SPRINGBANK OFF-STREAM RESERVOIR PROJECT
Wildlife Mitigation and Monitoring Plan

Prepared for:
Alberta Transportation

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Abbreviations

AEP	Alberta Environment and Parks
AVC	animal-vehicle collisions
CEAA	Canadian Environmental Assessment Agency
ECO	Environmental Construction Operations
ECCC	Environment and Climate Change Canada
KWBZ	key wildlife and biodiversity zone
LAA	local assessment area
PDA	Project development area
RAA	regional assessment area
RAP	restricted activity period
SARA	*Species at Risk Act*
SOMC	species of management concern
WMMP	Wildlife Mitigation and Monitoring Plan

1.0 INTRODUCTION

This document describes the Wildlife Mitigation and Monitoring Plan (WMMP) for the Springbank Off-stream Reservoir Project (the Project, SR1). Mitigation and monitoring of wildlife and wildlife habitat has been developed consistent with the measures identified in the Environmental Impact Assessment (EIA) and in accordance with approval conditions identified by the Impact Assessment Agency of Canada (IAAC) and the Natural Resources Conservation Board (NRCB). This WMMP demonstrates Alberta Transportation's commitment to mitigate and monitor potential Project effects on wildlife and wildlife habitat in the Local Assessment Area (LAA) during all phases of the Project.

1.1 PLAN OBJECTIVES

The goals and objectives of the WMMP have been developed to align with approval conditions (see Section 2.0, Table 2-2) related to wildlife mitigation and monitoring including specific requirements for a follow-up program identified in approval condition 4.11.

Specifically, the goals of the WMMP link predicted Project effects to mitigation, mitigation objectives to monitoring, and monitoring results to adaptive management actions. To achieve the goals, specific measurable objectives have been nested underneath each goal.

- Goal 1 is to reduce changes in wildlife habitat, wildlife movement and mortality risk by applying mitigation to reduce predicted effects.
  - Objective 1a is to reduce direct habitat loss.
  - Objective 1b is to reduce indirect habitat loss.
  - Objective 1c is to reduce change in wildlife movement.
  - Objective 1d is to reduce change in mortality risk.
- Goal 2 is to monitor effectiveness of mitigation designed to reduce changes in wildlife movement and mortality risk.
  - Objective 2a is to monitor wildlife use and movement at Project components including the diversion channel, Highway 22 bridge over the diversion channel, floodplain berm, and wildlife friendly fencing to evaluate the effectiveness in maintaining wildlife movement in the LAA.
  - Objective 2b is to monitor the implementation and effectiveness of mitigation to reduce changes in mortality risk and track and determine cause of wildlife mortality associated with the Project.

- Goal 3 is to adapt mitigation designed to reduce changes in wildlife movement and mortality risk, as necessary, based on monitoring outcomes.
  - Objective 3a is to adapt mitigation if wildlife are not crossing over or under Project components as predicted.
  - Objective 3b is to adapt mitigation if wildlife mortality as a result of contact with Project components or vehicles is not meeting targets.

2.0 REGULATIONS, APPROVALS AND GUIDELINES

The Project was subject to approval under various provincial and federal regulations and regulations relevant to wildlife are provided in Appendix A. Alberta Transportation has prepared this WMMP to meet IAAC approval conditions 4.1 to 4.10 (migratory birds including bank swallow), 4.11 (follow-up program), 5.1 (little brown myotis), 5.2 to 5.5 (amphibian species at risk), 8.1 (migratory birds) and 8.3 to 8.5 (grizzly bear, Ursus arctos). In addition, this WMMP has been prepared to meet NRCB approval condition 10 as described in approval NR 2021-01. The approval conditions as defined by IAAC and NRCB are provided in Table 2.1. Commitments made by Alberta Transportation related to wildlife throughout the regulatory approvals process have been considered.

Table 2.1 Summary of Approval Conditions for Migratory Birds and Wildlife Species at Risk

Project Phase	Reference	Approval Condition
All Phases	**Migratory Birds** IAAC Condition 4.1	The Proponent shall carry out the Designated Project in a manner that protects migratory birds and avoids harming, killing or disturbing migratory birds or destroying, disturbing or taking their nests or eggs. In this regard, the Proponent shall take into account Environment and Climate Change Canada's Guidelines to reduce risk to migratory birds. The Proponent's actions when carrying out the Designated Project shall be in compliance with the *Migratory Birds Convention Act*, 1994, the Migratory Birds Regulations and with the *Species at Risk Act*.
Construction	IAAC Condition 4.2	The Proponent shall give preference to the use of existing access roads and disturbed areas for temporary workspaces and transportation activities over building new access roads and temporary workspace in undisturbed areas, and shall revegetate any area where native vegetation was removed for temporary workspace.
All Phases	IAAC Condition 4.3	The Proponent shall control the lighting required for Designated Project activities throughout all phases of the Designated Project, including its direction, duration of use, intensity, spectrum colour and brightness, to mitigate the adverse effects of the Designated Project on migratory birds and species at risk caused by sensory disturbances due to light, while complying with operational health and safety requirements.
All Phases	IAAC Condition 4.4	The Proponent shall identify, in consultation with Indigenous groups and relevant authorities, dates of breeding season for migratory birds and notify the Agency of these dates prior to construction.

Table 2.1 Summary of Approval Conditions for Migratory Birds and Wildlife Species at Risk

Project Phase	Reference	Approval Condition
Construction and Dry Operations	IAAC Condition 4.5	The Proponent shall develop, prior to construction, in consultation with Environment and Climate Change Canada and taking into account Environment and Climate Change Canada's *Description of Residence for bank swallow (Riparia riparia) in Canada*, measures to mitigate the adverse environmental effects on bank swallow (*Riparia riparia*) attributed to the Designated Project. The Proponent shall establish a schedule for the implementation of the measures and shall, as part of these measures:
Construction	IAAC Condition 4.5.1	• maintain foraging habitat within 500 metres of bank swallow residences. If it is not technically feasible for the Proponent to maintain a distance of 500 metres, the Proponent shall provide a rationale to relevant authorities and develop and implement additional mitigation measures, in consultation with relevant authorities, to avoid effects on bank swallow. The Proponent shall submit these measures to the Agency prior to implementing them.
All Phases	IAAC Condition 4.5.2	• install, prior to construction, and in consultation with Environment and Climate Change Canada, artificial nesting structures in suitable habitat to compensate for the loss of nesting sites within the project development area and identified in Appendix H, Figure 3-1, of the Environmental Impact Statement. The Proponent shall perform maintenance on the nesting structures annually and maintain their accessibility and integrity during all phases of the Designated Project and shall ensure the presence of foraging habitat within 500 metres of the artificial nesting structures. If it is not technically feasible for the Proponent to ensure the presence of foraging habitat within a distance of 500 metres, the Proponent shall provide a rationale to relevant authorities and develop and implement additional mitigation measures, in consultation with relevant authorities, to avoid effects on bank swallow. The Proponent shall submit these measures to the Agency prior to implementing them;
Construction	IAAC Condition 4.5.3	• maintain the slope of topsoil, soil and sediment stockpiles located within the project development area and not used as artificial nesting structures in accordance with condition 4.5.2 at less than 70 degrees; and
Construction	IAAC Condition 4.5.4	• demonstrate how any other offsetting measures implemented by the Proponent will compensate for the adverse environmental effects on bank swallow (Riparia riparia) attributed to the Designated Project in the project development area.

Table 2.1 Summary of Approval Conditions for Migratory Birds and Wildlife Species at Risk

Project Phase	Reference	Approval Condition
Construction	IAAC Condition 4.6	The Proponent shall conduct vegetation removal, and any other activity that could potentially disturb migratory birds, within the project development area outside of the breeding season(s) for migratory birds identified in condition 4.4. If vegetation removal or the conduct of other disturbance activity outside of the breeding season(s) is not technically feasible during any given year, the Proponent shall develop and implement additional mitigation measures, in consultation with relevant authorities, to avoid harm to migratory birds and their nests or eggs. The Proponent shall submit these measures to the Agency prior to implementing them.
Post-Flood Operations	IAAC Condition 4.7	The Proponent shall remove debris in the off-stream reservoir within seven days after the draining of the reservoir. If it is not technically feasible for the Proponent to remove debris within seven days after the draining of the reservoir, the Proponent shall provide a rational to Indigenous groups and relevant authorities and develop and implement additional mitigation measures, in consultation with relevant authorities, to avoid harm to migratory birds and their nests or eggs. The Proponent shall submit these measures to the Agency prior to implementing them.
All Phases	IAAC Condition 4.8	For any active migratory bird nests identified during construction or operation, the Proponent shall establish and implement, in consultation with relevant authorities, mitigation measures to avoid destroying, disturbing or taking the nest(s), including by implementing a disturbance setback buffer during construction and dry operation and by following the approach outlined in the Response to Information Request Round 2 Package 4 -01 to -04, IR4-03 (Canadian Impact Assessment Registry Reference Number 80123, Document Number 1311) during flood operation.
Flood Operations	IAAC Condition 4.9	The Proponent shall develop and implement, in consultation with Indigenous groups and relevant authorities, a protocol to prevent harm to migratory birds, including migratory birds species at risk identified in Table 3 of the environmental assessment report, within the project development area. The Proponent shall develop the protocol prior to construction and implement it prior to flood operation. The protocol shall include: 4.9.1 flood forecasting undertaken prior to inventories conducted in accordance with condition 4.10; and 4.9.2 measures to rescue migratory birds chicks and eggs.

Table 2.1 Summary of Approval Conditions for Migratory Birds and Wildlife Species at Risk

Project Phase	Reference	Approval Condition
Dry Operations	IAAC Condition 4.10	The Proponent shall conduct, in consultation with Indigenous groups, inventories of potential migratory bird habitat, including the collection of information on breeding bird densities and the presence of ground nesting birds, as well as mapping of important habitat features, shrub lands, wetlands and grassland within the project development area every five years starting the first year of operation, and update the migratory bird protocol referred to in condition 4.9 based on the results of the inventories.
All Phases	IAAC Condition 4.11	The Proponent shall develop, prior to construction and in consultation with Indigenous groups and relevant authorities, a follow-up program to verify the accuracy of the environmental assessment and to determine the effectiveness of all mitigation measures to avoid harm to migratory birds, including migratory birds that are listed species at risk, their eggs and nests. The follow-up program shall include the mitigation measures used to comply with conditions 4.1 to 4.10. As part of the development of the follow-up program, the Proponent shall identify performance indicators that shall be used by the Proponent to evaluate the effectiveness of mitigation measures. The Proponent shall implement the follow-up program during all phases of the Designated Project.
Construction and Dry Operations	IAAC Condition 4.11.1	As part of the follow-up program, the Proponent shall: • monitor, annually during construction, for the first three years of operation and every five years thereafter, bank swallow use of the project development area.
Construction	**Species at Risk** IAAC Condition 5.1	The Proponent shall conduct pre-construction surveys to determine the presence of little brown myotis (*myotis lucifugus*) roosting sites in the project development area. The Proponent shall establish, in consultation with Indigenous groups and relevant authorities, buffer zones around little brown myotis (*myotis lucifugus*) active roosts identified during the pre-construction surveys or found by the Proponent or brought to the attention of the Proponent by an Indigenous group during any phase of the project. The Proponent shall maintain the buffer zones until it is determined the roosts are no longer active.
Construction	IAAC Condition 5.2	The Proponent shall conduct, prior to construction and in consultation with Indigenous groups and relevant authorities, breeding habitat surveys for the northern leopard frog (*Lithobates pipiens*), western toad (*Anaxyrus boreas*), and western tiger salamander (*Ambystoma mavoritium*) within the project development area.

Table 2.1 Summary of Approval Conditions for Migratory Birds and Wildlife Species at Risk

Project Phase	Reference	Approval Condition
Construction	IAAC Condition 5.3	For any construction activity within 100 metres of breeding habitat identified under condition 5.2 for the northern leopard frog (*Lithobates pipiens*), western toad (*Anaxyrus boreas*), or western tiger salamander (*Ambystoma mavoritium*) during the breeding season, the Proponent shall develop, prior to construction and in consultation with Indigenous groups and relevant authorities, measures to prevent northern leopard frog (*Lithobates pipiens*), western toad (*Anaxyrus boreas*), and western tiger salamander (*Ambystoma mavoritium*) from accessing the active construction areas. Measures shall include:
Construction	IAAC Condition 5.3.1	• the installation of fencing prior to construction; and
Construction	IAAC Condition 5.3.2	• the monitoring, during construction and by a qualified individual, of the presence of northern leopard frog (*Lithobates pipiens*), western toad (*Anaxyrus boreas*), or western tiger salamander (*Ambystoma mavoritium*) in active construction areas within 100 metres of their breeding habitat.
Construction	IAAC Condition 5.4	If the results of the monitoring conducted in accordance with condition 5.3.2 identify the presence of northern leopard frog (*Lithobates pipiens*), western toad (*Anaxyrus boreas*), or western tiger salamander (*Ambystoma mavoritium*) in active construction areas within 100 metres of their breeding habitat, the Proponent shall implement additional species-specific mitigation measures in consultation with Indigenous groups and relevant authorities.
Flood Operations	IAAC Condition 5.5	The Proponent shall develop and implement, in consultation with Indigenous groups and relevant authorities, a protocol to prevent the mortality of amphibians, including northern leopard frog (*Lithobates pipiens*), western toad (*Anaxyrus boreas*), and western tiger salamander (*Ambystoma mavoritium*) during flood operation within the reservoir footprint. The Proponent shall develop the protocol prior to construction, taking into account the flood forecasting undertaken in accordance with condition 4.9.1. The protocol shall include measures to rescue and relocate northern leopard frog (Lithobates pipiens), western toad (*Anaxyrus boreas*), and western tiger salamander (*Ambystoma mavoritium*) to suitable habitat outside the reservoir footprint.

Table 2.1 Summary of Approval Conditions for Migratory Birds and Wildlife Species at Risk

Project Phase	Reference	Approval Condition
Construction	IAAC Condition 8.4	The Proponent shall follow the timing restrictions on industrial activities identified in the Alberta's Recommended Land Use Guidelines: Key Wildlife and Biodiversity Zones when undertaking construction and maintenance activities in the Key Wildlife and Biodiversity Zone identified along the Elbow River.
Construction	IAAC Condition 8.4.1	If it is not economically or technically feasible for the Proponent to follow the timing restrictions on industrial activities identified in the Alberta's Recommended Land Use Guidelines: Key Wildlife and Biodiversity Zones, develop and implement additional mitigation measures, in consultation with Environment and Climate change Canada and other relevant authorities. The Proponent shall submit these measures to the Agency prior to implementing them.
All Phases	IAAC Condition 8.5	The Proponent shall install and maintain, during construction and operation, one underpass under Highway 22 where it crosses the diversion channel and wildlife friendly fences to provide passage for grizzly bear western population (*Ursus arctos*) and ungulates. The Proponent shall install the wildlife friendly fences as identified in Figure IR 15-1 submitted in the Response to Information Requests Round 1 Package 2 (Canadian Impact Assessment Registry Reference Number 80123, Document Number 1260), taking into account Alberta Conservation Association Landholder's Guide to Wildlife Friendly Fencing, to prevent access by livestock and allow safe passage for wildlife. The Proponent shall maintain the fences during all phases of the Designated Project.

2.1 RESPONSIBILITIES AND REPORTING REQUIREMENTS

Alberta Transportation will be responsible for implementation of the WMMP during Project construction and for a period of three years post-construction during the dry operations phase of the Project. Alberta Environment and Parks (AEP) will be responsible for implementing the WMMP during dry operations, and both flood and post-flood operation phases of the Project.

In compliance with IAAC approval condition 2.11, Alberta Transportation and AEP will prepare an annual report summarizing the monitoring results, which will be provided to IAAC and the First Nation Land Use Committee by October 31 of the reporting year to which the annual report applies. IAAC has defined the reporting year as July 1 of the calendar year to June 30 of the subsequent calendar year (definition 1.32). The annual report, including a plain language executive summary in both official languages, will be made publicly available to Indigenous groups and public stakeholders no later than October 31 following the reporting year to which

the annual report applies (IAAC approval condition 2.13). Indigenous groups, the First Nation Land Use Advisory Committee and the Agency will be notified of the annual reports within 48 hours of their publication (IAAC approval condition 2.14). The annual reports will be available for 15 years following their publication (IAAC approval condition 2.14).

In compliance with NRCB approval condition 10, Alberta Transportations will make the WMMP easily accessible to the public, subject to privacy protection requirements and to the satisfaction of AEP.

3.0 INDIGENOUS AND PUBLIC STAKEHOLDER INPUT

Since completion of the EIA, additional feedback on wildlife was received from Indigenous groups, stakeholders and the public, and through supplemental regulatory information requests and the Project approval hearing.

Alberta Transportation developed a draft WMMP, which outlines key mitigations and monitoring commitments during construction, dry and flood operations, and was shared with Piikani Nation, Ermineskin Cree Nation, Foothills Ojibway Society, Ktunaxa Nation Council, Métis Nation of Alberta Region 3, Montana First Nation, and Samson Cree Nation on April 20, 2020 for review and feedback. This draft WMMP was also shared with Blood Tribe/Kainai, Siksika Nation, Stoney Nakoda Nations, and Louis Bull Tribe on May 6, 2020 and Tsuut'ina Nation on July 16, 2020. Alberta Transportation also offered funding to Indigenous groups to provide written feedback and offered multiple opportunities to provide oral feedback, including group meetings in the fall of September 2020 and individual meetings to discuss. The WMMP has been finalized following the NRCB and IAAC decisions and associated conditions, and has taken into account feedback received from Indigenous groups.

Alberta Transportation provided opportunities to discuss the Migratory Bird and Amphibian Species at Risk Salvage Plan as well as the remote camera monitoring program with Indigenous groups and AEP. Rockyview County also provided input related to the placement of remote cameras in the LAA. All input provided to Alberta Transportation related to migratory birds and amphibian species at risk salvage protocols as well as the locations of remote camera monitoring stations has been included in this WMMP.

4.0 PROJECT DESCRIPTION

The Project consists of the construction and operation of an off-stream reservoir to divert and retain a portion of Elbow River flows during a flood. The diverted water will be released back to Elbow River in a controlled manner after the flows in Elbow River decrease sufficiently to accommodate the release of water from the reservoir. The off-stream reservoir will not hold a permanent pool of water.

4.1 PROJECT COMPONENTS

The primary Project components are:

- a diversion structure on the main channel and floodplain of Elbow River
- a diversion channel to transport partially diverted floodwater into the reservoir
- an off-stream dam to temporarily retain the diverted floodwater
- a low-level outlet in the dam to return retained water through the existing unnamed creek and back to the river when AEP Operations determines conditions are appropriate.

4.2 PROJECT PHASES

4.2.1 Construction

The Project is scheduled to be functionally operational (able to accommodate a 1:100-year flood event) for floods after two years of construction and be completely constructed (able to accommodate the design flood) after three years of construction.

4.2.2 Dry Operations

Dry operation refers to post-construction and Project operation between floods. During dry operation, the diversion inlet gates will close, and the service spillway gates will open. The outlet structure will remain open to carry the flow of the unnamed creek over which the dam will be built. The outlet gate system and its operation will be checked according to a routine maintenance schedule to be developed by AEP Operations.

The associated access roads, emergency spillway and reservoir will be inspected at the same time and repaired, if necessary. The maintenance schedule will also include inspections of the diversion structure and the river channel immediately upstream of it, the maintenance building, the floodplain berm, and the auxiliary spillway. Repairs and debris management will be completed.

4.2.3 Flood Operations

AEP Operations will be in communication with the City of Calgary Glenmore Dam operators in advance of and during the flood season each year. The need for flood operations will be determined through this communication, which will be informed by forecasted and measured flows on Elbow River at the diversion structure and upstream. AEP Operations staff, in communication with the City of Calgary Glenmore dam operators, will decide on when to open the diversion gates to commence diversion of flood water flows into the off-stream reservoir.

4.2.4 Post-Flood Operations

During post-flood operations, the diversion inlet gates are closed and the service spillway gates are open (lowered to the riverbed). The gates of the outlet structure would be opened to allow the floodwater retained in the reservoir to drain through the low-level outlet into the unnamed creek and then into Elbow River. The outlet structure gates will remain open after the reservoir has drained.

5.0 WILDLIFE OVERVIEW

The following provides a summary of baseline wildlife and wildlife habitat conditions. See Volume 3A, Section 11 of the EIA for further detail.

There is potential suitable habitat for 86 wildlife species of management concern (SOMC), including 54 birds, 26 mammals, three amphibians and three reptiles, 22 of which are species at risk (SAR) listed on Schedule 1 of the Species at Risk Act (SARA) and 12 which are listed in the Alberta *Wildlife Act*. The wildlife LAA is dominated by an agricultural landscape (48.3%), which includes tame pasture (27.3%), annual cropland (11.3%) and hayland (9.7%). Although these land cover types provide relatively low habitat suitability for most SOMC, there are native vegetation communities in the LAA that provide relatively higher habitat suitability for wildlife including grassland (8.8%), shrubland (8.4%), mixed forest (6.1%), broadleaf (deciduous) forest (5.2%), coniferous forest (5.0%), and wetlands (6.4%).

Wildlife field surveys were completed in 2016 and included surveys for amphibians, rail, breeding birds, raptor nests, waterfowl, and large mammals (remote camera and winter tracking). During the breeding bird survey, 79 bird species were recorded. Eight of those species are SOMC: olive-sided flycatcher (*Contopus cooperi*), western wood-pewee (*Contopus sordidulus*), alder flycatcher (*Empidonax alnorum*), least flycatcher (*Empidonax minimus*), eastern kingbird (*Tyrannus tyrannus*), bank swallow (*Riparia riparia*), Cape May warbler (*Setophaga tigrina*), and Baltimore oriole (*Icterus galbula*). Mixed forest habitat contained the highest breeding bird species richness, followed by shrubland and broadleaf forest habitat. Similarly, breeding bird density was highest in mixed forest and broadleaf forest. Clay-colored sparrow (*Spizella pallida*), house wren (*Troglodytes aedon*) and savannah sparrow (*Passerculus sandwichensis*) had the highest densities in the LAA. In total, 16 waterbird species were observed in the LAA, with mallard (*Anas platyrhynchos*) as the most observed species. Several raptor stick and platform nests were observed in the LAA, some of which were occupied by red-tailed hawk (*Buteo jamaicensis*), osprey (*Pandion haliaetus*), and bald eagle.

During amphibian surveys (nocturnal acoustic and diurnal visual), an estimated 52 boreal chorus frogs (*Pseudacris maculata*) and 26 wood frogs (*Rana sylvatica*) were detected. No amphibian SOMC were observed. Ten sora (*Porzana carolina*) were observed within the LAA during systematic broadcast rail surveys and seven were observed incidentally. No yellow rail (*Coturnicops noveboracensis*) or Virginia rail (*Rallus limicola*) were detected.

Nine medium-to-large mammal species were recorded during the remote camera survey. White-tailed deer (*Odocoileus virginianus*) were the most commonly detected species (n=2,433), followed by elk (*Cervus canadensis*) (n=796). Winter tracking surveys conducted during 2015 and 2017 showed similar results where deer were encountered most frequently, followed by coyote and elk. Overall, wildlife track counts were higher along Elbow River compared to other areas surveyed in the LAA. Grizzly bear (*Ursus arctos*) and cougar (*Puma concolor*) were also

detected along Elbow River during the remote camera survey. Site surveys by Indigenous groups, land owner observations, and government studies have also confirmed the presence of grizzly bears in the LAA. TUS reports by Indigenous groups have described various locations of high suitability habitat for elk in the LAA, including calving grounds within the off-stream reservoir as well as elk migration routes

Pre-construction wildlife surveys were completed during 2021 to meet IAAC approval conditions associated with species at risk including bat roosts (Condition 5.1), amphibian species at risk breeding wetlands (Condition 5.2), and grizzly bear denning (Condition 8.3). In addition, a nocturnal rail survey was completed to identify breeding wetlands that could be affected during construction and to provide an update to the 2016 rail survey results. Consistent with the 2016 baseline survey, the primary target of the 2021 survey was yellow rail (*Coturnicops noveboracensis*), which is listed as special concern under the *Species at Risk Act* (SARA). Sora (*Porzana carolina*) and Virginia rail (*Rallus limicola*) were secondary targets for the survey.

Twenty-two remote cameras were also installed in the LAA in September 2021 to provide additional baseline data in areas previously monitored in 2016 and near proposed Project permanent structures (e.g., Hwy 2 bridge underpass, diversion channel, floodplain berm) as well as at select locations where wildlife-friendly fencing will be installed. Appendix C provides further details related to the remote camera monitoring program.

6.0 MITIGATION

The objectives of the mitigation measures are to ensure that sensitive wildlife and wildlife habitat features (e.g., nests, wetlands) are properly identified to avoid or reduce potential Project effects. Key mitigation measures identified in this WMMP have been revised to meet IAAC approval conditions related to bank swallow, migratory bird and amphibian species at risk during flood operations as well as identification of little myotis bat roosts and grizzly bear dens. A Bank Swallow Mitigation Plan has been developed in accordance with IAAC approval condition 4.5 and is provided in Appendix B. In addition, a Migratory Bird and Amphibian Species Risk Salvage Plan has been developed in accordance with IAAC approval condition 4.9 and 5.5 respectively, and is provided in Appendix C.

6.1 CONSTRUCTION

The objectives of the construction mitigation measures are to reduce potential Project effects related to change in habitat, wildlife movement and mortality risk. During construction, mitigation measures will be implemented to identify sensitive wildlife features (e.g., nests, dens, roosts) prior to construction to avoid or reduce potential Project effects on wildlife including species at risk. Mitigation measures that will be implemented are listed in Table 6.1 including mitigation to protect migratory birds and their nests during the breeding season. In accordance with IAAC approval condition 4.4, the breeding season for migratory birds extends from April 1 to August 31, which includes the nesting period for nesting zone B4 (April 17 to August 24) and species at risk (April 1 to August 31) (ECCC 2018; Gregoire 2020, pers. comm.). The Environmental Monitor (or designate) will follow established industry best management practices and will evaluate effectiveness of site-specific mitigation during construction.

Table 6.1 Key Mitigation Measures During Construction to Reduce Potential Effects on Wildlife and Wildlife Habitat

Potential Effect	Mitigation Objective	Mitigation Measure
Change in habitat	• Reduce direct habitat loss or alteration including residences of species at risk (SAR) from vegetation clearing.	• Where possible, temporary workspaces and access roads will be in areas that avoid wildlife features and native vegetation (e.g., shrubland, treed areas, wetlands). Existing access roads and previously disturbed areas will be used, where feasible. • Temporary workspaces will be reclaimed according to the Vegetation and Wetland Mitigation, Monitoring and Revegetation Plan (approval condition 4.2). • Prior to construction, pre-construction wildlife surveys (i.e., sweeps) will be completed to identify active wildlife features (e.g., nests, dens, roosts) and appropriate site-specific mitigation developed consistent with IAAC approval conditions 4.1, 4.5 and 4.6, 4.7 and 4.8 (migratory birds), 5.1 (little brown myotis), 5.4 (amphibians) and 8.3 (grizzly bear). • A geotextile sheet will be installed to cover vertical or near-vertical banks at the location of the reservoir outlet channel and maintain the sheet in place until the end of the nesting period. The geotextile cover will be installed prior to the arrival of the bank swallow in May. Other areas that provide suitable vertical or near-vertical bank will also be assessed and similar mitigation applied, as required. • Artificial nesting structures will be installed prior to construction in suitable habitat (e.g., open areas near water) to compensate for the loss of bank swallow nesting sites within the project development area and identified in Volume 4, Appendix H, Figure 3-1 of the EIA. The number of nest boxes will be determined in consultation with Environment and Climate Change Canada • Accessibility and integrity of nesting structures will be maintained on an annual basis to provide suitable bank swallow nesting habitat during all phases of the Project and shall ensure the presence of foraging habitat within 500 m of the artificial nesting structures. • No construction activities will occur within 500 m of bank swallow residences including artificial nesting structures. If this is not possible, site-specific mitigation will be developed in consultation with ECCC. Additional mitigation measures will be considered, which could include monitoring of active residences and foraging habitat use. • Maintain the slope of topsoil, soil and sediment stockpiles located within the project development area and not used as artificial nesting structures in accordance with condition 4.5.2 at less than 70 degrees.

Table 6.1 Key Mitigation Measures During Construction to Reduce Potential Effects on Wildlife and Wildlife Habitat

Potential Effect	Mitigation Objective	Mitigation Measure
Change in habitat (cont'd)	• Reduce indirect habitat loss (sensory disturbance).	• Lighting will be controlled during construction including its direction, duration of use, intensity, spectrum colour and brightness to reduce sensory disturbance to migratory birds and species at risk while complying with operational health and safety requirements (IAAC approval condition 4.3) • Where possible, focusing lights on habitats that surround the work site during evening hours will be avoided. This will reduce potential sensory disturbance to wildlife. • No construction activities will occur within 500 m of bank swallow residences including artificial nest boxes. If this is not possible, site-specific mitigation will be developed in consultation with ECCC. Additional mitigation measures will be considered, which could include monitoring of active residences.
Change in movement	• Reduce change in wildlife movement (daily or seasonal) because of habitat change and sensory disturbance.	• Construction activities will be avoided during the Restricted Activity Period (RAP) for the Key Wildlife and Biodiversity Zone (KWBZ) identified along Elbow River (December 15 to April 30). This will reduce potential effects on wildlife movement of wintering ungulates (ESRD 2015). If construction during the RAP cannot be avoided, site-specific mitigation will be developed in consultation with AEP. • 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 to move across. • The diversion channel and off-stream dam will be built with side slopes of 3H:1V, and 3.5H:1V respectively. • Existing barbed wire fencing in the Project Development Area (PDA) will be removed. Where fencing is proposed around the PDA, wildlife-friendly fencing will be installed to allow ungulate passage (except for fencing around the diversion structure control building).

Table 6.1 Key Mitigation Measures During Construction to Reduce Potential Effects on Wildlife and Wildlife Habitat

Potential Effect	Mitigation Objective	Mitigation Measure
Change in mortality risk	• Reduce mortality risk (i.e., physical destruction of key habitat features [e.g., nests, dens, roosts, hibernacula]) due to: – ground disturbance and vegetation clearing,	• Vegetation removal will be avoided during the RAP for nesting migratory birds (April 1-August 31), as well as raptors and owls (February 15-August 31). The recommended RAP to avoid destruction and disturbance to migratory bird and raptor/owl nests is February 15 to August 31 (SRD 2011; ESRD 2013; Gregoire 2020, pers. comm.; GOA 2021; ECCC 2018). • If vegetation removal is scheduled to occur within the RAP for migratory birds and raptors/owls, a qualified wildlife biologist will inspect the site for active nests within seven days of the start of the proposed vegetation removal or ground disturbance and appropriate mitigation developed consistent with IAAC approval conditions for migratory birds (4.1, 4.5, 4.6, 4.7, 4.8). • If an active nest is found, it will be subject to a recommended setback buffer and site-specific mitigation measures developed in consultation with regulators, as required. • If vegetation removal is scheduled to occur during wildlife breeding or active periods (Feb 15 to September 30), wildlife sweeps (GOA 2020) will be completed within 10 days of the start of construction to identify wildlife features (e.g., nests, dens, roosts, hibernacula) protected under the Alberta *Wildlife Act* and appropriate site-specific mitigation developed. • Pre-construction wildlife surveys have been completed to identify wildlife features that need protection consistent with IAAC approval conditions 5.1 (little brown myotis roosting sites), 5.4 (amphibian breeding waterbodies) and 8.3 (grizzly bear dens). • Identified wildlife features will be avoided during construction activities, as identified by the appropriate signage and/or exclusion fencing. The Environmental Monitor(s) or designate and Wildlife Resource Specialist(s) will recommend the appropriate setback distance for identified wildlife features. • If construction activities occur within 100 m of an amphibian SOMC breeding wetland during the breeding season (approximately May 1 to September 30), silt fencing will be installed around the perimeter of the wetlands to prevent amphibians from moving into active construction areas. 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. • If previously unidentified listed or sensitive wildlife species or their site-specific habitat (e.g., dens, nests are identified during construction), then the occurrence will be reported to the Environmental Monitor(s) or designate.

Table 6.1 Key Mitigation Measures During Construction to Reduce Potential Effects on Wildlife and Wildlife Habitat

Potential Effect	Mitigation Objective	Mitigation Measure
	– Vehicle and equipment movement – Animal-vehicle collisions.	• During construction, increases in traffic volumes due to the Project will be managed through the Traffic Accommodation Strategy (TAS), which will reduce Project-related mortality risk related to animal-vehicle collisions in the LAA. Speed limits in construction zones will be reduced; allowing more visibility to drivers and less chance of animal-vehicle collisions. • All construction traffic will adhere to safety, road closure regulations, and other access measures and guidelines for the construction area and associated access roads. • If construction activities occur within 100 m of an amphibian SOMC breeding wetland during the breeding season (approximately May 1 to September 30), silt fencing will be installed around the perimeter of the wetlands to prevent amphibians from moving into active construction areas. 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. • Unauthorized vehicles will be prevented from accessing the PDA by using gates.
	– Reduce wildlife-human conflict (i.e., removal of unwanted (problem) wildlife in the construction area).	• Wildlife will not be harassed or fed. • Waste will be stored in wildlife-proof containers and wildlife awareness training will be provided to staff on site to reduce human-wildlife conflict • Personnel will not be permitted to have dogs at the construction site. Firearms are not permitted in project vehicles or on the construction footprint, or at associated project facilities. • Incidents with wildlife will be reported to an Alberta Transportation representative. Sightings of species of interest will be reported to the Environmental Monitor(s) or designate. Protection measures might be implemented and the sighting will be recorded. • Unanticipated wildlife issues encountered during construction will be discussed and resolved by the Environmental Monitor(s) or designate, wildlife resource specialist(s), and the responsible regulatory agencies, if necessary.

6.2 DRY OPERATIONS

There will be no direct habitat loss and minimal sensory disturbance (e.g., occasional maintenance activities) during dry operations. The dry operations phase has limited potential to result in increased direct mortality risk because there will be no ground disturbance (e.g., vegetation clearing) during maintenance activities as well as substantially less human activity and vehicle traffic compared to the construction phase. The reduction in onsite activity will reduce the likelihood of Project-related wildlife mortality and wildlife-human conflict compared to the construction phase. Therefore, the main objectives of the dry operations mitigation measures are to reduce potential Project effects to wildlife from reduced habitat effectiveness from sensory disturbance and from major Project components (e.g., diversion channel, floodplain berm, off-stream dam) that may alter or reduce wildlife movement. Key mitigation measures that will be implemented are listed in Table 6.2.

Table 6.2 Key Mitigation Measures During Dry Operations to Reduce Potential Effects on Wildlife and Wildlife Habitat

Potential Effect	Mitigation Objective	Mitigation Measure
Change in habitat	• Reduce indirect loss or reduced habitat effectiveness from sensory disturbance.	• Restrict maintenance activities to the PDA where possible and use existing access roads. • Unauthorized vehicles will be prevented from accessing the PDA by using gates.
Change in movement	• Reduce potential barrier effects due to Major Project structures (diversion channel, floodplain berm, off-stream dam) as a result of habitat change and sensory disturbance.	• 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 to move across. • The diversion channel and off-stream dam will be built with side slopes of 3H:1V, and 3.5H:1V respectively. • Two underpasses and wildlife friendly fencing will be installed and maintained during construction and dry operations to provide passage for grizzly bear western population (*Ursus arctos*) and ungulates. The two underpasses will be located under Highway 22 and Township Road 242 where they cross the diversion channel. • Where fencing is proposed around the PDA, wildlife-friendly fencing will be installed to prevent access by livestock and allow safe passage for wildlife (except for fencing around the diversion structure control building) • Wildlife friendly fencing will be installed as part of Project development taking into account Alberta Conservation Association *Landholder's Guide to Wildlife Friendly Fencing* to prevent access by livestock and allow safe passage for wildlife.

Table 6.2 Key Mitigation Measures During Dry Operations to Reduce Potential Effects on Wildlife and Wildlife Habitat

Potential Effect	Mitigation Objective	Mitigation Measure
Change in mortality risk	• Reduce animal-vehicle collisions.	• All operations vehicles will adhere to speed limits and other access measures and guidelines for associated access roads.

6.3 FLOOD OPERATIONS

The objectives of the flood operations mitigation measures are to reduce mortality risk to ground-nesting migratory birds and amphibian species at risk.

6.3.1 Migratory Bird and Amphibian Species at Risk Salvage Plan

Alberta Transportation committed to developing and implementing a Migratory Bird and Amphibian Species at Risk Salvage Plan. The Migratory Bird and Amphibian Species at Risk Salvage Plan has been developed to meet IAAC approval conditions 4.9. 4.10 and 5.5. The field survey methods and translocation protocols for the Migratory Bird and Amphibian Salvage Plan are provided in Appendix B. Mitigation measures designed to reduce potential effects on migratory birds and amphibian species at risk during flood operations are provided in Table 6.3.

Table 6.3 Mitigation Measures to Reduce Potential Mortality Risk on Migratory Birds and Amphibian Species at Risk during Flood Operations

Potential Effect	Mitigation Objective	Mitigation Measure
Change in mortality risk	• Reduce the mortality risk due to rising flood waters on migratory birds and species at risk amphibians	• Implement migratory bird and amphibian species at risk salvage (rescue) program in accordance with approval condition 4.9, 4.10 and 5.5 (see Appendix B).

6.4 POST-FLOOD OPERATIONS

The objectives of the post-flood operations mitigation measures are to reduce potential Project effects on wildlife and wildlife habitat from sensory disturbance during post-flood maintenance activities, reduce mortality risk from ground disturbance to wildlife during sediment and debris management in the PDA, and maintain wildlife movement in the LAA. Key mitigation measures that will be implemented are listed in Table 6.4.

Table 6.4 Key Mitigation Measures to Reduce Potential Effects on Wildlife and Wildlife Habitat During Post-Flood Operations

Potential Effect	Mitigation Objective	Mitigation Measure
Change in habitat	• Reduce indirect loss or reduced habitat effectiveness from sensory disturbance.	• Maintenance activities will be restricted to the PDA to reduce the area of disturbance during post-flood operations. • During maintenance activities in the off-stream reservoir, maintain 100 m setback distance from amphibian species at risk breeding wetlands previously identified and confirmed occupied during the post-flood habitat assessment. Maintenance activities will be reduced as much as possible in the KWBZ identified along Elbow River from December 15 to April 30 (ESRD 2015).
Change in movement	• Reduce change in movement due to habitat change and sensory disturbance.	• Side slopes of the diversion channel will be revegetated (if required) as part of post-flood maintenance to provide a more conducive material for wildlife to move across or out of the channel to its original design parameters. • Post-flood infrastructure maintenance within the reservoir footprint will be temporary and the duration will be reduced as much as possible. • Post-flood reservoir footprint maintenance will be localized and should be preferably completed during daylight hours.
Change in mortality risk	• Manage vehicle and equipment movement and ground disturbance to reduce accidental mortality of small, less mobile species or individuals (e.g., amphibians). • Reduce animal-vehicle collisions.	• Manage post-flood maintenance activities to the required areas and reduce the area of disturbance. All maintenance traffic will adhere to safety and road closure regulations. • If maintenance activities in the off-stream reservoir occur more than seven days following reservoir draining, and during the RAP for nesting migratory birds and raptors, nest searches will be conducted. If an active nest or den is found, it will be subject to a provincial or federal disturbance setback buffer and site-specific mitigation.
	• Reduce wildlife-human conflict (i.e., removal of nuisance animals).	• Do not harass or feed wildlife. Store waste in wildlife-proof containers and provide wildlife awareness training to all staff on site.

7.0 MITIGATION MONITORING

Mitigation monitoring will be implemented to monitor the effectiveness of mitigation designed to reduce predicted changes in wildlife habitat, wildlife movement and mortality risk. Performance indicators (monitoring metrics), and measurable targets have been developed to evaluate mitigation effectiveness to meet goals identified in Section 1.1 as well as IAAC approval condition 4.10 as it applies to migratory birds.

Performance indicators for wildlife as well as specific triggers or thresholds to inform adaptive management. (i.e., corrective actions) have been developed using baseline information, scientific literature related to mitigation effectiveness (e.g., wildlife-friendly fencing) and monitoring design, professional judgment and past experience.

7.1 SPATIAL EXTENT

This WMMP has been developed to mitigate and monitor focal wildlife species potentially affected in the Project PDA and LAA, where applicable (e.g., wildlife movement, setback buffers that extend past the PDA).

7.2 FREQUENCY AND DURATION

Wildlife features (i.e., nests, dens) will be identified and mitigation implemented on a continuous basis throughout the construction period, as required. In accordance with IAAC approval condition 4.11.1, bank swallow habitat use will be monitored annually during construction and continue for the first three years of dry operations and every five years thereafter. The duration of monitoring for other components of the WMMP such as the remote camera monitoring program will continue for three years post-construction.

As stated in the Vegetation and Wetland Mitigation, Monitoring and Revegetation Plan (Section 10.0), Project upland areas affected by flooding will be monitored for two to five years post flood reclamation with monitoring done at three time intervals (i.e., year one, three and five post reclamation) if monitoring is needed for five years. Wetlands not previously included in the wetland *Water Act* replacement plan and intersected by flood waters will be monitored at three time periods for five years post flood (i.e., year one, three, and five post reclamation). Areas not achieving end goal key performance indicators (e.g., plant composition and vigour, litter quality and quantity) will continue to be monitored until indicators are achieved. As such, the results of the reclamation monitoring will be used to evaluate the reestablishment of wildlife habitat.

7.3 CONSTRUCTION AND DRY OPERATIONS

Performance targets and assumptions used to evaluate mitigation measures during construction and dry operations (post-construction and for periods in between flood operations) are provided in Table 7.1. A more detailed discussion of monitoring methods as well as any limitations related to performance indicators, study design, and sampling effort is provided in Appendix B (Bank Swallow Mitigation Plan), Appendix C (Migratory Bird and Amphibian Salvage Plan) and Appendix D (Remote Camera Monitoring Program).

Table 7.1 Summary of Performance Indicators and Targets used to Evaluate Mitigation Effectiveness during Construction, Dry Operations and the Three Year Post-Construction Period

Project Phase	Residual Effect	Performance Indicator	Target	Adaptive Management Action[1]
Construction	• Change in Habitat – Direct habitat loss or alteration including residences of species at risk (SAR) from vegetation clearing. – Indirect habitat loss (sensory disturbance)	• Number of active wildlife features that remain in use to meet species breeding needs (i.e., successful nesting, denning due to effective setback buffers)	• 100% of active wildlife features receive an effective setback buffer that results in nesting or denning success (i.e., evidence of fledging, or no den abandonment).	• Setback distances and monitoring protocols will be evaluated immediately if there is destruction of a migratory bird or raptor nest, bat roost site, snake hibernaculum, or a mammal den during construction.
	• Change in Movement	• Number of days construction activities occur during the RAP for the Key Wildlife Biodiversity Zone (KWBZ) along Elbow River (December 15 to April 30)	• Minimize the number of days construction activities occur during the RAP for the Key Wildlife Biodiversity Zone (KWBZ) along Elbow River (December 15 to April 30)	• Monitor wildlife use of KWBZ during construction and consider additional mitigation measures based on ungulate response to human disturbance (e.g., temporary suspension of work activities until wildlife have left the active construction area).

Table 7.1 Summary of Performance Indicators and Targets used to Evaluate Mitigation Effectiveness during Construction, Dry Operations and the Three Year Post-Construction Period

Project Phase	Residual Effect	Performance Indicator	Target	Adaptive Management Action[1]
Construction (cont'd)	• Change in Mortality Risk	• Number of active wildlife features (i.e., nests, dens, roost sites, hibernacula) destroyed • Number of animal-vehicle collisions (AVC) in the LAA (e.g., Hwy 22, Springbank Road) that can be attributed to the Project (i.e., construction traffic) • Number of reported wildlife–human conflicts • Number of problem (i.e., conflict) wildlife animals removed from the Project site	• Zero active wildlife features destroyed • Zero AVC in the LAA that can be attributed to the Project • Zero wildlife-human conflicts • Zero problem wildlife removed from the PDA due to human-wildlife conflicts • All workers (100%) on site receive wildlife awareness training (e.g., Bear Smart)	• Mitigation will be evaluated immediately if there is destruction of a migratory bird or raptor nest, bat roost site, snake hibernaculum, or a mammal den during construction • Speed limits and Traffic Accommodation Strategy will be reviewed if there are AVC due to Project-related activities • If animal carcass density demonstrates an increasing trend or new AVC prone locations (as per Alberta Wildlife Watch) are identified, further mitigation will be implemented (e.g., signage, speed limits).
Dry Operations	Change in Habitat (sensory disturbance)	• Number of maintenance activities reported to disturb wildlife (noise, humans, vehicles)	• Minimize maintenance activities that result in sensory disturbance	• Evaluate the number of maintenance activities reported to disturb wildlife (flushing, fleeing etc.) and adjust accordingly (e.g., implement temporary cessation of activity)

Table 7.1 Summary of Performance Indicators and Targets used to Evaluate Mitigation Effectiveness during Construction, Dry Operations and the Three Year Post-Construction Period

Project Phase	Residual Effect	Performance Indicator	Target	Adaptive Management Action[1]
The three-year post-construction period	Change in Habitat (sensory disturbance)	• Photographic rate (remote camera monitoring metric, number of detections/100 camera days) • Percentage (%) of remote camera locations with at least one detection for each wildlife species (i.e., naïve occupancy)	• Photographic rate (number of detections/100 camera-days) is similar to Baseline estimates. • Percent (%) of remote camera locations with at least one detection of focal wildlife species (e.g., ungulates and carnivores) does not change compared to Baseline levels (i.e., presence maintained.	• Evaluate environmental and Project site conditions at remote camera locations when photographic rates for focal species indicate a decline over two monitoring years.
The three-year post-construction period	Change in Movement • daily or seasonal because of habitat change and sensory disturbance.	• Percentage (%) of successful crossings or crossing rate by focal wildlife species (e.g., ungulates and carnivores) • Successful crossings or crossing rate per camera-day by focal species and Project permanent structure.	• All focal wildlife species that approach the **diversion channel** successfully cross the majority of the time (i.e., wildlife movement and permeability maintained) • All focal wildlife species that approach the **floodplain berm** or offstream dam successfully cross the majority of the time (i.e., wildlife movement and permeability maintained)	• Evaluate crossing success (%) by species and Project structure when crossing success (performance indicator) falls below 60%. • •If animals are not crossing under the Hwy 22 or Township Road 242 underpass, the results will be evaluated in context, environmental conditions (season, time of day, temperature etc.) and levels of human disturbance.

Table 7.1 Summary of Performance Indicators and Targets used to Evaluate Mitigation Effectiveness during Construction, Dry Operations and the Three Year Post-Construction Period

Project Phase	Residual Effect	Performance Indicator	Target	Adaptive Management Action[1]
The three-year post-construction period (cont'd)	*See above*	*See above*	• All focal wildlife species that approach **Hwy 22 or Township Road 242 bridge over the diversion channel** successfully cross the majority of the time (i.e., wildlife movement and permeability maintained at underpasses) • All focal wildlife species that approach **wildlife friendly fencing** successfully cross (over or under) at least 60% of the time (i.e., semi-permeable barrier based on Burkholder et al. 2018; Segar and Keane 2020)	• If ungulate crossing success at wildlife-friendly fencing falls below 60%, wildlife friendly fence design and other environmental factors (e.g., habitat, human disturbance) will be evaluated.
	Change in Mortality Risk	• Number of animal-vehicle collisions in the PDA • number of reported wildlife–human conflicts • number of unwanted (problem) animals removed from the Project site	• Zero animal vehicle collisions in the PDA • Zero wildlife-human conflicts and no animals removed from Project site	• If animal carcass density demonstrates an increasing trend or new AVC prone locations are identified, further mitigation will be implemented (e.g., signage, speed limits). • On-site mitigation measures (e.g., waste management) will be reviewed if there is one reported wildlife-human conflict.

7.4 FLOOD AND POST-FLOOD OPERATIONS

Performance indicators, targets and assumptions used to evaluate mitigation measures during flood and post-flood operations are provided in Table 7.2.

Table 7.2 Summary of Performance Indicator and Targets used to Evaluate Mitigation Effectiveness during Flood and Post-Flood Operations

Project Phase	Residual Effect	Performance Indicator	Target	Adaptive Management
Flood Operations	Change in Habitat	• Area (ha) of inundation during flood operations (i.e., temporary direct habitat loss)	• Not applicable	• The areas of inundation where reclamation may occur will be evaluated using revegetation targets and timelines described in the Vegetation and Wetland Mitigation, Monitoring and Revegetation Plan,
	Change in Mortality Risk	• Number of birds and eggs salvaged prior to each flood event. • Number of amphibian species at risk relocated to nearby waterbody or wetland prior to each flood event.	• Total number of birds, and eggs salvaged is maximized relative to estimated bird densities for each habitat type and within the constraints of worker safety. • No injury or mortality of migratory birds or amphibian species at risk in the salvage area while activities are occurring. • Amphibian species at risk still occupy the translocation area and/or other suitable habitat in the PDA in subsequent seasons or years	• Any bird or amphibian species at risk mortality directly related to flood operations will trigger a review of mitigation measures/salvage plan. • Additional mitigation measures will be considered if any mortality occurs, or the amphibian relocation site(s) are not occupied in subsequent seasons or years.

Table 7.2 Summary of Performance Indicator and Targets used to Evaluate Mitigation Effectiveness during Flood and Post-Flood Operations

Project Phase	Residual Effect	Performance Indicator	Target	Adaptive Management
Post Flood Operations	Change in Habitat	• Area (ha) of sediment deposited in high and moderate suitability habitat for key wildlife indicator species • Area (ha) of each habitat type within each sediment depth category (<10 cm, 10-100 cm and >100 cm) as identified during the wildlife habitat assessment (see Section 8.2.1).	• Not applicable.	• The areas of inundation where reclamation may occur will be evaluated using revegetation targets and timelines described in the Vegetation and Wetland Mitigation, Monitoring and Revegetation Plan.
	Change in Mortality Risk	• Number of SOMC wildlife mortalities encountered during post-flood habitat assessment.	• Zero SOMC wildlife mortalities encountered during post-flood habitat assessment.	• Any wildlife mortality directly related to post- flood operations will trigger a review of mitigation measures/salvage plan.

7.4.1 Wildlife Habitat Assessment

7.4.1.1 Objectives

The draining of the off-stream reservoir will result in post-flood sediment being left in the off-stream reservoir, which would cover vegetation and reduce habitat suitability for wildlife. The time for wildlife habitat to return to baseline conditions (i.e., dry operations) following a flood event would depend on the magnitude of the flood. The objectives of the wildlife habitat assessment survey would be to assess habitat suitability for key wildlife indicator species and other species of management concern (e.g., wildlife species of cultural importance), and incidentally record observations of all wildlife.

7.4.1.2 Methods

The post-flood wildlife habitat assessment will be completed following release of water from the off-stream reservoir. At least two visits will be completed: one immediately after draining when it is safe to enter the off-stream reservoir, and another completed the following spring to assess vegetation reestablishment in affected areas and its potential to support wildlife habitat (see Vegetation and Wetlands Mitigation, Monitoring and Revegetation Plan). Habitat suitability will be assessed for key wildlife indicator species including elk, grizzly bear, northern leopard frog, sora, Sprague's' pipit and olive-sided flycatcher as well as other SOMC (e.g., wildlife species of cultural importance). Depending on the size of the area affected (ha) and sediment depths, the habitat assessment would be completed along a series of transects selected in each habitat type affected within the post-flood area. Potential changes in the amount (ha) of each habitat suitability class (i.e., high, moderate low) directly affected will be quantified and evaluated in terms of baseline conditions.

7.4.1.3 Results

Results of the post-flood wildlife habitat assessment will be presented and discussed in terms of potential changes to habitat conditions for SOMC and habitat suitability for each key wildlife indicator species (see Table 7.2) as well as a summary of SOMC observations.

7.5 REPORTING REQUIREMENTS

In compliance with IAAC approval condition 2.11, Alberta Transportation will prepare an annual report summarizing the monitoring results which will be provided to IAAC and the First Nation Land Use Committee by October 31 of the reporting year to which the annual report applies. IAAC has defined the reporting year as July 1 of the calendar year to June 30 of the subsequent calendar year (definition 1.32). The annual report, including a plain language executive summary in both official languages, will be made publicly available to Indigenous groups and public stakeholders no later than October 31 following the reporting year to which the annual report applies (IAAC approval condition 2.13). The report will evaluate mitigation effectiveness in the context of the goals and objectives outlined in Section 1.1 as well as targets and performance indicators outlined in Section 8.0. This information will also be made available to Indigenous groups and public stakeholders.

8.0 ADAPTIVE MANAGEMENT

Adaptive management is a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs (Walters 1986; Walters and Holling 1990). An adaptive management approach will be applied to this WMMP focusing on the remote camera monitoring program and mitigation to reduce residual effects related to wildlife movement in the LAA. Specifically, results of the remote camera monitoring program will provide the necessary data to evaluate the effectiveness of mitigation measures related to wildlife movement and provide opportunities to adjust and improve mitigation, as required.

Alberta Transportation will be responsible for evaluating the success of mitigation measures using an adaptive management approach as part of all follow-up and monitoring programs for three years post-construction. Beyond three years, AEP would assume responsibility depending on the specific monitoring program and proposed duration.

As part of the Vegetation and Wetland Mitigation, Monitoring and Revegetation Plan, achievement of revegetation goals will also provide a means to assess reestablishment of wildlife habitat, and identify if additional actions are needed (e.g., evaluate soil conditions and seed mixes).

9.0 REFERENCES

9.1 LITERATURE CITED

ECCC (Environment and Climate Change Canada). 2018. General Nesting Periods of Migratory Birds. Available at: https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html

ESRD (Alberta Environment and Sustainable Resource Development). 2013. Sensitive Species Inventory Guidelines. Alberta Sustainable Resource Development, Fish and Wildlife Division, Edmonton, AB. Available at: https://open.alberta.ca/publications/sensitive-species-inventory-guidelines

ESRD. 2015. Recommended Land Use Guidelines: Key Wildlife Biodiversity Zones. Alberta Environment and Sustainable Resource Development, Fish and Wildlife Division, Edmonton, Alberta. Available at: https://open.alberta.ca/publications/recommended-land-use-guidelines-key-wildlife-and-biodiversity-zones

GOA (Government of Alberta). 2014. The Government of Alberta's Guidelines on Consultation with First Nations on Land and Natural Resource Management.

GOA. 2021 Master Schedule of Standards and Conditions. Available at: https://open.alberta.ca/dataset/133e9297-430a-4f29-b5d9-4fea3e0a30c2/resource/37d91717-08ab-4998-a13f-ce5c103c0735/download/aep-master-schedule-of-standards-and-conditions-2021-04.pdf

SRD (Sustainable Resources Development). 2011. Recommended Land Use Guidelines for Protection of Selected Wildlife Species and Habitat within Grassland and Parkland Natural Regions of Alberta. Edmonton, AB. 5 pp. https://open.alberta.ca/publications/3054250

Walters, C. J. 1986. Adaptive management of renewable resources. New York: McGraw-Hill

Walters, C.J., and C.S. Holling. 1990. Large-scale management experiments and learning by doing. Ecology 71: 2060–2068.

9.2 PERSONAL COMMUNICATIONS

Gregoire, P. 2020. Senior Wildlife Biologist, Canadian Wildlife Service, Environment and Climate Change Canada, Prairie and Northern Region. Personal communication, email.

APPENDIX A LEGISLATION WITH REGULATORY AUTHORITY OVER WILDLIFE RELEVANT TO THE PROJECT

Table A.1 Legislation with Regulatory Authority over Wildlife Relevant to the Project

Legislation	Regulatory Agency	Resource
Canadian Environmental Assessment Act, 2012	Impact Assessment Agency of Canada (Environment and Climate Change)	Environmental protection and public interest
Migratory Birds Convention Act (MBCA), 1994	Environment and Climate Change Canada	The MBCA protects migratory bird populations and individuals and their nests within Canada. Section 6 of the Migratory Birds Regulations states that without a permit, the disturbance, destruction, or removal of a nest, egg, nest shelter, eider duck shelter, or duck box of a migratory bird, or possession of a migratory bird, carcass, skin, nest, or egg of a migratory bird are prohibited As there are no authorizations to allow Project-related effects on migratory birds and their nests, best management practices will be followed to comply with the MBCA.
Species at Risk Act (SARA), 2002	Environment and Climate Change Canada	SARA protects wildlife species listed on Schedule 1 as endangered, threatened, or extirpated. Under SARA, it is prohibited to kill, harm, or harass, capture, or take individual species at risk (section 32) or damage or destroy their residences (section 33) or critical habitat (section 58).
Wildlife Act, 2000	Alberta Environment and Parks	The Alberta *Wildlife Act* protects species listed as endangered or threatened. The regulation (36) [1] protects the house, nest or den of prescribed wildlife as defined in the Act.

APPENDIX B BANK SWALLOW MITIGATION PLAN

B.1 INTRODUCTION

As described in the Impact Assessment Agency of Canada (IAAC) Environmental Assessment Report (EA Report) as well as the Decision Statement and associated approval conditions 4.5 to 4.8, Alberta Transportation was requested to develop a Bank Swallow (*Riparia riparia)* Mitigation Plan prior to construction, and in consultation with Environment and Climate Change Canada (ECCC), other relevant authorities and Indigenous groups.

B.2 GOALS AND OBJECTIVES

The goals and objectives of the Bank Swallow Mitigation Plan have been developed to align with approval conditions related to bank swallow (see Section 3.0) mitigation and monitoring including specific requirements for a follow-up program identified in approval condition 4.11. The Bank Swallow Mitigation Plan links predicted Project effects to mitigation, mitigation objectives to monitoring, and monitoring results to adaptive management actions. The primary goal of the Bank Swallow Mitigation Plan is to reduce potential changes in bank swallow nesting and foraging habitat as defined in the proposed Recovery Strategy for the Bank Swallow (*Riparia riparia*) in Canada (ECCC 2021). The mitigation objectives of this plan are to reduce potential Project effects on residences of bank swallow as defined by ECCC (GOC 2019) and monitor areas where artificial nest structures will be installed to replace nesting habitat temporarily rendered inaccessible due to geotextile cover.

B.3 REGULATORY CONTEXT, APPROVALS AND GUIDELINES

Alberta Transportation has prepared the Bank Swallow Mitigation Plan in accordance with IAAC approval conditions related to bank swallow (Table B.1). The Bank Swallow Mitigation Plan has also been developed to align with the recently released proposed Recovery Strategy for the Bank Swallow (*Riparia riparia*) in Canada (ECCC 2021) as well as in consideration of the Description of Residence for Bank Swallow (*Riparia riparia*) in Canada (GOC 2019), which defines a residence as an occupied burrow. The destruction of this migratory bird species' residence is prohibited on all lands under the *Species at Risk Act* (SARA).

The recovery strategy recommends that any new residential, commercial or industrial development avoid removing nesting habitat in natural settings. Outside of designated critical habitat units, natural nesting habitat should be created before the following nesting season when removing existing nesting habitat cannot be avoided. Nesting habitat compensation should result in an increase of available nesting habitat that persists over the long-term (ECCC 2021). Although critical habitat was defined and identified in the recovery strategy (ECCC 2021), critical habitat identified in Alberta does not occur in the Local Assessment Area (LAA).

Table B.1 Summary of Approval Conditions for Bank Swallow during Construction and Dry Operations

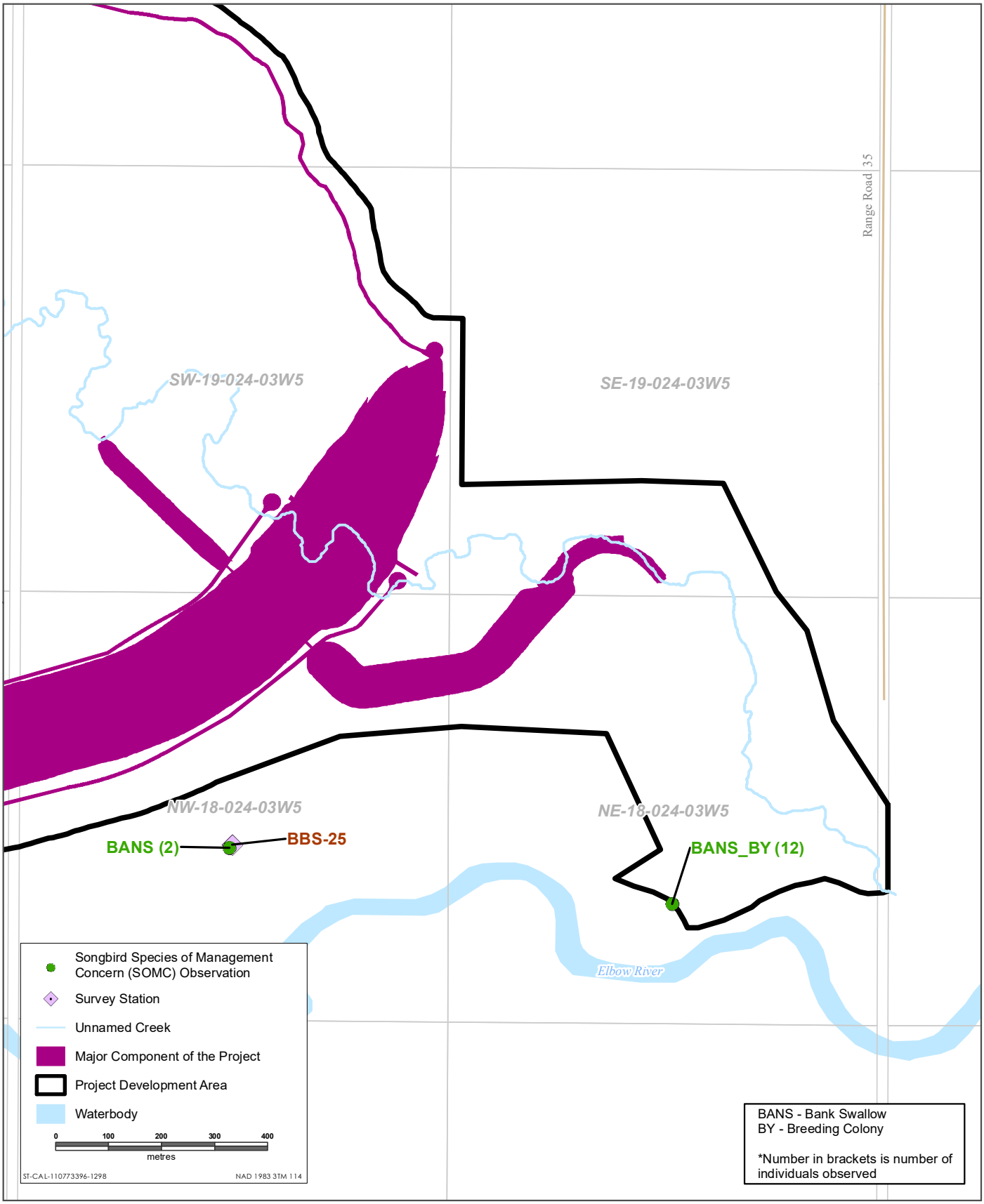
Reference	Approval Condition
IAAC Condition 4.5	• The Proponent shall develop, prior to construction, in consultation with Environment and Climate Change Canada and taking into account Environment and Climate Change Canada's *Description of Residence for bank swallow (Riparia riparia) in Canada*, measures to mitigate the adverse environmental effects on bank swallow (*Riparia riparia*) attributed to the Designated Project. The Proponent shall establish a schedule for the implementation of the measures and shall, as part of these measures:
IAAC Condition 4.5.1	• maintain foraging habitat within 500 metres of bank swallow residences. If it is not technically feasible for the Proponent to maintain a distance of 500 metres, the Proponent shall provide a rationale to relevant authorities and develop and implement additional mitigation measures, in consultation with relevant authorities, to avoid effects on bank swallow. The Proponent shall submit these measures to the Agency prior to implementing them.
IAAC Condition 4.5.2	• install, prior to construction, and in consultation with Environment and Climate Change Canada, artificial nesting structures in suitable habitat to compensate for the loss of nesting sites within the project development area and identified in Appendix H, Figure 3-1, of the Environmental Impact Statement. The Proponent shall perform maintenance on the nesting structures annually and maintain their accessibility and integrity during all phases of the Designated Project and shall ensure the presence of foraging habitat within 500 metres of the artificial nesting structures. If it is not technically feasible for the Proponent to ensure the presence of foraging habitat within a distance of 500 metres, the Proponent shall provide a rationale to relevant authorities and develop and implement additional mitigation measures, in consultation with relevant authorities, to avoid effects on bank swallow. The Proponent shall submit these measures to the Agency prior to implementing them;
IAAC Condition 4.5.3	• maintain the slope of topsoil, soil and sediment stockpiles located within the project development area and not used as artificial nesting structures in accordance with condition 4.5.2 at less than 70 degrees; and
IAAC Condition 4.5.4	• demonstrate how any other offsetting measures implemented by the Proponent will compensate for the adverse environmental effects on bank swallow (*Riparia riparia*) attributed to the Designated Project in the project development area.
IAAC Condition 4.11.1	• As part of the follow-up program, the Proponent shall: monitor, annually during construction, for the first three years of operation and every five years thereafter, bank swallow use of the project development area.
IAAC EA Report	• Install in the PDA, prior to the arrival of the bank swallow in the spring, a geotextile sheet to cover vertical and near-vertical banks at the location of the reservoir outlet channel and maintain the sheet in place until the end of the nesting period for the species.
IAAC EA Report	• Monitor the use (expressed in number of breeder pairs and active burrows) of the bank swallow monitoring study area. Carry out this monitoring annually during construction and for the first three years following the end of construction and every five years thereafter

B.4 BANK SWALLOW NESTING AND FORAGING HABITAT

The bank swallow is an aerial insectivore that nests in colonies (burrows) excavated in vertical banks, frequently along waterways (Garrison and Turner 2020). Nesting colonies are found in vertical or near-vertical banks composed of silt or sand deposits. A vertical face height of 0.5 m is defined in the recovery strategy as the minimum vertical face height of a suitable nesting site (ECCC 2021). In addition to natural habitats, bank swallows opportunistically establish nesting colonies in human-made habitats. Burrows can be found in vertical or near-vertical faces in aggregate pits, along road-cuts, and in piles of sand, gravel, or sawdust (ECCC 2021). Bank swallow forage over open and aquatic habitats that provide insect populations. Open habitats include areas that support perennial cover such as natural grasslands, pastures, hayfields, and croplands. Aquatic habitats include rivers, creeks, lakes, wetlands and sewage lagoons, as well as coastal waters (ECCC 2021).

B.5 EXISTING CONDITIONS AND POTENTIAL EFFECTS

Potential Project effects on migratory birds including bank swallow were assessed in the EIA and in responses to IAAC Information Requests (IRs). As part of the wildlife baseline surveys completed in 2016, breeding bird surveys were completed at 54-point count stations in the Local Assessment Area (LAA). Bank swallow was observed on two occasions including 2 individuals at breeding bird point count station (BBS) 25, and a colony where 12 individuals were incidentally observed. Both observations occurred along Elbow River (see Volume 4, Appendix H, Wildlife and Biodiversity Technical Data Report, Figure 3-1 of the EIA). The bank swallow colony is located on the edge of the Project Development Area (PDA) and will not be directly affected during construction or flood operations. However, there is potential for the Project to result in sensory disturbance to nesting and/or foraging habitat during construction of the low-level outlet and associated access, which is approximately 250 m from the identified bank swallow nesting colony (see Figure B.1).



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

Location of Bank Swallow Colony and Observations in the LAA

Stantec

ALBERTA TRANSPORTATION SPRINGBANK OFF-STREAM RESERVOIR PROJECT

Figure B.1

B.6 FIELD SURVEYS

Consistent with IAAC approval condition 4.5.2, a field survey designed to identify potential suitable habitat to install artificial nesting structures will be completed prior to construction in 2022. It is anticipated this habitat assessment will be scheduled for late fall 2021 or early spring 2022 depending on landowner access agreements. In addition, the geotextile fabric will be installed at the existing colony along Elbow River prior to the nesting season (May 1 to August 31).

B.7 MITIGATION

The objectives of the construction mitigation measures are to reduce potential Project effects on bank swallow nesting and foraging habitat. The bank swallow mitigation measures were developed in accordance with the IAAC approval conditions listed in Table 1. Although mitigation measure developed to protect migratory birds including bank swallow are provided in the WMMP (see Section 7, Table 7.1), mitigation measures that will be implemented to reduce potential Project effects on bank swallow are also provided in Table B.2. The Plan will be implemented prior to and during construction.

An initial nest search will be completed for bank swallow and will target the previously identified nesting colony along Elbow River and other areas within 500 m of suitable habitat in the PDA. The number of nest structures to install will be determined during the initial site visit, which will confirm the number of burrows in the previously identified bank swallow colony along Elbow River.

Table B.2 Key Mitigation Measures During Construction to Reduce Potential Effects on Bank Swallow

Potential Effect	Mitigation Objective	Mitigation Measure
Change in habitat	• Reduce direct habitat loss or alteration including residences of species at risk (SAR) from vegetation clearing. • Reduce indirect habitat loss (sensory disturbance).	• Where possible construction activities will avoid the bank swallow breeding period (May 1 to August 31). • If activities are planned to occur in the migratory bird breeding period including bank swallow (May 1 to August 31) pre-construction nest searches will be completed to identify active nests (burrows). If an active bank swallow nest (burrow) is identified, site specific mitigation will be implemented, which will include a 500 m recommended setback buffer in accordance with IAAC approval condition 4.5.1.). No work activities will be allowed within the setback buffer until the birds have fledged and the nest (burrows) are no longer occupied (GOC 2019). • A geotextile sheet will be installed to cover vertical or near-vertical banks within 500 m upstream and downstream of the diversion structure inlet and low-level outlet channel. The sheet will be in place during construction until the end of the nesting period. The geotextile cover will be installed prior to the arrival of the bank swallow in May. Other areas that provide suitable vertical or near-vertical banks will also be assessed and similar mitigation applied, as required. • Artificial nesting structures will be installed prior to construction in suitable habitat (e.g., open areas near water) to compensate for the potential loss of bank swallow nesting sites within the project development area and identified in Appendix H, Figure 3-1, of the Environmental Impact Statement. The number of nesting structures installed will support at least 6 breeding pairs based on previous occupancy observed in 2016 (i.e., 12 individuals). The number of burrows will be confirmed during a site visit that will be scheduled prior to the bank swallow return in spring 2022. • Accessibility and integrity of nesting structures will be maintained on an annual basis to provide suitable bank swallow nesting habitat during all phases of the Project and shall ensure the presence of foraging habitat within 500 m of the artificial nesting structures. • No construction activities will occur within 500 m of bank swallow residences including artificial nesting structures. If this is not possible, site-specific mitigation will be developed in consultation with ECCC. Additional mitigation measures will be considered, which could include monitoring of active bank swallow residences and foraging habitat use. • Bank swallow use in the PDA will be monitored during all phases of the Project and continue for the first three years of dry operations (i.e., post-construction) and every five years thereafter. • Maintain the slope of topsoil, soil and sediment stockpiles located within the PDA and not used as artificial nesting structures in accordance with condition 4.5.2 at less than 70 degrees.

Table B.2 Key Mitigation Measures During Construction to Reduce Potential Effects on Bank Swallow

Potential Effect	Mitigation Objective	Mitigation Measure
Change in Mortality Risk	• Reduce mortality risk (i.e., physical destruction of bank swallow residences due to vegetation removal and ground disturbance.	• Where possible construction activities will avoid the bank swallow breeding period (May 1 to August 31). • If activities are planned to occur in the migratory bird breeding period including bank swallow (May 1 to August 31) pre-construction nest searches will be completed to identify active nests (burrows). If an active bank swallow nest (burrow) is identified, site specific mitigation will be implemented, which will include a 500 m recommended setback buffer in accordance with IAAC approval condition 4.5.1.). No work activities will be allowed within the setback buffer until the birds have fledged and the nest (burrows) are no longer occupied (GOC 2019).

B.8 MONITORING

The mitigation objectives are to reduce potential Project effects on bank swallow nesting and foraging habitat as well as avoid mortality risk. Mitigation monitoring will be implemented to monitor the effectiveness of mitigation designed to reduce direct and indirect effects on bank swallow nesting and foraging habitat. Performance indicators, targets and associated assumptions have been developed to evaluate mitigation effectiveness and to meet approval condition 4.5 as it applies to bank swallow.

B.8.1 Timing and Frequency

The status of existing bank swallow residences including nesting structures will be monitored annually during construction and the first three years of dry operations where active residences will be checked twice yearly between May 1 and August 31.

B.8.2 Duration

In accordance with IAAC approval conditions 4.11.1, bank swallow habitat use will be monitored annually during construction and continue for the first three years of dry operations and every five years thereafter.

Table B.3 Summary of Performance Indicators, Targets and Assumptions used to Evaluate Mitigation Effectiveness during Construction and Dry Operations

Project Phase	Residual Effect	Performance Indicator	Target	Adaptive Management
• Construction • Dry Operations	• Change in Habitat – direct habitat loss or alteration – Indirect habitat loss (sensory disturbance) • Change in Mortality Risk	• Number of breeding pairs and active bank swallow burrows in the PDA • Number of residences destroyed or created	• Continued use of the PDA each monitoring year as indicated by the number of breeding pairs of bank swallow observed during construction and dry operations. • Zero residences destroyed	• Mitigation will be evaluated immediately if there is destruction of a bank swallow residence including nesting structures during construction or dry operations. • Mitigation will be evaluated if the number of breeding pairs in the PDA decreases during any monitoring year.

B.9 REPORTING

In compliance with IAAC approval condition 2.11, Alberta Transportation will prepare an annual report summarizing the monitoring results, which will be made available to IAAC and the First Nation Land Use Committee by October 31 of the reporting year to which the annual report applies. IAAC has defined the reporting year as July 1 of the calendar year to June 30 of the subsequent calendar year (definition 1.32). The annual report, including a plain language executive summary in both official languages, will be made publicly available to Indigenous groups and public stakeholders no later than October 31 following the reporting year to which the annual report applies (IAAC approval condition 2.13). The report will evaluate mitigation effectiveness in the context of the goals and objectives outlined in Section 2 as well as targets and performance indicators outlined in Section 7.0.

B.10 ADAPTIVE MANAGEMENT

This effectiveness of the proposed mitigation measures and monitoring results will be evaluated using an adaptive management approach. If performance indicators are not meeting the objectives of the Plan, based on the measurable targets, mitigation measures will be evaluated, and corrective actions implemented in consultation with ECCC. Alberta Transportation and Alberta Environment and Parks will consider any published updates to species' recovery strategies or action plans and adapt the plan to be consistent with these documents, as required.

B.11 REFERENCES

ECCC (Environment and Climate Change Canada). 2021. Recovery Strategy for the Bank Swallow (*Riparia riparia*) in Canada [Proposed]. Species at Risk Act Recovery Strategy 4 Series. Environment and Climate Change Canada, Ottawa. ix + 122 pp.

Garrison, B. A. and A. Turner.2020. Bank Swallow (*Riparia riparia*), version 1.0. In Birds of the World (S. M. Billerman, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.banswa.01

(GOC) Government of Canada. 2019. *Species at Risk Act* Public Registry. Residence Descriptions. Description of residence for Bank Swallow (*Riparia riparia*) in Canada. May 2019.

APPENDIX C MIGRATORY BIRD AND SPECIES AT RISK SALVAGE PLAN

C.1 INTRODUCTION

The primary objective of the Migratory Bird[1] and Amphibian Species at Risk Salvage Plan is to reduce mortality risk during flood operations. The approach and criteria described in this salvage protocol is designed to demonstrate due diligence and to comply as best as possible with the *Migratory Birds Convention Act* (MBCA) and the *Species at Risk Act* (SARA) during a flood response.

This protocol describes nest search methods for migratory birds designed to: (i) find active nests; and (ii) salvage nests with eggs or chicks prior to a flood event. In addition, this protocol describes field methods to salvage adult amphibian species at risk listed as Special Concern on Schedule 1 of SARA including northern leopard frog (*Lithobates pipiens*), western toad (*Anaxyrus boreas*), and western tiger salamander (*Ambystoma mavoritium*) prior to a flood event. Migratory bird nest salvage refers to relocating a migratory bird nest that contains eggs or chicks to a rehabilitation center, these nests and their occupants that would otherwise be negatively affected during flood operations. Similarly, amphibian salvage refers to moving an amphibian species at risk that would otherwise be negatively affected during flood operations to a release site outside the flood inundation area (e.g., Randall et al. 2018).

C.2 APPROVAL CONDITIONS

The migratory bird nest and amphibian species at risk salvage program has been developed in accordance with the Impact Assessment Agency of Canada (IAAC) Approval Conditions 4.9 and subsections, 4.10 and 5.5. The IAAC approval conditions related to rescue (salvage) of migratory birds and amphibian species at risk prior to a flood event are listed in Table C.1.

[1] Migratory bird defined as per Government of Canada's list of migratory birds protected under the *Migratory Birds Convention Act*. Available at: https://www.canada.ca/en/environment-climate-change/services/migratory-birds-legal-protection/convention-act.html

Table C.1 Summary of Approval Conditions for Migratory Birds and Amphibian Species at Risk during Flood Operations

Reference	Approval Condition
IAAC Condition 4.9	• The Proponent shall develop and implement, in consultation with Indigenous groups and relevant authorities, a protocol to prevent harm to migratory birds, including migratory bird species at risk identified in Table 3 of the environmental assessment report, within the project development area. The Proponent shall develop the protocol prior to construction and implement it prior to flood operation. The protocol shall include:
IAAC Condition 4.9.1	– flood forecasting undertaken prior to inventories conducted in accordance with condition 4.10; and
IAAC Condition 4.9.2	– measures to rescue migratory birds, chicks and eggs.
IAAC Condition 4.10	• The Proponent shall conduct, in consultation with Indigenous groups, inventories of potential migratory bird habitat, including the collection of information on breeding bird densities and the presence of ground nesting birds, as well as mapping of important habitat features, shrub lands, wetlands and grassland within the project development area every five years starting the first year of operation, and update the migratory bird protocol referred to in condition 4.9 based on the results of the inventories.
IAAC Condition 5.5	• The Proponent shall develop and implement, in consultation with Indigenous groups and relevant authorities, a protocol to prevent the mortality of amphibians, including northern leopard frog (*Lithobates pipiens*), western toad (*Anaxyrus boreas*), and western tiger salamander (*Ambystoma mavoritium*) during flood operation within the reservoir footprint. The Proponent shall develop the protocol prior to construction, taking into account the flood forecasting undertaken in accordance with condition 4.9.1. The protocol shall include measures to rescue and relocate northern leopard frog (*Lithobates pipiens*), western toad (*Anaxyrus boreas*), and western tiger salamander (*Ambystoma mavoritium*) to suitable habitat outside the reservoir footprint.

C.3 MIGRATORY BIRD NEST AND AMPHIBIAN SPECIES AT RISK SALVAGE PROTOCOL

The following sections outline the salvage protocols and logistics necessary to rescue salvaged bird nests and relocate amphibian species at risk. The primary purpose of the migratory bird nest salvage is to find active ground-nesting bird nests with eggs, chicks or fledglings and rescue them prior to a flood event. As feasible, all chicks (i.e., hatchling, nestling, fledgling) and eggs found will be rescued and transported to a local wildlife rescue center(s) (see Section C.4). The primary purpose of the amphibian salvage is to capture and move any amphibian species at risk encountered in wetlands or other habitats in the inundation flood area out of harms way.

C.3.1 Survey Planning

C.3.1.1 Flood Forecast for Elbow River and Reservoir Filling

Flood forecasting for Project operations will be provided by Alberta Environment and Parks (AEP) River Engineering and Technical Services. Forecasts will be based on modelled predictions that consider hydrometric, snowpack, precipitation and meteorological forecast. A reliable forecast from AEP River Engineering and Technical Services that flows in Elbow River of 160 m^3/s or greater (the flows at which the project could be activated), and indication that the activation of the project is likely, will initiate migratory bird salvage in the reservoir area. Limiting the implementation of the salvage program to the advance flood warning period will reduce the uncertainty associated with salvaging in areas that may not receive flood waters (i.e., salvaging prior to the best available advance warning could result in unnecessary salvage efforts because there is uncertainty associated with predicting a future flood). Salvage efforts themselves also have the potential to harm birds and eggs, so there is a desire to limit the risk of harm that may be caused by undertaking salvage in areas that do not have flooding.

Salvage efforts will be considered if the predicted flood event is anticipated to occur during the migratory bird breeding period for nesting Zone B4 with consideration of species at risk, which extends from April 1 to August 31). The likelihood that the salvage program would be implemented will increase during the peak flood season (May 15 to July 15). However, the safety of the salvagers will take precedence over salvage efforts as necessary.

C.3.1.2 Logistics

AEP Operations will be responsible for coordinating the Migratory Bird and Amphibian Species at Risk Salvage Plan, when required. AEP Operations will contact the Contractor responsible for completing the bird nest search and amphibian salvage to inform them that there is a flood event and project activation are predicted to occur. AEP Operations will notify ECCC that a predicted flood event (advanced warning) has been issued, and the Migratory Bird and Amphibian Species at Risk Salvage Plan will be executed.

The Contractor will be responsible for implementing the salvage plan as described in this protocol. The Contractor(s) would be responsible for maintaining communication with AEP Operations, confirming existing salvage capacity (i.e., number of individual eggs, chicks and fledglings) at each rehabilitation center, coordinating field crews, travel and field equipment and ensuring the appropriate bird/amphibian salvage permits (see Section C.3.5) are in place, as required. Given the relatively quick response required to carry out the salvage plan once the advanced warning has been issued, it is recommended wildlife permits be in place well before the flood season every spring to ensure permit approval is obtained and prevent any delays in salvage efforts.

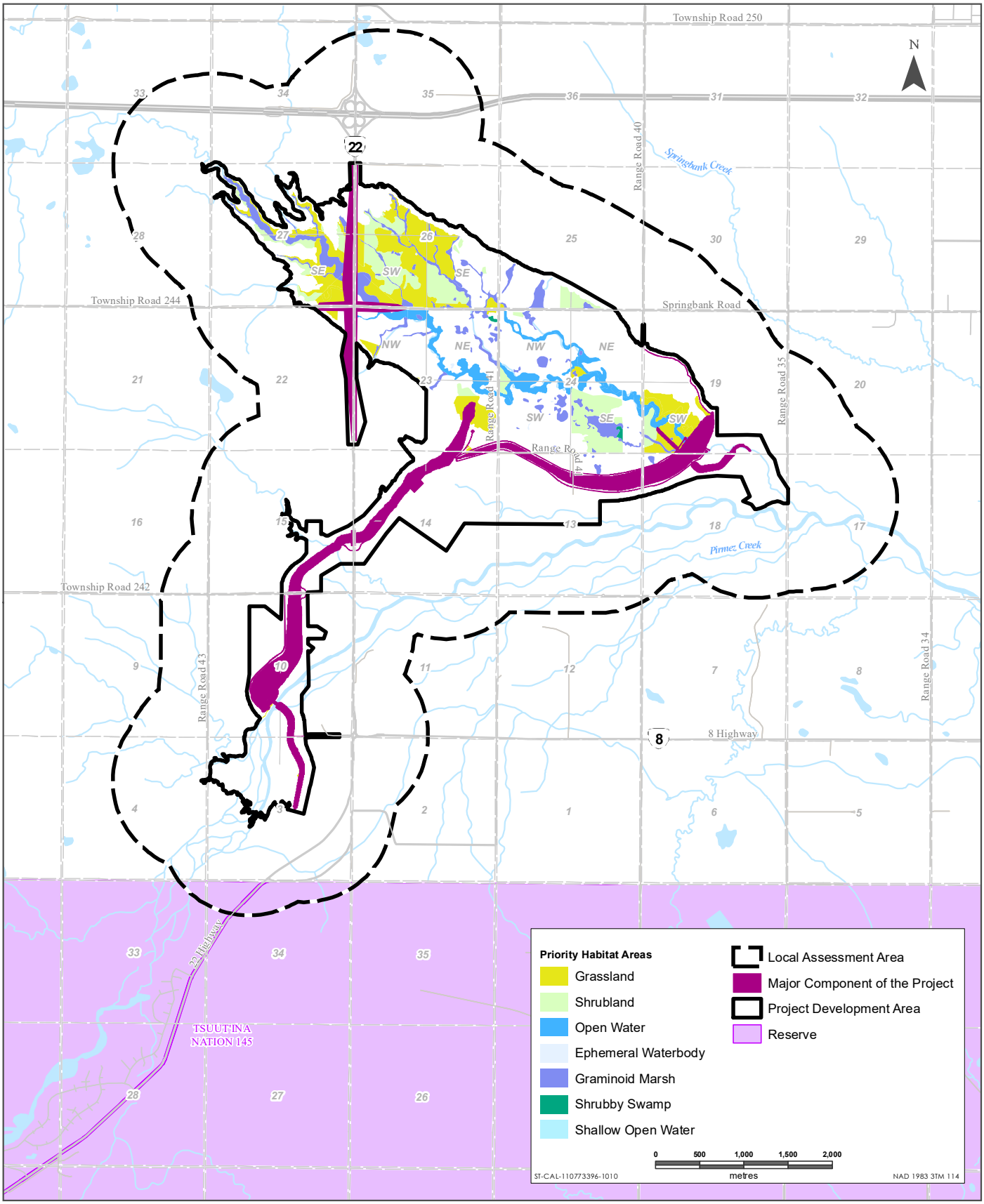
C.3.1.3 Search Area

Spatial and forecasting constraints, combined with estimated bird densities will be used as criteria to identify where in the reservoir's footprint potential bird salvage could occur while protecting worker safety and feasibility of success.

Migratory Bird Priority Habitat Areas

Based on the estimated breeding bird densities and habitat types available within the offstream reservoir (see response to CEAA Conformity IR1-07), there are areas that are expected to contain relatively higher densities of bird nests compared to other habitat types (i.e., "hotspots"). Although results from the breeding bird baseline surveys indicated forested areas contained relatively higher breeding bird densities (357 to 587 territories/100 ha) (see response to CEAA Conformity IR1-07) compared to other habitat types, ground nesting birds are most at risk during flood operations. Therefore, shrublands, wetlands and grassland (i.e., native and reclaimed grassland) will be focused on during bird nest search efforts and salvage operations within the reservoir (see Figure B.1). These priority habitat areas are expected to contain moderate densities of breeding birds (220 territories/100 ha to 357 territories/100 ha) based on previous baseline breeding bird surveys (see Volume 4, Appendix H, Section 3.0 of the EIA,).

The priority habitat areas of grassland, wetlands and shrublands along the unnamed creek will be targeted for nest salvage, based on estimated bird densities. However, the exact locations of bird salvage efforts will depend on the rate of reservoir filling: salvage efforts will be focused on priority habitats located in the lower portions of the reservoir nearest to the dam where the risk of mortality to ground-nesting birds will be relatively higher because those areas contain an abundance of high priority habitats and will be inundated relatively early during reservoir filling (e.g., SW-19-24-03W5M, SE-24-24-04W5M; see Figure C.1). However, these areas will only be targeted for salvage efforts if it is safe to do so (i.e., prior to inundation of the reservoir). Where possible (or if necessary), salvage efforts may include the middle and upper portions of the reservoir, depending on the rate of reservoir filling.



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

Priority Habitat Areas within the Reservoir and Potential Locations of Migratory Bird and Species at Risk Salvage Efforts

Stantec

C.3.2 Migratory Bird Nest Search Methods

Bird nest surveys completed prior to a predicted flood event will focus on identifying and rescuing nesting migratory birds including migratory bird species at risk that are at greatest risk of potential mortality due to nest flooding and drowning (i.e., ground or shrub nesters). Based on previous baseline breeding bird surveys (see Volume 4, Appendix H of the EIA), bird species that are most likely to be encountered and potentially salvaged include:

- Savanna sparrow (*Passerculus sandwichensis*)
- clay colored sparrow (*Spizella pallida*)
- Lincoln's sparrow (*Melospiza lincolnii*)
- yellow warbler (*Setophaga petechia*)

As well as three species of management concern:

- sora (Porzana *carolina*)
- alder flycatcher (*Empidonax alnorum*)
- eastern kingbird (*Tyrannus tyrannus*)

In addition, waterfowl such as mallard (*Anas platyrhynchos*) and Canada goose (*Branta canadensis*) are potential candidates for bird rescue if their nests or eggs are encountered.

Nest searches will be completed using a combination of passive detection techniques (observing bird behaviour and listening for bird song or calls) and systematically walking the salvage area to identify nests and observe nesting behaviour. A nest can be confirmed by:

- physically observing the nest structure (often identified by a flushing bird)
- observation of breeding behaviour (e.g., auditory signs [singing males, alarm calls,
- defense calls, screeching, begging vocalizations by nestlings])
- distraction displays
- nest defense behaviours (e.g., diving)
- birds carrying nesting material, food or fecal sacs
- observation of nestlings or fledglings
- repeated flying towards a specific location

To maximize the probability of finding a nest, transects must be close enough together that nests and/or nesting behaviour is not obscured from view by vegetation. Recommended spacing between parallel transects is approximately 5 m in open and grassland areas, but in particularly dense vegetation (e.g., low shrub) salvagers may reduce this spacing as necessary.

- Surveyors will use industry best practices to accomplish the nest searches.
- Surveyors can use a sweeping stick (e.g., 1.5 m long) that is swept back and forth across the top of the vegetation to flush birds from their nests (Winter et al. 2003).

If an active nest is found, the area will be marked with flagging tape and communicated to the person responsible for transfer to the rehabilitation transport vehicle. The biologists will identify the bird species and number of individuals rescued including the stage of nesting (egg, hatchling, nestling, fledgling) and record existing body condition, and nest location, as well as take photographs of the nest and birds.

Each nest or individual egg/chick will be transferred to a portable incubator or transfer box and marked with a unique identification number. It is assumed field crews will be able to access salvage areas by foot or UTV. Rehabilitation transport vehicles will be parked at the closest access trail or road to facilitate efficient transfer of rescued birds to a rehabilitation facility.

C.3.3 Amphibian Salvage Methods

Wetlands and other waterbodies that may contain amphibian species at risk will also be searched in conjunction with migratory bird nest searches. Although these habitat types are distributed throughout the PDA, they are largely associated with the unnamed creek that passes through the middle of the reservoir (see Figure B.1). The unnamed creek contains riparian areas dominated by sedge marsh, grasslands and low shrub communities. Salvage efforts will be limited to amphibian species at risk including:

- tiger salamander
- western toad
- northern leopard frog

Although no amphibian species at risk were observed during baseline wildlife surveys completed in 2016 or 2021, any amphibian species at risk listed above will be relocated out of harm's way to suitable habitat outside of the inundated reservoir.

Amphibians will be captured and relocated using dip nets. Plastic ziplock bags or containers will be used to transport individual amphibians. Handling will follow the Alberta Wildlife Animal Care Committee Class Protocol #003 - Capture and Handling of Amphibians (GOA 2012), the Canadian Council on Animal Care (CCAC) Guidelines: Amphibians (CCAC 2021), and *Guidelines for Mitigation Translocations of Amphibians: Applications for Canada's Prairie Provinces* (Randall et al. 2018).

The release site will be outside the inundation footprint and should meet the needs of all life stages of the relocated amphibians (Randall et al. 2018). Amphibians will be released into similar habitat to the collection site and released into emergent vegetation, if available, so that they can evade predators (Randall et al. 2018).

C.3.3.1 Time of Day

Migratory bird nests searches, and amphibian salvages should be completed during daylight hours. Although, survey time will be limited prior to a flood event (see below), migratory bird nest searches should be completed between 0600 and 1100, where possible. This time period is when most nests are typically found (Winter et al. 2003); light conditions before 0600 are often unfavorable for spotting a flushed bird and for finding nests, and after 1100, adult birds spend more time off their nest, such that nest-searching becomes less efficient. High winds (>20km/hour) or steady precipitation can reduce the ability to detect nesting birds (visual or auditory), which would be addressed in the summary report as required.

C.3.4 Survey Effort

The migratory bird nest and amphibian species at risk salvage program will occur in daylight hours and based on the estimated advance flood warning received. The total number of nests potentially salvaged will depend on nest densities within priority habitat areas and relative survey effort (i.e., number of field staff and the success of nest searches) and number of amphibian species at risk encountered within the constraints of worker safety.

A three-person crew will be responsible for completing the nest search and transfer of salvaged birds to a rehabilitation vehicle. A minimum of two qualified wildlife biologists will complete the bird nest searches following the protocols described above with the third field assistant responsible for transferring salvaged bird nests to a nearby rehabilitation transport vehicle. Eggs will be placed in portable incubators and young birds placed in a warm environment (e.g., transport box) with suitable heat, food and water and transported to the nearest available rehabilitation centre. The number of birds transferred will be limited by the number of incubators available and the rehabilitation capacity of each centre.

Overall, the number of nests salvaged, and amphibians relocated may be limited to only the areas that can be safely searched within the time constraints and the combined capacity of rehabilitation centers for birds. For example, the Calgary Wildlife Rehabilitation Society (CWRS) currently has capacity to raise approximately 100 individuals at any given time based on 2 incubators (Whelan 2020, pers. comm.). The capacity of the other two rehabilitation centres (see Section 4.0) needs to be confirmed by the Contractor.

Based on the predicted areal extent (ha) of inundation, a 1:10 year flood event would inundate approximately 21 ha. It is possible that two 3-person crews could complete the bird nest salvage within one 12-hour day.; however, extending the salvage into a second day could still be within

the estimated early warning time period depending on approval from AEP Operations. One 2-person crew would be deployed to complete the amphibian salvage in conjunction with the 3-person bird rescue crew.

The search areas included in flood events larger than a 1:10 year event will be surveyed within the constraints of worker safety, which will likely be limited to priority habitat areas north of Springbank Road (see Figure B.1). A larger number of field crews would be required to search the areas of inundation during a 1:100 year (481 ha) and a 2013 design flood (816 ha), and the total number of birds rescued will be limited by each rehabilitation center's capacity as mentioned above.

C.3.5 Wildlife Permits

Alberta Transportation and AEP (as applicable) will obtain any necessary provincial wildlife permits (e.g., collection license) to allow public handling and collecting of authorized wildlife species in consultation with AEP (Fish and Wildlife). A collection license to salvage bird nests and amphibian species at risk is required prior to salvage efforts (e.g., Alberta Wildlife Animal Care Committee Class Protocol #003 - *Capture and Handling of Amphibians* [GOA 2012]). Although Environment and Climate Change Canada (ECCC) does not issue salvage permits for migratory birds, they will be notified of any planned salvage program once the advance flood warning has been issued by AEP.

C.4 WILDLIFE REHABILITATION CENTRES

A key component of the migratory bird salvage program is the rehabilitation necessary to increase the chances of survival following field salvage efforts, which will require expertise from local wildlife rescue and rehabilitation centres. Alberta Transportation and AEP (Operations) will continue to establish and maintain working relationships with local wildlife rescue centers to facilitate rehabilitation of salvaged birds. Depending on each facilities capacity as well as the number of bird nests and individuals successfully found during the bird nest search, coordination with the CWRS, Cochrane Ecological Institute (CEI) and Alberta Institute for Wildlife Conservation (AIWC) will be required during each salvage operation.

Following salvage from the field, rehabilitation methods will be based on standard incubation and hand-rearing protocols at each participating rehabilitation centre using trained staff and volunteers. Birds successfully rehabilitated will be released back into suitable habitat within the Project LAA in consultation with ECCC.

Contact information for local wildlife rehabilitation centers that service the Calgary area is provided in Table C.1.

Table C.1 Contact Information for local Wildlife Rehabilitation Centres in Calgary and Surrounding Areas

Wildlife Rehabilitation Centre	Contact Person	Phone	Email	Location	Approximate Distance from SR1
Calgary Wildlife Rehabilitation Society	Melanie Whelan (Director of Animal Care)	(403) 214-1312	admin@calgarywildlife.org	11555 85th St NW, Calgary	29 km
Cochrane Ecological Institute		(403) 932-5632	cei@nucleus.com	Township Road 280 and Range Road 51, Cochrane, AB	41 km
Alberta Institute for Wildlife Conservation	Holly Lillie (Executive Director)	(403) 946-2361	info@aiwc.ca	Township Road 282 and Range Road 30, Madden, AB	50 km

C.5 FOLLOW-UP AND MONITORING

This WMMP has been developed in accordance with approval condition 4.11, which includes the development of a follow-up program to verify the accuracy of the environmental assessment and to determine the effectiveness of all mitigation measures to avoid harm to migratory birds, including migratory birds species at risk, their eggs and nests as well as amphibian species at risk.

Priority habitat areas to identify potential nesting locations will be further refined during preconstruction bird nest search surveys. These surveys will be completed to provide additional information related to bird species occurrence and nest densities in each of the priority habitat types (i.e., grassland, wetland, shrubland).

Although some of the areas affected during a 1:100 year flood and design flood occur outside the Project construction area (i.e., construction footprint and temporary workspace), the habitat types affected during construction and flood operations are the same. Therefore, results of pre-construction bird nest surveys will be used to refine potential bird nesting priority areas that might be affected during a flood. To account for changes in habitat over time, the reservoir will be surveyed at regular intervals of approximately five years to update the understanding of habitat conditions and to re-characterize high priority areas in accordance with IAAC approval condition 4.10.

C.5.1 Performance Indicators

The success or release rate of rehabilitated wildlife varies with several factors including taxonomic group (e.g., precocial versus altricial), body condition and age (Kelly and delBarco-Trillo 2020; Whelan 2020, pers. comm.). The ground-nesting birds most likely to be encountered and rescued during salvage efforts include primarily passerines and waterfowl. Preliminary discussions with the CWRS indicated approximately 40% of the birds rescued are successfully released as an average across all bird species with slightly higher success rates for precocial bird species like ducks and geese (Whelan 2020, pers. comm.). This is consistent with other published release rates for rehabilitated birds, which have reported an overall success rate of 48% across a range of taxonomic groups (Kelly and delBarco-Trillo 2020). It is recommended AEP Operations keep in contact with the rehabilitation centres to monitor successful bird rehabilitations rescued from the PDA to evaluate overall program success. No post-release monitoring of birds is recommended, at this time.

The performance indicators and targets (see Section 7.4 of WMMP) used to evaluate success of the migratory bird and amphibian salvage are provided in Table C.2.

Table C.2 Performance Indicators and Targets used to Evaluate Mitigation Effectiveness of the Migratory Bird and Amphibian Species at Risk Salvage Plan

Residual Effect	Performance Indicator	Target	Adaptative Management
Change in Mortality Risk	• Number of birds and eggs salvaged prior to each flood event. • Number of amphibian species at risk relocated to nearby waterbody or wetland prior to each flood event.	• Total number of birds, and eggs salvaged is maximized relative to estimated bird densities for each habitat type and within the constraints of worker safety. • No injury or mortality of migratory birds or amphibian species at risk in the salvage area while activities are occurring. • Amphibian species at risk still occupy the translocation area and/or other suitable habitat in the PDA in subsequent seasons or years.	• Any bird or species at risk amphibian mortality directly related to flood operations will trigger a review of mitigation measures/salvage plan. • Additional mitigation measures will be considered if any mortality occurs, or the amphibian relocation site(s) are not occupied in subsequent seasons or years.

Presence/absence surveys are recommended to determine if amphibian species at risk still occupy suitable habitat in the PDA. Surveys could be completed during the post-flood habitat assessment, which will occur immediately after draining of the off-stream reservoir and the following spring. Subsequent amphibian surveys are recommended during the priority bird habitat surveys every five years.

The habitat that migratory birds and amphibian species at risk were rescued from (i.e., salvage areas) because of a flood forecast will be confirmed during the post-flood wildlife habitat assessment (see Section 7.4.1 of the WMMP). The post-flood habitat assessment will determine if the salvage areas were inundated, and species-specific habitats rendered temporarily unsuitable. A report detailing the results of the migratory bird and amphibian species at risk salvage will be made available to Indigenous groups, AEP and ECCC following each salvage effort.

C.6 REFERENCES

C.6.1 Literature Cited

AIWC (Alberta Institute for Wildlife Conservation). 2020. Available at: https://www.aiwc.ca/

CCAC (Canadian Council on Animal Care). 2021. Guidelines: amphibians. Available at: https://ccac.ca/Documents/Standards/Guidelines/CCAC_Guidelines-Amphibians.pdf

CEI (Cochrane Ecological Institute). 2020 Available at: https://ceinst.org/

GOA (Government of Alberta). 2012. Alberta Wildlife Animal Care Committee Class Protocol #003. Class Activity: Capture and Handling Amphibians. Available at: https://open.alberta.ca/dataset/3d6a3d31-7478-4558-aef8-2859a26db4c0/resource/36401970-021a-400d-b44c-ef8a9e2f2125/download/2005-alberta-wildlife-animal-care-committee-class-protocol-003-capture-handlingamphibians.pdf.

Kelly G., and J. delBarco-Trillo. 2020. Importance of taxonomic group, life stage and circumstance of rescue upon wildlife rehabilitation in Ontario, Canada. *Journal of Nature Conservation* 57. 125897. https://www.sciencedirect.com/science/article/pii/S1617138120301436?via%3Dihub

Randall, L., N. Lloyd, and A. Moehrenschlager. 2018. Guidelines for Mitigation Translocations of Amphibians: Applications for Canada's Prairie Provinces. Version 1.0. Centre for Conservation Research, Calgary Zoological Society. Calgary, Alberta, Canada. 94 pp.

Winter, M., S.E., Hawks, J.A. Shaffer, D.H. Johnson. 2003. Guideline for Finding Nests of Passerine Birds in Tallgrass Prairie. USGS Northern Prairie Wildlife Research Center. 160.

C.6.2 Personal Communications

Whelan, M. 2020. Director of Animal Care. Calgary Wildlife Rehabilitation Society (CWRS). Personal Communication, April 21, 2020.

APPENDIX D REMOTE CAMERA MONITORING PROGRAM

D.1 INTRODUCTION

Alberta Transportation assessed the potential effects of the Project on wildlife movement during all phases of the Project and addressed concerns related to wildlife movement from Indigenous groups, regulators and landowners during the regulatory process. Mitigation measures identified to reduce potential impediments to wildlife movement include construction of wildlife passages across Project infrastructure and use of wildlife friendly fencing in the Local Assessment Area (LAA). Alberta Transportation has also committed to developing and implementing a remote camera monitoring program to monitor the effectiveness of mitigation designed to reduce potential effects on wildlife movement in the LAA. The following section describes the remote camera monitoring program.

D.2 OBJECTIVES

As part of the EIA, the wildlife assessment identified potential changes in wildlife movement during the construction and operation of the diversion channel, floodplain berm and off-stream dam. Specifically, the assessment described how each of these structures may impede or alter wildlife movement, especially of large mammals (e.g., deer, elk, grizzly bear) known to occur in the LAA.

The objectives of the remote camera monitoring program are to evaluate potential Project effects on wildlife habitat use and movement as well as to evaluate the effectiveness of mitigation measures. The remote camera monitoring program will focus on monitoring focal wildlife species including species of cultural importance such as large (e.g., deer, elk, grizzly bear) and medium-sized mammals (e.g., coyote, red fox).

Specifically, Alberta Transportation has proposed mitigation measures that include Project design features to reduce potential effects on wildlife movement during dry operations in the LAA. These Project design features have been used to focus monitoring efforts described in this remote camera monitoring program and include the following:

- The diversion channel will be built with gradual slopes (3:1) (i.e., not steep and well within range of slopes ungulates (and other wildlife) are known to traverse (e.g., 17 to 45% slopes) (see Volume 3A, Section 11.4.3.2 of the EIA)
- Vegetated side slopes along sections of the diversion channel will provide a more conducive surface to travel across (e.g., for ungulates).

- There are 4 areas along the diversion channel that have been proposed to be vegetated based on wildlife activity data from remote cameras, winter tacking and information from Indigenous groups. These areas represent approximately 1.8 km of the 4.7 km diversion channel (38.3%) including the Hwy 22 and Twp Road 242 bridges over the diversion channel.
- The north (250 m) and south (450 m) sections of the floodplain berm will be revegetated with native grasses, which will provide a natural surface for ungulates and other wildlife to travel across.
- The middle portion of the floodplain berm, which will include exposed rip-rap (550 m) will be filled with finer material such as sand, gravel and vegetation to allow for more a conducive travel surface.
- All barb-wired fence surrounding and within the Project Development Area (PDA) will be removed following construction and replaced with wildlife-friendly fencing around the perimeter of the PDA.
- The Highway 22 bridge over the diversion channel has been designed with high openness and clearance (10 m height and 24 m width), which will provide suitable conditions for ungulates to cross based on recognized best practices.
- The raised section of Highway 22 and Springbank Road intersection will include 3:1side slopes that are within the range of terrain that ungulates and other wildlife can move across. The side slopes will also be vegetated.
- The placement of a 3.67 m diameter culvert at the bottom of the raised intersection could function as a passageway for smaller wildlife to pass under the road.

D.2.1 Key Questions

Based on the overriding objectives, the remote camera monitoring program has been designed to answer the following key questions:

- Is there a measurable change in the relative abundance (photographic rate) of large and medium-sized mammals in the LAA during construction and dry operations compared to baseline?
- What is the wildlife crossing success or crossing rate for Project permanent structures including the Hwy 22 underpass, Hwy 22 culvert, diversion channel, floodplain berm, wildlife-friendly fencing, off-stream dam, and low-level outlet? (i.e., do mitigation measures facilitate wildlife movement in the LAA?)

D.3 METHODS

D.3.1 Spatial Scale and Scope of Inference

The remote camera monitoring program is primarily designed to evaluate the effectiveness of mitigation measures designed to facilitate local wildlife movement in the PDA and LAA. As such, the remote camera monitoring stations were selected to monitor wildlife movement and behavioral responses (e.g., crossing success) at specific Project permanent structures and were not randomly chosen. Therefore, the results of the monitoring program (e.g., wildlife relative abundance estimates) are applicable to local wildlife use and response to Project structures and do not necessarily reflect broader regional wildlife abundance or movement patterns.

D.3.2 Monitoring Design

The remote camera monitoring program has been developed to monitor wildlife use and movement (i.e., crossing success) in the LAA using a before-after study design. Photographic rates defined as the number of detections/100 camera-days will be used to compare baseline data with remote camera data collected during construction and dry operations phases. It is anticipated there will be a time lag or period of habituation to new structures for some species; therefore, target crossing rates may not be met during early monitoring years.

D.3.2.1 Camera Locations

2016-2017 ESA Camera Locations

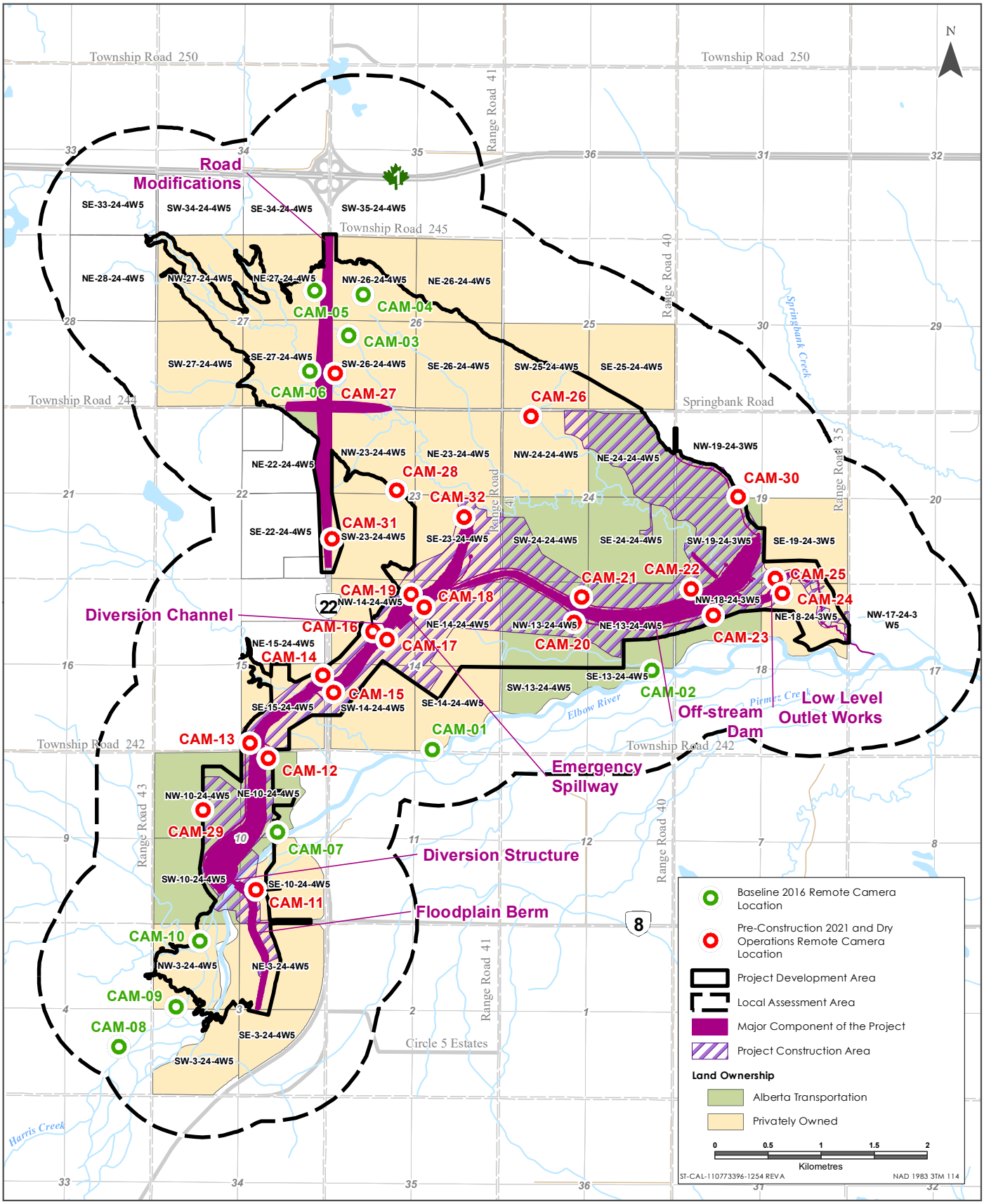
Ten remote cameras were deployed in the LAA from April 26, 2016 to March 21, 2017 to collect baseline data for the Project's EIA. Cameras were installed where there was potential for wildlife movement, focusing on activity within the Key Wildlife Biodiversity Zone (KWBZ) identified along Elbow River, and evidence of use such as wildlife trails, or human trails. Six remote cameras were deployed along Elbow River including three cameras located upstream of the proposed diversion structure, and three cameras located downstream of the diversion structure (see Figure C.1). Remote cameras were installed in representative habitat types in the LAA including mixed forest along Elbow River (CAM-07, CAM-08, CAM-09 and CAM-10), broadleaf forest along Elbow River (CAM-02) and west of Hwy 22 (CAM-05), shrubland along Elbow River (CAM-01) and areas east and west of Hwy 22) (CAM-03 and CAM -04) and wetlands (graminoid marsh) west of Hwy 22 (CAM-06). The results of the 2016-2017 remote camera survey are provided in the EIA (see Volume 4, Appendix H: Wildlife and Biodiversity Technical Data Report). The locations of remote cameras relative to land cover type is provided in response to CEAA Round 1, IR17-2, Figure C.1).

Remote Camera Monitoring Program Camera Locations

Albert Transportation provided opportunities to discuss the Migratory Bird and Amphibian Species at Risk salvage Plan as well as the remote camera monitoring program with Indigenous groups and AEP. Rockyview County also provided input related to the placement of remote cameras in the LAA. All input provided to Alberta Transportation related to the locations of remote camera monitoring stations has been included in this WMMP.

Pre-construction

Twenty-two remote cameras (Reconyx Hyperfire 2™) were deployed in the LAA on September 16 and 17, 2021 to provide additional baseline data. Four of the remote cameras were installed at previous 2016 remote camera monitoring stations including CAM-03, CAM-07, CAM-09, and CAM-10. Although the intent was to deploy all 10 cameras at the 2016 locations, constraints related to landowner access prevented the deployment of the other six remote cameras during the fall 2021 deployment. The remaining cameras will be deployed as soon as land access is available, which is expected in late 2021 or early 2022. The other 18 remote cameras were deployed in the PDA to provide pre-construction data near proposed Project permanent structures including along vegetated sections of the diversion channel, floodplain berm, off-stream dam, the Hwy 22 culvert where the highway will be raised and sections where wildlife-friendly fencing will be installed. After construction has been completed, cameras will be installed at paired locations along the proposed diversion channel, Hwy 22 and Township Road 242 underpass locations to evaluate crossing success (see Figure D.1).



Sources: Base Data - Government of Canada. Thematic Data - Government of Alberta

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

Pre-Construction 2021 and Dry Operations Proposed Remote Camera Survey Locations

Stantec

ALBERTA TRANSPORTATION SPRINGBANK OFF-STREAM RESERVOIR PROJECT

Figure D.1

Construction

During the construction phase, six remote cameras will be deployed along Elbow River in the same locations as the 2016-2017 baseline survey to compare data (photographic rates) between the two time periods. Three of these remote cameras will be deployed upstream and three will be deployed downstream of the diversion structure; these cameras are designed to monitor wildlife use and movement in the KWBZ identified along Elbow River. The remote cameras deployed during 2021 pre-construction monitoring that overlap the construction development area (i.e., permanent Project structure footprint and temporary workspaces) will be moved immediately prior to the start of construction and redeployed in similar habitat types outside the construction development area, where possible.

Dry Operations)

During the post-construction period of (for 3 years following construction) dry operations, remote cameras will be deployed in the wildlife LAA to monitor wildlife presence and movement (see Figure D.1). The six remote cameras along Elbow River will remain at the same locations as during the pre-construction and construction phases. Four remote cameras would be re-deployed at the same locations as the pre-construction phase near Highway 22 (i.e., near the raised portion of Highway 22) and the remaining 22 remote cameras will be installed using the paired design shown in Figure D.1 to monitor and evaluate wildlife crossing success at Project permanent structures.

D.3.2.2 Sample Size

Approximately 32 remote cameras will be installed to monitor wildlife use and movement in the LAA during the post-construction period of dry operations. The sample size needed to detect changes in the proposed monitoring metric or performance indicator (photographic rates) (see Table 7.1 of the WMMP) depends on the variability in the data, effect size to detect a difference between time periods (i.e., before-after) and the level of confidence desired (Munkittrick et al. 2009; McComb et al. 2010; Morrison et al. 2010; Munkittrick et al. 2019). In addition, Shannon et al. (2014) reported that species that are relatively common and have moderate or high detectability compared to rare species typically require fewer cameras and shorter sampling periods (i.e., survey effort) to provide reliable estimates of animal occupancy. Similarly, Kays et al. (2020) reported 25-35 cameras were required to reliably estimate species richness (number of individual wildlife species detected) and less than 20 cameras to estimate species-level occupancy for relatively common species (occupancy probability = 0.75). As such, the number of cameras deployed in this monitoring program (n = 32) are considered adequate to answer the key questions based on the abundance of focal wildlife species and previous monitoring results in the LAA. As the monitoring program progresses, there will be opportunities to evaluate remote camera results each monitoring year and adjust the sample size if necessary.

D.3.2.3 Timing and Frequency

The remote cameras will be installed to capture wildlife use and movement at each monitoring station during all four seasons. A wildlife biologist will visit the cameras every three to four months during the 2021 pre-construction survey, as well as construction and dry operations (i.e., post-construction) to change out memory cards and batteries and check the overall status of equipment (e.g., positioning, weather related malfunctions, animal or human tampering of equipment). In addition, winter transects will be completed during the first three years of dry operations to provide additional information related to snow conditions, species occurrence (i.e., identify wildlife that might have been missed because individuals travelled outside the remote camera field of view) and direction of movement along the diversion channel. Winter transects would be placed parallel to the diversion channel and completed concurrently with any scheduled winter remote camera status check.

D.3.2.4 Duration

The 2021 pre-construction monitoring will continue until construction starts in spring 2022. The remote camera monitoring program will continue during the estimated 3-year construction period and for three years post-construction (dry operations).

D.3.3 Data Analysis

Data collected from remote cameras during 2016-17 and 2021 pre-construction surveys will be used to compare photographic rates during construction and operation to determine if Project components affect wildlife movement in the LAA. The 2021 pre-construction monitoring data will capture fall, and winter wildlife use, which will increase sample size for the pre-construction period.

All images will be reviewed. Individuals detected by remote cameras would be identified to species as well as age and sex class, when possible. Relative abundance will be measured by first identifying independent events, defined as any image or series of images of the same animal or group of animals and ends after the animal or group of animals has left the image for greater than two minutes. To estimate relative abundance (i.e., photographic rate), data will be standardized by summing the count for each species over all independent events and dividing by the number of days the camera was active and calculated as the number of detections per 100 camera-days. Species richness (total number of species recorded) will also be compared among camera stations.

Relative abundance (photographic rates) will be calculated for each species and summarized for each monitoring year and Project phase accounting for seasonality (Kays et al. 2020). Differences between baseline and Project phase rates will be compared using a non-parametric test for repeated measures (e.g., Freidman test). For all analyses, differences will be considered statistically significant when $p < 0.05$.

To determine whether large mammals use and cross permanent Project components, as well as use the diversion channel to travel under the Highway 22 bridge or Township Road 242 bridge, percent crossing success will be calculated for each structure as the total number of occasions an individual animal (or group) passes over or under a structure divided by the total number of occasions that animal (or group) approaches the structure (i.e., number of individuals that enter the frame of the camera) (Sawyer et al. 2012; Simpson et al. 2016). Where applicable, crossing rates will also be calculated where actual use is compared relative to expected use in control areas (i.e., pre-construction) (van der Grift and van der Ree 2015; Andis et al. 2017).

D.4 RESULTS

The monitoring results will summarize, photographic rates for each species detected and the crossing frequencies at permanent Project components to measure the effectiveness of mitigation. Results will be summarized by species, season and monitoring year. Photographic rates and crossing success will be evaluated using the performance indicators and targets identified in Section 8.0 of the WMMP, which were partly based on previous wildlife crossing studies (Clevenger and Waltho 2000; Clevenger and Waltho 2005; Sawaya et al. 2013). Any potential limitations associated with the study design (e.g., sample size) or interpretation of monitoring results (e.g., confounding factors) will be discussed during annual reporting.

D.5 REPORTING

In compliance with IAAC approval condition 2.11, Alberta Transportation will prepare an annual report (during construction and for a period of three years post-construction during the dry operations phase of the Project) summarizing the monitoring results, which will be provided to IAAC and the First Nation Land Use Committee by October 31 of the reporting year to which the annual report applies. IAAC has defined the reporting year as July 1 of the calendar year to June 30 of the subsequent calendar year (definition 1.32). The annual report, including a plain language executive summary in both official languages, will be made publicly available to Indigenous groups and public stakeholders no later than October 31 following the reporting year to which the annual report applies (IAAC approval condition 2.13). The report will contribute to adaptive management strategies to address the effectiveness of mitigation related to wildlife movement.

D.6 REFERENCES

Andis, A.Z., M.P. Huijser, and L. Broberg. 2017. Performance of arch-style road crossing structures from relative movement rates of large mammals. Frontiers in Ecology and Evolution 5: 1-13.

Burton, A.C., E. Neilson, D. Moreira, A. Ladle, R. Steenweg, J.T. Fisher, E. Bayne, and S. Boutin. 2015. Wildlife camera trapping: a review and recommendations for linking surveys to ecological processes. Journal of Applied Ecology 52: 675-685.

Clevenger, A.P. and N. Waltho. 2000. Factors influencing the effectiveness of wildlife underpasses in Banff National Park, Alberta, Canada. Conservation Biology 14: 47-56.

Clevenger, A.P. and N. Waltho. 2005. Performance indices to identify attributes of highway crossing structures facilitating movement of large mammals. Biological Conservation 121: 453-464.

Kays, R., Arbogast, B. S., Baker-Whatton, M., Beirne, C., Boone, H. M., Bowler, M., et al. 2020. An empirical evaluation of camera trap study design: how many, how long and when? Methods in Ecology and Evolution 11: 700–713.

McComb, B., B. Zuckerberg, D. Vesley, and C. Jordan. 2010. Monitoring Animal Populations and their Habitats – a Practitioners Guide. CRC Press, Taylor and Francis Group. 277 pp.

Morrison, M.L., W.M. Block, M.D. Strickland, B.A Collier, and M.J. Peterson. 2010. Wildlife Study Design. Second Edition. Springer Series on Environmental Management. Pp 386.

Munkittrick, K., 2009. A review of potential methods of determining critical effect size for designing environmental monitoring programs. Environmental Toxicology and Chemistry 28: 1361–1371.

Munkittrick, K., T.J. Arciszewski, and M. A. Gray. 2019. Principles and challenges for multi-stakeholder development of focused, tiered, and triggered, adaptive monitoring programs for aquatic environments. Diversity 11, 155; doi:10.3390/d11090155.

Sawaya, M. A., A. P. Clevenger, and S. Kalinowski. 2013. Wildlife crossing structures connect Ursid populations in Banff National Park. Conservation Biology 27:721–730.

Sawyer, H., C. Lebeau, and T. Hart. 2012. Mitigating roadway impacts to migratory mule deer—a case study with underpasses and continuous fencing. Wildlife Society Bulletin 36(3):492–498; 2012.

Shannon, G. J.S. Lewis and B.D. Gerber. 2014. Recommended survey designs for occupancy modeling using motion-activated cameras: insights from empirical data. PeerJ 2:3532; DOI 10.7717/peerj.532.

Simpson, N.O., K.M. Stewart, C. Schroeder, M. Cox, K. Huebner, and T. Wasley. 2016. Overpasses and Underpasses: Effectiveness of Crossing Structures for Migratory Ungulates. The Journal of Wildlife Management 80:1370-1378.

van der Grift, E.A., and R. van der Ree. 2015. Guidelines for evaluating use of wildlife crossing structures, Chapter 15. In *Handbook of Road Ecology*, First Edition. Edited by Rodney van der Ree, Daniel J. Smith and Clara Grilo. John Wiley & Sons, Ltd.