated in response to Round 1 CEAA Package 1, IR1-07, salvage of eggs and nestlings in the off-stream reservoir immediately before flooding will not be possible because it is a safety concern to do so. • There will be limited advance warning for potential flooding, which is estimated to be between 30 hours and 49 hours. At that time, public warnings will be issued and, as part of the emergency response procedures, human access to the PDA will be limited to AEP Operations and staff. • Flow rates in Elbow River can change rapidly during rain or other flooding events; therefore, the decision to open the diversion inlet gates will occur quickly.
NOTE: Flood operations refers to water diversion from Elbow River to the diversion channel and off-stream reservoir (i.e., reservoir filling) and the draining of the reservoir							

Table 9-21 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Flood Operations – Mammal Species at Risk

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Mammal species at risk	• grizzly bear (*special concern*)	• change in mortality risk	• See Context and Rationale.	• See Context and Rationale.	• See Context and Rationale.	• See Context and Rationale.	• There is no mitigation proposed to reduce mortality risk to grizzly bear during flood operations because it is anticipated that bears will move away from flooding areas (i.e., perceived risk).
Mammal species at risk	• American badger (*special concern*)	• change in mortality risk	• See Context and Rationale.	• See Context and Rationale.	• See Context and Rationale.	• See Context and Rationale.	• There is no mitigation proposed to reduce mortality risk to American badger during flood operations because it is anticipated that badgers will move away from flooding areas (i.e., perceived risk).
Mammal species at risk	• little brown myotis (*endangered*)	• change in mortality risk	• See Context and Rationale.	• See Context and Rationale.	• See Context and Rationale.	• See Context and Rationale.	• There is no mitigation proposed to reduce mortality risk to little brown myotis because there are no known roosting sites or hibernacula in the PDA. In addition, it is anticipated that bats will fly away from flooding areas (i.e., perceived risk), if water levels threatened any occupied features.
NOTE: Flood operations refers to water diversion from Elbow River to the diversion channel and off-stream reservoir (i.e., reservoir filling) and the draining of the reservoir							

Table 9-22 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Post-Flood Operations – Site-wide (All Wildlife Species)

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Site-wide (all wildlife species)	N/A	• change in habitat	Purpose • To reduce potential Project effects on habitat including nesting and breeding habitat. Objectives • Reduce indirect habitat loss (habitat effectiveness) due to sensory disturbance during maintenance activities.	• A post-flood habitat assessment will be conducted to identify potential nesting areas affected by sediment deposition based on breeding bird densities. • Site-specific mitigation related to revegetation of disturbed areas will occur in accordance with the Vegetation, and Wetland Mitigation, Monitoring and Revegetation Plan. • If post-flood maintenance activities in the off-stream reservoir are planned to occur during the RAP for migratory birds including species at risk (April 1 to August 31), a bird nest survey will be conducted, and the appropriate setback distance (30 m to 1,000 m) applied to protect any active nests.	• Areas targeted for revegetation will occur in areas that do not meet target percentages (e.g., 60% or greater). • Overall, mitigation will be applied where there are relatively higher densities of breeding birds (see Figure 7-4) and areas identified as high and moderate habitat suitability for key indicator species (see the EIA, Volume 3A, Figures 11-3 to 11-10).	• Vegetation cover establishment will be monitored, and areas of poor cover re-seeded as needed. • Active nests will only be monitored to determine nest status as appropriate (i.e., determine if nesting/fledging is complete). • The effectiveness of site-specific mitigation will be evaluated using nest completion as an indicator of success. • The reestablishment of areas (ha) that support key habitat areas (e.g., grassland, wetlands) as well as intermediate or high densities of breeding birds will be used as an indicator of success.	• As stated in the draft WMPP, a post-flood habitat assessment will be conducted following release of water from the off-stream reservoir to determine how sediment deposition has affected various habitat types. • At least two visits will be conducted including one after draining when it is safe to enter the off-stream reservoir, and another conducted the following spring to assess vegetation growth and wildlife habitat suitability. • Opportunities for Indigenous groups to participate in the post-flood habitat assessment will be determined as part of the engagement process.
		• change in mortality risk	Purpose • To reduce potential Project effects on mortality risk. Objectives • Reduce animal-vehicle collisions. • Reduce wildlife-human conflict.	• A post-flood habitat assessment will be conducted to assess habitat conditions and identify any wildlife mortality due to flooding and sediment deposition. • If post-flood maintenance activities are planned during the RAP for migratory birds including species at risk (April 1 to August 31), a bird nest search will be conducted, and the appropriate setback distance (30 m to 1,000 m) applied to protect any active nests. • All maintenance traffic will adhere to safety, road closure regulations and other access measures and guidelines access roads. • Waste will be stored in wildlife-proof containers and located away from high suitability bear habitats.	• Overall, mitigation will be applied where there are relatively higher densities of breeding birds (see Figure 7-4) and areas identified as high and moderate habitat suitability for key indicator species (see the EIA, Volume 3A, Figures 11-3 to 11-10).	• Active nests will only be monitored to determine nest status as appropriate (i.e., determine if nesting/fledging is complete).	

NOTES:
Post-flood operations include maintenance activities required on project infrastructure (e.g., the diversion channel, floodplain berm, off-stream dam, access roads and bridges. Post-flood sediment in the off-stream reservoir will be retained, although it may be moved or regraded within the reservoir if it interferes with drainage to the low-level outlet or functioning of the reservoir or associated components.

Table 9-23 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Post-Flood Operations – Water and Wetland Nesting Birds

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Migratory birds (including migratory and non-migratory bird species at risk) **Water and Wetland Nesting Birds**	• horned grebe (*special concern*) • western grebe (*special concern*) • yellow rail (*special concern*) • red knot (*endangered*) • rusty blackbird (*special concern*)	• change in mortality risk	Purpose • To reduce potential Project effects on mortality risk. Objectives • Reduce number of active migratory bird nests destroyed or disturbed.	• If post-flood maintenance activities are planned during the RAP for migratory birds including species at risk (April 1 to August 31), a bird nest search will be conducted, and the appropriate setback distance (30 m to 1,000 m) applied to protect any active nests.	• The location of migratory bird nests within the off-stream reservoir will be identified during post-flood bird nest surveys as appropriate. • Mitigation for water or wetland birds will be applied where active nests are in graminoid marsh or open shallow water.	• Active nests will only be monitored to determine nest status as appropriate (i.e., determine if nesting/fledging is complete). • The effectiveness of site-specific mitigation will be evaluated using nest completion as an indicator of success.	• Some of the species at risk have a relatively low probability of occurrence due to low suitability staging habitat in the LAA including western grebe and red knot. There are no historical observations of western grebe or red knot in the RAA. • Although the exact locations of migratory bird nests are not known, it is expected that site-specific mitigation (i.e., recommended setback distances for active nests) will be applied more frequently in areas where clean-up activities might occur and have relatively higher densities of breeding birds as shown in Figure 7-4.

NOTES:
Post-flood operations include maintenance activities required on project infrastructure (e.g., the diversion channel, floodplain berm, off-stream dam, access roads and bridges. Post-flood sediment in the off-stream reservoir will be retained, although it may be moved or regraded within the reservoir if it interferes with drainage to the low-level outlet or functioning of the reservoir or associated components.

Table 9-24 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Post-Flood Operations – Ground Nesting Upland Birds

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Migratory birds (including migratory and non-migratory bird species at risk) **Ground Nesting Upland Birds**	• long-billed curlew (*special concern*) • short-eared owl (*special concern*) • common nighthawk (*special concern*) • Sprague's pipit (*threatened*) • Baird's sparrow (*special concern*) • bobolink (*threatened*)	change in mortality risk	Purpose • To reduce potential Project effects on mortality risk. Objectives • Reduce number of active migratory bird nests destroyed or disturbed.	• If post-flood maintenance activities are planned during the RAP for migratory birds including species at risk (April 1 to August 31), a bird nest search will be conducted, and the appropriate setback distance (30 m to 1,000 m) applied to protect any active nests.	• The location of migratory bird nests within the off-stream reservoir will be identified during post-flood bird nest surveys as appropriate. • Mitigation for water or wetland birds will be applied where active nests are in graminoid marsh or open shallow water.	• Active nests will only be monitored to determine nest status as appropriate (i.e., determine if nesting/fledging is complete). • The effectiveness of site-specific mitigation will be evaluated using nest completion as an indicator of success.	• Some of the species at risk have a relatively low probability of occurrence due to low suitability habitat in the LAA including Sprague's pipit and bobolink. • Although the exact locations of migratory bird nests are not known, it is expected that site-specific mitigation (i.e., recommended setback distances for active nests) will be applied more frequently in areas where clean-up activities might occur and have relatively higher densities of breeding birds as shown in Figure 7-4.
NOTES: Post-flood operations include maintenance activities required on project infrastructure (e.g., the diversion channel, floodplain berm, off-stream dam, access roads and bridges. Post-flood sediment in the off-stream reservoir will be retained, although it may be moved or regraded within the reservoir if it interferes with drainage to the low-level outlet or functioning of the reservoir or associated components.							

Table 9-25 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Post-Flood Operations – Tree or Shrub Nesting Birds

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Migratory birds (including migratory and non-migratory bird species at risk) **Tree or Shrub Nesting Birds**	• **olive-sided flycatcher** (*threatened*) • loggerhead shrike (*threatened*)	change in mortality risk	Purpose • To reduce potential Project effects on mortality risk. Objectives • Reduce number of active migratory bird nests destroyed or disturbed.	• If post-flood maintenance activities are planned during the RAP for migratory birds including species at risk (April 1 to August 31), a bird nest search will be conducted, and the appropriate setback distance (30 m to 1,000 m) applied to protect any active nests.	• The location of migratory bird nests within the off-stream reservoir will be identified during post-flood bird nest surveys as appropriate. • Mitigation for water or wetland birds will be applied where active nests are in graminoid marsh or open shallow water.	• Active nests will only be monitored to determine nest status as appropriate (i.e., determine if nesting/fledging is complete). • The effectiveness of site-specific mitigation will be evaluated using nest completion as an indicator of success.	• Some of the species at risk have a relatively low probability of occurrence due to low suitability habitat in the LAA including the peregrine falcon. • Although the exact locations of migratory bird nests are not known, it is expected that site-specific mitigation (i.e., recommended setback distances for active nests) will be applied more frequently in areas where clean-up activities might occur and have relatively higher densities of breeding birds as shown in Figure 7-4.
NOTES: Post-flood operations include maintenance activities required on project infrastructure (e.g., the diversion channel, floodplain berm, off-stream dam, access roads and bridges. Post-flood sediment in the off-stream reservoir will be retained, although it may be moved or regraded within the reservoir if it interferes with drainage to the low-level outlet or functioning of the reservoir or associated components. Bolded species represent wildlife species at risk observed in the LAA during wildlife baseline surveys							

Table 9-26 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Post-Flood Operations – Other Nesters

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Migratory birds (including migratory and non-migratory bird species at risk) **Other Nesters (e.g., cliffs, anthropogenic structures)**	• **bank swallow** (*threatened*) • **barn swallow** (*threatened*) • peregrine falcon (*special concern*)	change in mortality risk	Purpose • To reduce potential Project effects on mortality risk. Objectives • Reduce number of active migratory bird nests destroyed or disturbed.	• If post-flood maintenance activities are planned during the RAP for migratory birds including species at risk (April 1 to August 31), a bird nest search will be conducted, and the appropriate setback distance (30 m to 1,000 m) applied to protect any active nests.	• The location of migratory bird nests within the off-stream reservoir will be identified during post-flood bird nest surveys as appropriate. • Mitigation for water or wetland birds will be applied where active nests are in graminoid marsh or open shallow water.	• Active nests will only be monitored to determine nest status as appropriate (i.e., determine if nesting/fledging is complete). • The effectiveness of site-specific mitigation will be evaluated using nest completion as an indicator of success.	• Some of the species at risk have a relatively low probability of occurrence due to low suitability habitat in the LAA including the peregrine falcon. • Although the exact locations of migratory bird nests are not known, it is expected that site-specific mitigation (i.e., recommended setback distances for active nests) will be applied more frequently in areas where clean-up activities might occur and have relatively higher densities of breeding birds as shown in Figure 7-4.

NOTES:

Post-flood operations include maintenance activities required on project infrastructure (e.g., the diversion channel, floodplain berm, off-stream dam, access roads and bridges. Post-flood sediment in the off-stream reservoir will be retained, although it may be moved or regraded within the reservoir if it interferes with drainage to the low-level outlet or functioning of the reservoir or associated components.

Bolded species represent wildlife species at risk observed in the LAA during wildlife baseline surveys

Table 9-27 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Post-Flood Operations – Amphibian Species at Risk

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Amphibian species at risk	• northern leopard frog (*special concern*) • western toad (*special concern)* • western tiger salamander (*special concern*)	• change in mortality risk	Purpose • To reduce potential Project effects on amphibian mortality risk. Objectives • Reduce mortality risk to amphibians during maintenance activities.	• If post-flood maintenance activities are planned to occur within 100 m of an amphibian SOMC breeding wetland during the breeding season (approximately April 15 to September 30), install silt fencing around the perimeter of the wetlands to prevent amphibians from moving into disturbance footprint.	• Mitigation will be applied where amphibian breeding wetlands occur within the Project construction footprint or recommended setback distance (100 m). • Graminoid marsh wetlands are relatively more abundant between the proposed off-stream dam and Springbank Road as well as west of Highway 22 north of Township Road 244 and north of Township Road 242 (see the EIA, Volume 3A, Section 10.2.2., Figure 10-3).	• An environmental monitor will be on site continuously during post-flood maintenance activities to investigate the fencing and relocate any amphibians trapped by the silt fencing, as directed by a qualified wildlife biologist.	• None of the amphibian species at risk were observed during nocturnal or diurnal amphibian surveys (see the EIA, Volume 4, Appendix H). • A total of 3% of the LAA represents high and moderate suitability habitat for northern leopard frog (see the EIA, Volume 3A, Section 11.2.2.4, Table 11-8). • Moderate potential for western toad and western tiger salamander to occur in the LAA.

NOTE:
Post-flood operations include maintenance activities required on project infrastructure (e.g., the diversion channel, floodplain berm, off-stream dam, access roads and bridges. Post-flood sediment in the off-stream reservoir will be retained, although it may be moved or regraded within the reservoir if it interferes with drainage to the low-level outlet or functioning of the reservoir or associated components.

Table 9-28 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Post-Flood Operations – Mammal Species at Risk

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Mammal species at risk	• **grizzly bear** (*special concern*)	• change in mortality risk • change in movement	Purpose • To reduce potential Project effects on mortality risk and grizzly bear movement. Objectives • Reduce mortality risk due to human-bear conflict during post-flood maintenance activities. • Reduce potential barrier effects due to major project structures (diversion channel, floodplain berm, off stream reservoir).	• All post-flood maintenance traffic will adhere to safety and road closures. • Waste will be stored in wildlife-proof containers and located away from high suitability bear habitats. • Where fencing is proposed around the PDA, wildlife-friendly fencing will be installed to allow wildlife passage (except for fencing around the diversion structure control building).	• Mitigation to reduce mortality risk will be limited to the off-stream reservoir post-flood maintenance activity areas and Elbow River near the diversion structure and floodplain berm as required.	• Grizzly bear sightings and encounters will be recorded as part of the WMMP. • All grizzly bear sightings and encounters will be reported to a Wildlife Resource Specialist and the responsible regulatory agencies.	• Mortality risk for grizzly bear is relatively low as most of the high suitability spring and summer feeding habitat is located along the Elbow River (see the EIA, Volume 3A, Section 11, Figure 11-8 and Figure 11-9).
	• American badger (*special concern*)	• change in mortality risk • change in movement	Purpose • To reduce potential Project effects on mortality risk and badger movement. Objectives • Reduce mortality risk to badger dens during post-flood maintenance activities. • Reduce potential barrier effects due to major project structures (diversion channel, floodplain berm, off stream reservoir).	• If an active den (i.e., American badger) is identified, site-specific mitigation will be developed in consultation with regulators. • Where fencing is proposed around the PDA, wildlife-friendly fencing will be installed to allow wildlife passage (except for fencing around the diversion structure control building).	• Mitigation will be applied where wildlife habitat features (e.g., dens) or suitable habitat (species-specific) occurs within the Project construction footprint or recommended setback distances. • Mitigation to facilitate wildlife movement including mammal species at risk (e.g., American badger) will occur along sections of the diversion channel including the underpass design for the Highway 22 bridge over the diversion channel as well as wildlife friendly fencing locations.	• Active dens will only be monitored to determine den status as appropriate (i.e., determine if denning is complete). • The effectiveness of site-specific mitigation will be evaluated using den abandonment as an indicator of success, where required.	• No badger dens or were identified during wildlife baseline surveys.

Table 9-28 Summary of Site-specific Mitigation and Monitoring for Migratory Birds and Wildlife Species at Risk during Post-Flood Operations – Mammal Species at Risk

Species Group	Species and SARA Status	Potential Project Effects	Mitigation Purpose and Objectives	Site-Specific Mitigation	Location of Mitigation	Site-Specific Monitoring	Context and Rationale
Mammal species at risk (cont'd)	• little brown myotis (*endangered*)	• change in mortality risk	Purpose • To reduce potential Project effects on mortality risk. Objectives • Reduce mortality risk (i.e., physical destruction) of key habitat features (e.g., roosting sites) due to ground disturbance and vegetation removal. • Reduce potential barrier effects due to major project structures (diversion channel, floodplain berm, off stream reservoir).	• If a bat roosting site or hibernacula is identified, site-specific mitigation will be developed in consultation with regulators.	• Mitigation will be applied where wildlife habitat features (e.g., roosts) or suitable habitat (species-specific) occurs within the Project construction footprint or recommended setback distances.	• Site-specific monitoring will occur where active bat features are identified. • The effectiveness of site-specific mitigation will be evaluated using criteria developed in consultation with regulators, where required.	• No bat hibernacula or roost sites were observed during wildlife baseline surveys.

NOTES:
Post-flood operations include maintenance activities required on project infrastructure (e.g., the diversion channel, floodplain berm, off-stream dam, access roads and bridges. Post-flood sediment in the off-stream reservoir will be retained, although it may be moved or regraded within the reservoir if it interferes with drainage to the low-level outlet or functioning of the reservoir or associated components.
Bolded species represent wildlife species at risk observed in the LAA during wildlife baseline surveys