APPENDIX 69-2 ELBOW RIVER SPAWNING HABITAT SUITABILITY ASSESSMENT: ELBOW FALLS TO GOOSEBERRY CAMPGROUND (FALL 2019) TECHNICAL DATA REPORT

ALBERTA TRANSPORTATION SPRINGBANK OFF-STREAM RESERVOIR PROJECT
RESPONSE TO NRCB AND AEP SUPPLEMENTAL INFORMATION REQUEST 2,
DATED NOVEMBER 18, 2019

Appendix 69-2 Elbow River Spawning Habitat Suitability Assessment: Elbow Falls to Gooseberry Campground (Fall 2019) Technical Data Report
June 2020

SPRINGBANK OFF-STREAM RESERVOIR PROJECT
Elbow River Spawning Habitat Suitability Assessment: Elbow Falls to Gooseberry Campground (Fall 2019)
Technical Data Report

Prepared for:
Alberta Transportation

Prepared by:
Stantec Consulting Ltd.

June 2020

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Abbreviations

EAU	Electronic Aquatic Utility
Stantec	Stantec Consulting Ltd.
SARA	*Species at Risk Act*

1.0 INTRODUCTION

Elbow River supports a traditional and recreational fishery that is part of known local and national fishing culture, with the Glenmore Reservoir being a popular sport fishing location for northern pike, trout, and perch. Salmonids are the most abundant fish species caught in Elbow River, with brown trout being the most abundant salmonid in the lower sections of Elbow River to Elbow Falls (FWMIS 2020), and bull trout being the most abundant in the section from Elbow Falls to the headwaters of Elbow River (FWMIS 2020). Brook trout and rainbow trout are found consistently throughout the length of Elbow River.

The Project during flood operations and post-flood operations is designed to alter river flows so as to mitigate the effects of floods in Elbow River downstream of the Project. The construction of the diversion inlet and spillway, and the operation for floods and post-floods will result in changes to physical habitat, flow regime, and water quality in Elbow River. It is anticipated that these changes will result in permanent alteration and destruction of fish habitat, which will be mitigated and offset to maintain the productivity and sustainability of fish habitat.

This spawning suitability assessment was completed for Alberta Transportation by Stantec Consulting Ltd. to support ongoing Elbow River pre-construction monitoring for the Project. Field surveys associated with this assessment were completed concurrently with habitat mapping and spawning surveys of the lower Elbow River. The results of this report may be used for responding to ongoing information requests as part of the Environmental Impact Assessment process and serve as baseline information for post-construction compliance monitoring.

1.1 OBJECTIVES

Potential bull trout spawning areas and spawning habitat suitability within Elbow River was assessed and documented within the upper reaches of Elbow River, between Elbow Falls and Gooseberry Campground in fall 2019 (Attachment B, Figure B-1). Bull trout typically spawn in early fall; therefore, the field study focused on collecting spawning suitability information. The objective was to gather baseline information on bull trout habitat use within Elbow River to inform the Project impact assessment, mitigation plans for fisheries management, and future monitoring programs.

2.0 METHODS

2.1 REDD SURVEY

Ideally, spawning surveys should be completed soon after the peak spawning times for the target species and when redds are most visible (e.g., before substrates are re-distributed in the channel and before algae and periphyton form on the disturbed substrate). Bull trout spawning in Elbow River occurs typically in September (Popowich 2005; Popowich and Eiler 2008). The fall spawning survey and habitat suitability assessment was completed from October 23 to October 25, 2019.

The study area consisted of main stem and side channel habitat on Elbow River between Elbow falls and Gooseberry Campground (Attachment A). The entire length of Elbow River from Elbow Falls to Gooseberry Campground was walked during this period. This area was chosen to replicate previous spawning surveys completed on Elbow River. From 2002 to 2005, spawning surveys were completed between Elbow Falls and Paddy's Flats Campground (Popowich 2005). In 2006, spawning surveys occurred in Elbow River from Paddy's Flats Campground to Gooseberry Campground (Popowich and Eilser 2008).

In previous surveys, field investigations were also completed for Canyon Creek. Canyon Creek was not a part of the original scope for this survey and was not completed in 2019. However, at the time of survey, dry areas were documented at the confluence of Canyon Creek and Elbow River that prevent fish migration. Observations indicate there was insufficient flow farther upstream to support fall spawning.

Spawning surveys were completed by a crew of two aquatic specialists who traversed the channel(s) in an upstream to downstream direction (when possible). Field staff wore polarized glasses to improve visibility through the water. Confirmed and suspected redds were counted, photographed, and georeferenced. Observations for each redd were completed within Stantec's Electronic Aquatic Utility tool (EAU) where the following information was collected:

- a generic point was used to identify redd location and photos were taken
- each generic point given a unique redd ID
- redd class designation:
  - definite, pit and tail spill recognizable with clean substrate noted
  - probable, pit and tail spill recognizable with dirty substrate noted
  - possible, pit and tail spill not recognizable
- denoted if fish observed on redd
- denoted if fish appears to be communal or individual redd (shape)
- stream-bed water depth (immediately upstream of pot)
- velocity and substrate composition

2.2 SPAWNING HABITAT SUITABILITY ASSESSMENT

Habitats were assessed to identify areas with potential to support bull trout spawning. The spawning habitat suitability survey occurred opportunistically during the redd study survey. Suitable bull trout spawning areas were identified as having (Roberge et al. 2002; Baxter and McPhail 1996):

- water depths ranging from 0.30 m to 0.60 m
- velocities ranging from 0.14 m/s to 0.52 m/s, with velocities 0.70 m/s being unsuitable
- accumulations of small gravels (2 mm to 16 mm) and large gravels (17 mm to 64 mm)
- low channel gradient area located in high order headwater streams
- presence of groundwater upwellings and cover for spawning adults

A summary of the general spawning timing and habitat preferences for bull trout is provided in Table 2-1.

Observations of depth, velocity and substrate size were qualitative and based on the professional judgement of the aquatic specialists in the field. Areas meeting the above criteria were mapped in EAU and the following information was collected for each location:

- generic point used to identify spawning area (SA) location
- each generic point given a unique SA ID
- denoted if fish observed
- photos were taken
- microhabitat type, including velocity and substrate composition, was noted

Table 2-1 Timing and Habitat Preferences of Bull Trout

Species	Spawning Type	Spawning Migration Period	Spawning Period (peak)	Substrate Composition	Habitat	Water Depth (m)	Temp. (°C)	Velocity (m/s)
Bull trout (*Salvelinus confluentus*)	Redd	Jul – Aug [a]	Aug.–Dec. (Sep.) [b]	Gravel [b]	Groundwater upwelling [b]	0.3–0.6 [b]	5–9 [b]	0.14–0.52 [b]
SOURCES: [a] Baxter and McPhail 1996 [b] Roberge et al. 2002								

3.0 RESULTS

Results of the 2019 Fall Spawning Survey are summarized for the Elbow River survey (Table 3-1). Site-specific summaries of spawning habitat and survey observations are further described in Table 3-2. Fall depicting georeferenced observations (redds and spawning habitat) within the study area are presented in Attachment A. No fish were observed in any section of Elbow River during redd and habitat spawning surveys completed between October 23 to 25, 2019.

3.1 REDD SURVEY

One probable and three possible bull trout redds were identified during the spawning survey (Table 3-1). No definite redds were observed. The four redds were identified within the main channel of Elbow River. The probable redd had a discernable pit and tail with a mix of clean and dirty substrate. The three possible redds included a visible depression, but no recognizable tail spill. All four locations containing potential redds were identified within a variety of microhabitat types, including a slow glide located in a side channel, a lateral gravel bar, and tail end of pools formed by bedrock. Redds observed were also associated with contributions of cover for spawning adults and emerging juveniles in the form of instream woody debris, bedrock cliffs or overhead woody debris. The probable redd RD1 (Photo 3-1) was identified in a side channel with clean gravels in a slow glide and documented groundwater upwelling. Groundwater was identified by water bubbling at the surface of the water upstream of RD1. Two of the potential redds (RD2 and RD3) were identified within 100 m of each other and were located within a lateral gravel bar and the tailing pool created by a bedrock cliff on the downstream right side. The last potential redd RD4 was identified in a tailing pool and was described as an inconsistent depression within appropriate sized gravels.

Table 3-1 Summary Information for Potential Redds within the Study Area

Site ID #	Class designation	Redd Depth (m)	Species
RD1	Probable	-	Bull Trout
RD2	Possible	0.65	Bull trout
RD3	Possible	0.49	Bull trout
RD4	Possible	-	Bull trout

3.2 SPAWNING HABITAT SUITABILITY

A total of 39 areas of potentially suitable habitat for bull trout spawning were identified in the 2019 spawning survey (Table 3-2). Potential spawning habitat was predominantly identified within the main channel of Elbow River, with seven of 39 sites found in side channels. The most common microhabitat suitable in the surveyed area was in the transitional area between pool and riffle commonly referred to as the tailout (Photo 3-2). Due to the morphology of the river within the surveyed area, most of these features are formed by bedrock. High quality spawning areas were characterized by low-flow velocity and a mixture of small and large gravels. Five lateral gravel bars were identified as potential spawning habitat along sections of bedrock wall where small and large gravels had deposited in a linear bar (Photo 3-3). Groundwater upwelling was documented at one site (SA6) and provided high bull trout spawning habitat. Glide habitat provided six locations with potential to support bull trout spawning (Photo 3-4). The quality of spawning habitat at these six locations varied, based on water velocities and substrate present.

Table 3-2 Summary Information for Potential Spawning Areas within the Study Area

Site ID #	Microhabitat type	Redds observed (Y/N)
SA1	Pool tailout	N
SA2	Side channel	N
SA3	Pool tailout	N
SA4	Pool tailout (bedrock formed)	N
SA5	Pool tailout (bedrock formed)	N
SA6	Slow glide with ground water upwelling (side channel)	Y
SA7	Riffle and slow glide	N
SA8	Pool tailout	N
SA9	Pool tailout (bedrock formed)	N
SA10	Slow glide along bank	N
SA11	Lateral gravel bar (bedrock formed)	Y
SA12	Pool tailout (bedrock formed)	Y
SA13	Pool tailout (bedrock formed)	N
SA14	Pool tailout (bedrock formed)	N
SA15	Pool tailout (bedrock formed)	N
SA16	Pool tailout (bedrock formed)	N
SA17	Fast glide (main channel)	N
SA18	Pool tailout and island gravel bar	N
SA19	Pool tailout (bedrock formed)	N

Table 3-2 Summary Information for Potential Spawning Areas within the Study Area

Site ID #	Microhabitat type	Redds observed (Y/N)
SA20	Tailout of fast glide	N
SA21	Pool tailout (bedrock formed)	N
SA22	Pool tailout (bedrock formed)	N
SA23	Pool tailout (bedrock formed)	N
SA24	Slow glide side channel	N
SA25	Pool tailout (bedrock formed)	N
SA26	Pool tailout (side channel)	N
SA27	Fast glide (side channel)	N
SA28	Pool tailout (below bridge)	N
SA29	Pool tailout (bedrock formed)	N
SA30	Lateral gravel bar (bedrock formed)	N
SA31	Lateral gravel bar (bedrock formed)	N
SA32	Pool tailout	N
SA33	Lateral gravel bar (side channel bedrock formed)	N
SA34	Side channel	N
SA35	Pool tailout	N
SA36	Pool tailout	N
SA37	Lateral gravel bar	N
SA38	Pool tailout	N
SA39	Gravel bar	N

Photo 3-1 Probable Redd (RD1), Upstream Aspect, October 23, 2019

Photo 3-2 Potential Spawning Habitat (SA15) at Pool Tailout, Upstream Aspect, October 23, 2019

Photo 3-3 Potential Spawning Habitat (SA33) in Lateral Gravel Bar along Bedrock, Upstream Aspect, October 25, 2019

Photo 3-4 Potential Spawning Habitat (SA10) in Slow Glide, Upstream Aspect, October 23, 2019

4.0 DISCUSSION

4.1 REDD SURVEY

Previous studies indicate that bull trout typically complete spawning in the study section by September 26 (Popowich and Eisler 2008), almost one month prior to start of the current study. Discharge rates were stable between August 1 and October 25 of 2019 (less than 10 m^3/s; Attachment B, Figure B-1) and no significant spikes in discharge occurred during that time, which would have increased the degradation rate of redds beyond normal levels. As such, it is not likely that sediment transport in the river altered the condition of the redds such that they would not be observable at the time of the survey.

The four potential redds identified ranged in likelihood from possible to probable and no definite redds were identified.

4.2 SPAWNING HABITAT

The surveyed area between Elbow Falls and Gooseberry campground contains multiple areas of potentially suitable bull trout spawning habitat. In previous surveys, prior to the 2013 flood, no redds were observed downstream of Paddy's Flats campground, which is located near SA20 (Popowich and Eisler 2008) (Attachment A). Limited data exists on winter ice conditions or presence of groundwater upwellings in this area; these elements may contribute or limit the bull trout use of otherwise suitable spawning habitat in these areas. While this section of Elbow River is mostly confined by bedrock, floods could change the distribution of appropriately sized gravels required for spawning. Multiple areas between Elbow Falls and Paddy's Flats appeared to have suitable spawning habitat as reported previously (Popowich 2005; Popowich and Eisler 2008). Multiple potential spawning areas were also identified between Paddy's Flats and Gooseberry Campground in fall 2019 in locations not previously reported having active spawning.

5.0 CONCLUSIONS

Numerous areas of potential spawning habitat were identified in this area, as indicated by suitable substrate, depth and water velocity conditions. Despite identifying 39 potentially suitable spawning areas, only four potential redds were observed. Of these, one was considered a 'probable' redd and was located in an area with groundwater upwellings. The other three redds were considered 'possible redds' and were present in a variety of different microhabitats.

Recognizing the annual variance in habitat conditions, use and spawning activity, the results of this report should be considered in conjunction with past and future spawning assessments in Elbow River when characterizing spawning activity and spawning habitat suitability.

6.0 REFERENCES

Baxter, J.S., and J.D. McPhail. 1996. Bull trout spawning and rearing habitat requirements: summary of the literature. Fisheries Technical Circular. 98; pg 27 p. Prepared for Province of British Columbia Fisheries Branch. Vancouver, British Columbia.

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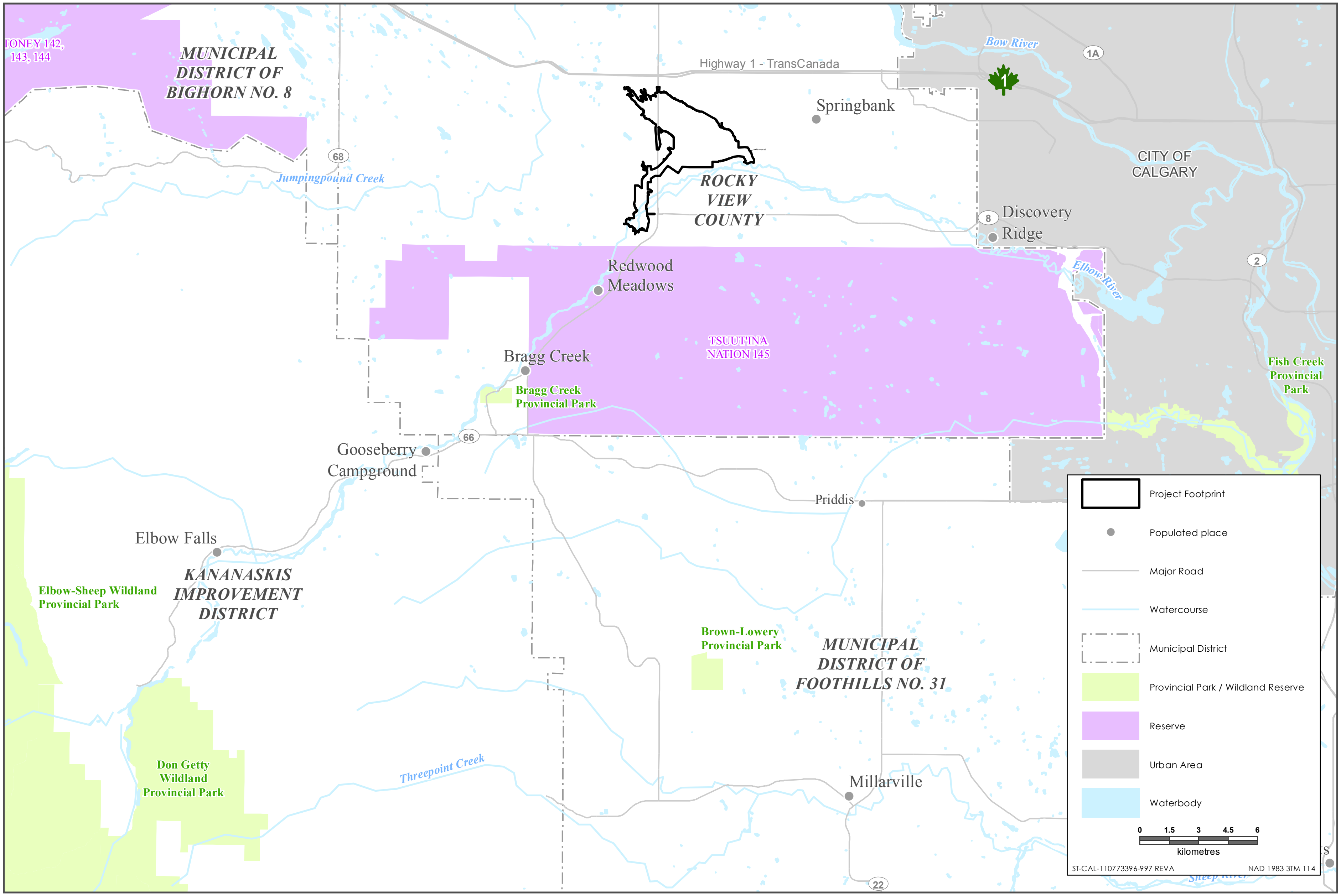
Popowich, R. and G. Eisler. 2008. Fluvial Bull trout red surveys on the Elbow, Sheep and Highwood Rivers, Alberta – Trout Unlimited Canada. Applied Aquatic Research Ltd., Calgary, Alberta.

Roberge, M., J.M.B. Hume, C.K. Minns, and T. Slaney. 2002. Life History Characteristics of Freshwater Fishes Occurring in British Columbia and the Yukon, with Major Emphasis on Stream Habitat Characteristics. Canadian Manuscript Report of Fisheries and Aquatic Sciences. 2611: 248p.

Attachment A FALL SPAWNING SURVEY OBSERVATION MAP



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

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ALBERTA TRANSPORTATION SPRINGBANK OFF-STREAM RESEVOIR PROJECT ENVIRONMENTAL IMPACT ASSESSMENT

General Overview of Elbow River Survey Area

Figure A-1

Attachment B ELBOW RIVER DISCHARGE 2019

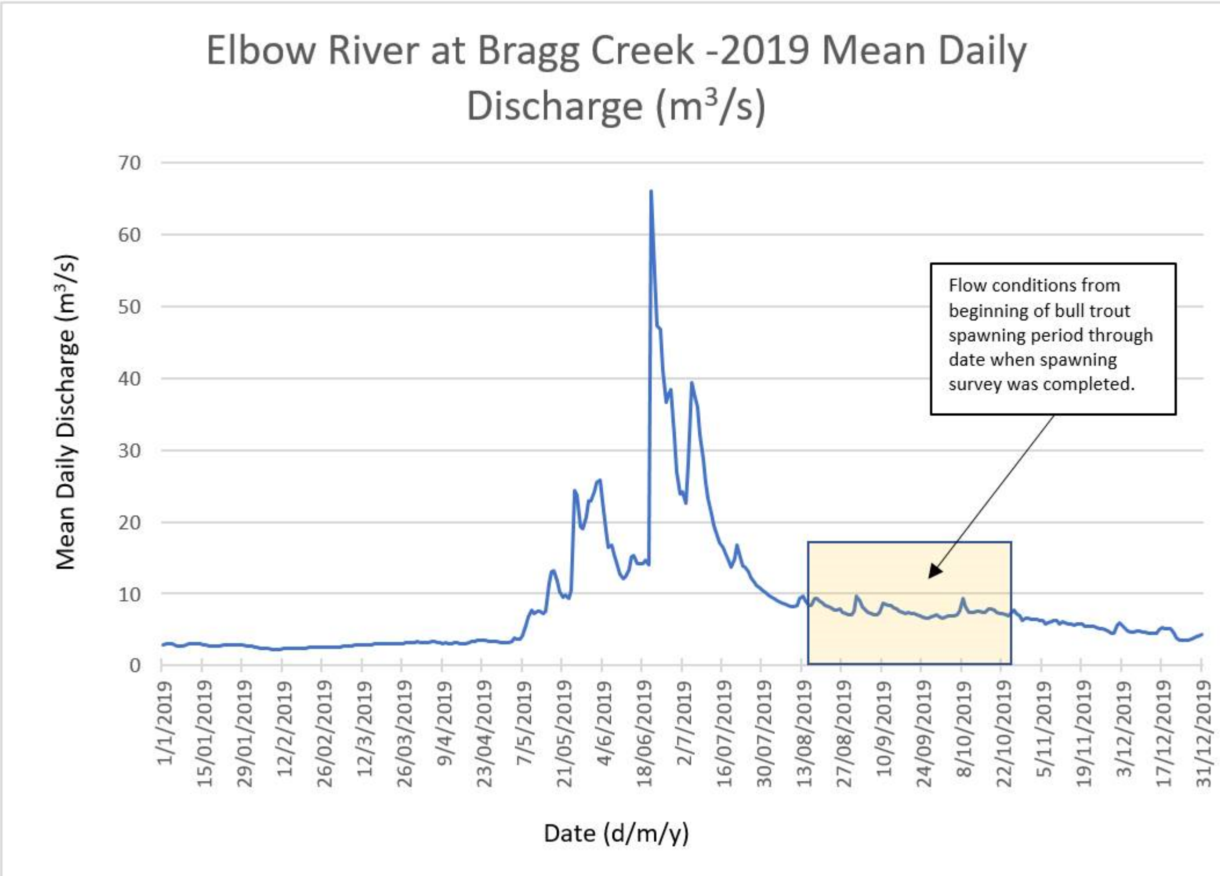

Figure B-1 Elbow River Discharge Taken from Bragg Creek Hydrometric Water Station (05BJ004)

APPENDIX 69-3 ELBOW RIVER SPAWNING SURVEY AND SPAWNING HABITAT SUITABILITY ASSESSMENT: REDWOOD MEADOWS TO DISCOVERY RIDGE (FALL 2019) TECHNICAL DATA REPORT

Appendix 69-3 Elbow River Spawning Survey and Spawning Habitat Suitability Assessment: Redwood Meadows to Discovery Ridge (Fall 2019) Technical Data Report
June 2020

SPRINGBANK OFF-STREAM RESERVOIR PROJECT
Elbow River Spawning Survey and Spawning Habitat Suitability Assessment: Redwood Meadows to Discovery Ridge (Fall 2019) Technical Data Report

Prepared for:
Alberta Transportation

Prepared by:
Stantec Consulting Ltd.

June 2020

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REDWOOD MEADOWS TO DISCOVERY RIDGE (FALL 2019) TECHNICAL DATA REPORT

Abbreviations

EAU	electronic aquatic utility
the Project	Springbank Off-Stream Reservoir Project
Stantec	Stantec Consulting Ltd.

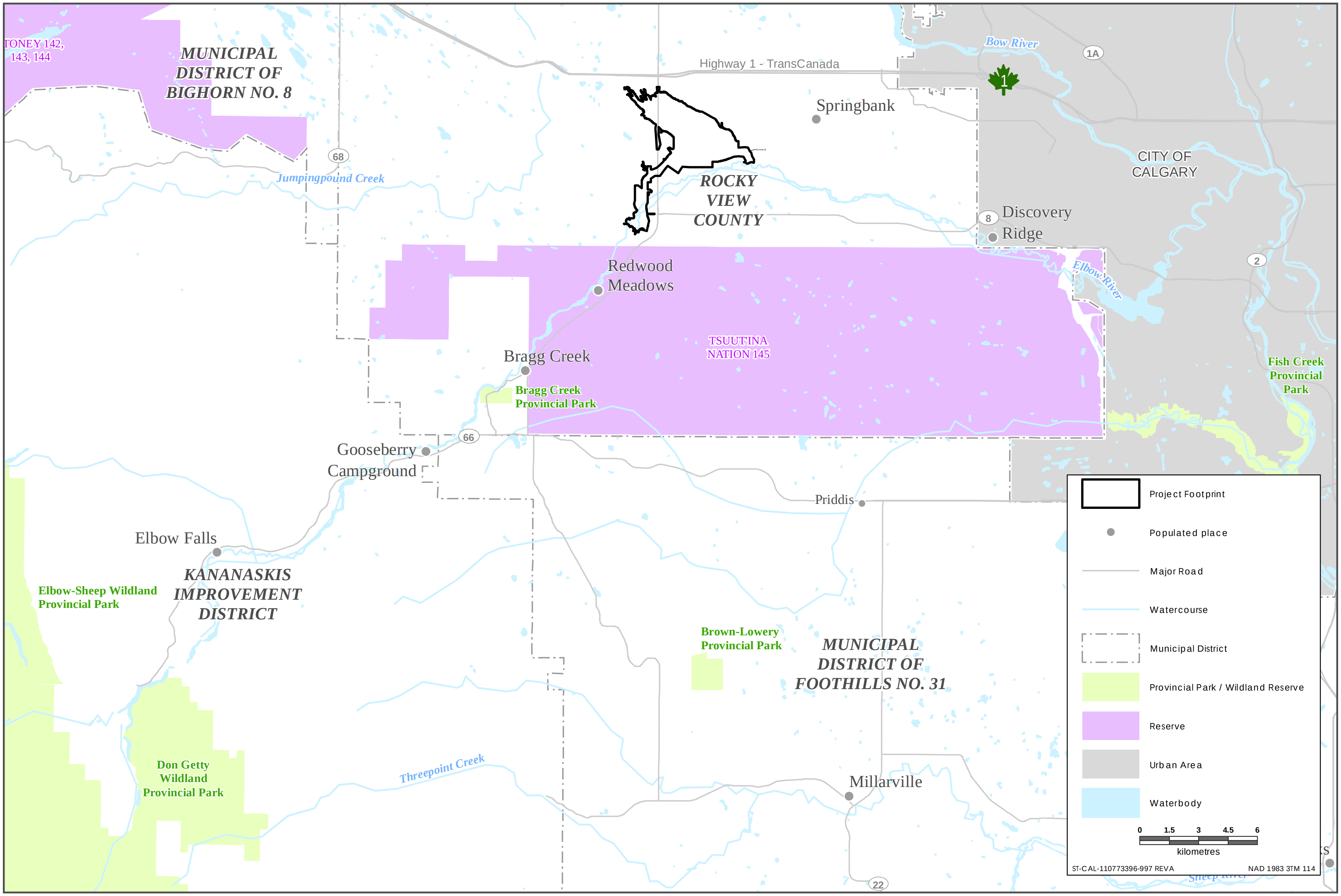
1.0 INTRODUCTION

1.1 PROJECT OVERVIEW

Elbow River supports a traditional and recreational fishery that is part of known local and national fishing culture, with Glenmore Reservoir being a popular sport fishing location for northern pike, trout, and perch. Salmonids are the most abundant fish species caught in Elbow River, with brown trout being the most abundant salmonid in the lower sections of Elbow River to Elbow Falls (FWMIS 2020), and bull trout being the most abundant in the section from Elbow Falls to the headwaters of Elbow River (FWMIS 2020). Brook trout and rainbow trout are found consistently throughout the length of Elbow River.

The Project is designed to alter river flows during flood operations and post-flood operations so as to mitigate the effects of floods in Elbow River downstream of the Project. The construction of the diversion inlet and spillway, and the operations during flood and post flood conditions will result in changes to physical habitat, flow regime, and water quality in Elbow River. It is anticipated that these changes will result in permanent alteration and destruction of fish habitat, which will be mitigated and offset to maintain the productivity and sustainability of fish habitat.

This spawning survey and spawning habitat suitability assessment was completed for Alberta Transportation by Stantec Consulting Ltd. to support ongoing Elbow River pre-construction monitoring for the Project. This technical data report describes the results of the spawning surveys completed from Redwood Meadows to Discovery Ridge (Figure 1-1). Field surveys associated with this assessment were completed concurrently with habitat mapping and a spawning habitat suitability assessment of the upper Elbow River. The results of this report may be used for responding to ongoing information requests as part of the Environmental Impact Assessment process and serve as baseline information for post-construction compliance monitoring.



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

General Overview of Elbow River Survey Area

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ALBERTA TRANSPORTATION SPRINGBANK OFF-STREAM RESEVOIR PROJECT ENVIRONMENTAL IMPACT ASSESSMENT

Figure 1-1

1.2 OBJECTIVES

The objectives of the field program were to:

- document salmonid spawning activity through the observation of redds (i.e., gravel nests) and actively spawning/staging fish along the mainstem of Elbow River. Targeted fish species during this study were brown trout, brook trout, bull trout, and mountain whitefish.
- identify potential spawning habitats for mountain whitefish evidenced by the presence of habitat suitable for newly emerged whitefish. This was completed through documenting observations of mountain whitefish age-0 (i.e., size class less than 100 mm).
- assess and record spawning habitat suitability throughout the surveyed area by documenting channel type and macrohabitat units. Habitat data collected through the spawning survey was used to evaluate spawning habitat potential for fall and spring spawning fish species. Habitat data was used to characterize potential for habitat using a Habitat Suitability Index (HSI) model for bull trout, brown trout, rainbow trout and mountain whitefish.

2.0 METHODS

2.1 FIELD SURVEY

The fall spawning survey was completed in conjunction with the detailed fish habitat mapping study between October 30 and November 26, 2019. An additional two days were specifically dedicated to redd surveys following the end of the habitat mapping surveys (November 27 and 28, 2019). The surveyed area consisted of all main stem Elbow River habitat between the Tsuut'ina Nation Reserve boundary near Redwood Meadows and the Reserve boundary near Discovery Ridge (Attachment A). Spawning surveys were completed by traversing the channel(s) in an upstream to downstream direction (when possible).

Due to inclement weather, the crew was unable to complete field surveys on several days within this period (i.e., windstorm, extreme cold temperatures). Additionally, the assessment area could not be surveyed in a continuous manner (i.e., upstream to downstream throughout the assessed area) due to dynamic land access constraints and a highly braided river channel. As a result, the crews were highly mobile within the assessment area; however, habitat within the entire study reach between the two Tsuut'ina Nation Reserve boundaries at Redwood Meadows and Discovery Ridge was surveyed.

Redds and spawning fish observations were documented, as well as the habitat they were located in. One of the objectives of this study was to identify the spawning habitat potential throughout the study area for fall and spring spawning species. Redd surveys only identify spawning at a given time and location and do not account for the overall potential within the river. This study aims to evaluate the spawning habitat potential on a broader scale (i.e., by looking at the various channel types) as well as on a detailed level (i.e., within macrohabitat units). By linking redd locations to the detailed habitat data, this study can identify additional areas of the river that may be considered high value for spawning. Relevant sections of the habitat methodology are described herein.

2.1.1 Channel Types

Redds were documented according to the channel types in which they were found. Four main channel types were defined and are consistent with the channel classifications found in the detailed habitat mapping study (Table 2-1).

Table 2-1 Elbow River Habitat Assessment Channel Types

Channel Type	Description
Active Channels	Channel segment conveying surface water flows for the main stem of Elbow River.
Main Channel	Channel segment conveying more than 50% of the surface water volume for Elbow River at the time of survey.
Side Channel	Channel segment conveying less than 50% of the surface water volume for Elbow River at the time of survey.
Inactive Channels	Channel receiving little to no surface water flows directly from Elbow River at the time of survey. Surface water at the time of survey is primarily maintained by the hyporheic flow or groundwater.
Connected	Channel segment that receives surface water directly from Elbow River at high discharges up to and including bankfull discharge.
Disconnected	Channel segment that does not receive surface water directly from Elbow River at bankfull discharge or lower. Disconnected channels are created and maintained by flows greater than bankfull discharge (i.e., flood-flows) or may be abandoned.

2.1.2 Macrohabitat Units

Redds were also documented according to the macrohabitat units they were found in (Table 2-2). Macrohabitat units were based on the California Salmond Stream Habitat Restoration Manual (Flosi et al. 2010).

Table 2-2 Elbow River Macrohabitat Mapping Units

Level 1	Level 2	Level 3	Level 4 (Actual Unit Classification)	Code
High flow	Turbulent		Riffle	RIF
	Non-turbulent		Run	RUN
			Pocket water	POW
			Fast glide	FGL
Medium flow	Pool	Mid-channel scouring	Mid-channel pool (undifferentiated)	MCP
			Mid-channel debris pool	MCD
			Channel confluence pool	CCP
			Plunge pool	PLP
		Lateral scouring	Lateral Scour Pool (Undifferentiated)	LSP
			Log-enhanced lateral scour pool	LSL
			Root-wad enhanced lateral scour pool	LSR

Table 2-2 Elbow River Macrohabitat Mapping Units

Level 1	Level 2	Level 3	Level 4 (Actual Unit Classification)	Code
Medium flow (cont'd)	Pool (cont'd)	Lateral scouring (cont'd)	Bedrock-formed lateral scour pool	LSBk
			Boulder-formed lateral scour pool	LSBo
			Armoured bank lateral scour pool	LSA
		Backwater	Bedrock-formed backwater pool	BPBk
			Boulder-formed backwater pool	BPBo
			Root-wad formed backwater pool	BPR
			Log-formed backwater pool	BPL
			Armoured bank backwater pool	BPA
	Slow glide			SGL
Low flow	Beaver impoundment			BIM
	Edgewater			EDW
	Backwatered channel confluence			BWC
	Flat			FLT

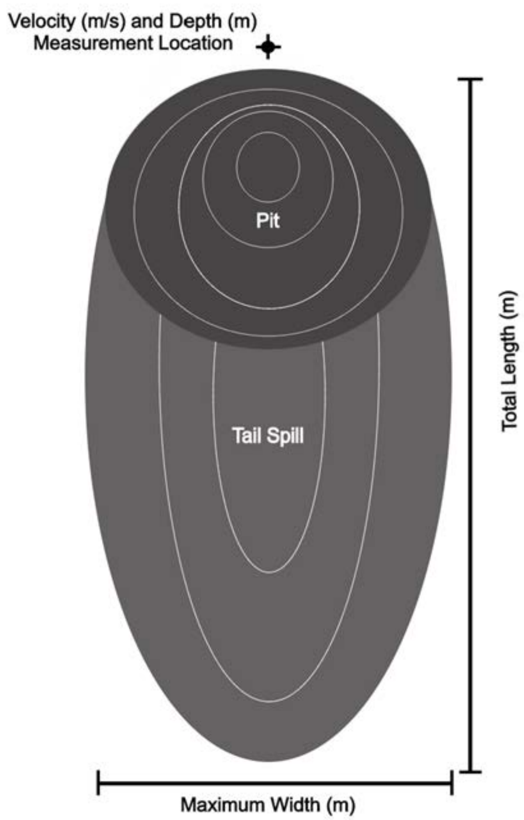
NOTE:
* Glide habitat (Flosi et al. 2010) further subdivided into fast glide and slow glide by Stantec.

2.1.3 Redd Classification

Redds observed during spawning surveys were measured and georeferenced. Photographs were collected using Stantec's Electronic Aquatic Utility tool (EAU). Crews did not disturb redds while completing the surveys. Measurements collected were based on methods from Gallagher et al. (2007). These measurements are shown in Table 2-3 and included:

- redd class designation:
  - Definite, pit and tail spill recognizable with clean substrate noted
  - Probable, pit and tail spill recognizable with dirty substrate noted
  - Possible, pit and tail spill not recognizable
- total length (pit and tail spill)
- maximum width (pit and tail spill)
- water depth (immediately upstream of pit)
- water velocity (immediately upstream of pit)
- substrate composition
- fish observed on the redd
- communal or individual redd (judged by the shape)

Table 2-3 Measurements Collected for Documented Redds

Figure	Type of Measurement	Description
	**Redd location**	UTM coordinate of the redd.
		Water Depth: Water depth to undisturbed substrate immediately in front of the pit.
		Water Velocity: Water velocity taken immediately in front of the pit.
	Redd length (measured in metres)	The total length of the pit and tail spill, parallel to the stream flow.
	Maximum width (measured in metres)	The maximum width of the pit or tail spill, measured perpendicular to stream flow.
	Substrate	Documentation of dominant substrates within the macrohabitat unit used to make the redd.
	Fish observation	Documentation of fish presence on a redd, where identified. Identified to species, if possible.
	Communal redd	Determined to be potential communal redd based on irregular shape and if multiple pits are observed.
	Notes	The stage of the observed redd (fully constructed, in construction, abandoned), age of the redd (new or old, as determined by presence of fines or algal growth) as well as fish observed within the stream reach.
SOURCE: Based on Gallagher et al. (2007)		

Substrate for each redd was characterized in order of dominance and up to five substrates were listed in decreasing order (Table 2-4). Substrate sizes were based on the methodologies found in Reconnaissance (1:20 000) Fish and Fish Habitat Inventory: Standards and Procedures RIC (2001). Gravels were further sub-divided into two categories: small gravels and large gravels.

Table 2-4 Categories of Substrate used for Redd Substrate Composition

Substrate Category	Size Class	Code
Organics	n/a	OR
Fines	<0.06 mm (particle not discernable)	FI
Sand	0.06-2 mm	SA
Small gravel	2-16 mm	SG
Large gravel	17-64 mm	LG
Cobble	64 mm to 25.6 cm	CB
Small boulder	25.7 cm to 1 m	SB
Large boulder	>1 m	LB
Bedrock	n/a	BR

Spawning habitat assessments and redd surveys and identifications were based on professional judgment, previous experience, and local habitat features. Characteristics used to distinguish spawning redds for targeted species (i.e., brown trout, brook trout, bull trout, and mountain whitefish) is provided in Table 2-5. The literature-based criteria in Table 2-5 was used to inform the assessment when spawning redds were difficult to identify. The following sections outline the criteria used to differentiate between the species.

Table 2-5 Timing and Habitat Preferences of Fall Spawning Fish Potentially Present within the Study Area

Species	Spawning Type	Spawning Period (peak)	Substrate Composition	Water Depth (m)	Temperature (°C)	Velocity (m/s)	Important Spawning Habitat Features
Brown trout	Redd	Oct.–Dec. [a]	Gravel, cobble [b]	0.3-0.5 [d]	6.7–8.9 [b]	0.21-0.64 [f]	Runs or Riffles [d]
Brook trout	Redd	Aug.–Dec. [b]	Gravel, cobble [b]	0.16–0.20 [b]	3–9 [b]	0.03-0.42 [g]	Groundwater upwelling [b]
Bull trout	Redd	Aug.–Dec. (Sep.) [b,i]	Gravel, cobble [c]	0.3–0.6 [b]	5–9 [b]	0.14–0.52 [b]	High gradient with groundwater upwelling [b] Cover high Importance (undercut banks, woody debris, overhanging vegetation) [b]
Mountain whitefish	Broadcast	Sep.–Feb. (Nov.-Jan.) [b]	Gravel, cobble, boulders [b]	0.1 – >3 [e]	3–5 [b]	0.15-1.1 [h]	Riffles, rapids [b] Riffles, pools, or may spawn near suitable age-0 habitat (channels >6 m with protected areas consisting of silt-dominant slow velocity areas). Cover low importance.[e]

SOURCES:

[a] Government of Alberta 2020

[b] Roberge et al. 2002

[c] McPhail and Baxter 1996

[d] Trout Unlimited Canada 2016

[e] Boyer 2016

f Bjornn and Reiser 1991

[g] Ford et al. 1995

[h] Addley et al. 2003

[i] Popowoch and Eisler 2008

2.1.3.1 Brown Trout

The biggest redds within the study area were determined to be those of brown trout. A study by Grost et al. (1990) reported average brown trout red lengths of approximately 1.47 m, ranging from 0.70 m to 2.59 m. Brown trout are likely to select areas within the mainstem of rivers, including side channels, particularly within shallow riffles and runs. Brown trout typically spawn in water depths ranging from 0.3 m to 0.5 m, with water velocities between 0.2 m/s and 0.6 m/s, and in accumulations of low to moderately embedded gravels and cobbles (Table 2-5). Brown trout do not appear to be highly selective in the presence of cover when choosing spawning locations; areas with suitable substrate, velocities, and water depths appear to be most important (Trout Unlimited Canada 2016).

It can be difficult to distinguish between redds of brown trout and bull trout due to the similarity in size. During the spawning survey, when larger redds were observed, field crews relied on differences in the specific habitat conditions to identify the species. A distinctive feature of brown trout spawning is in the lack of groundwater inputs and cover as compared to bull trout that prefer these types of conditions for spawning (Table 2-5). Details that may indicate the age of the redd were also used because brown trout were more likely to be actively spawning at the time of the survey, whereas bull trout redds were potentially already a month old or more.

2.1.3.2 Brook Trout

Brook trout redds were largely differentiated from brown trout and bull trout redds by the overall size; brook trout redds are noticeably smaller in size. Brook trout typically spawn in water depths ranging from 0.16 m to 0.20 m, with water velocities between 0.03 m/s to 0.42 m/s, and areas with substrates dominated by gravels (Table 2-5). As indicated in the literature, mean water velocities and substrate size associated with brook trout redds were significantly smaller than those of brown trout. A strong link to spawning in groundwater influenced habitats has also been widely documented (Witzel and Maccrimmon 1983). Redd selection in the headwater reaches of streams has also been shown (Roberge et al. 2002).

2.1.3.3 Bull Trout

Guzevich and Thurow (2017) reported average bull trout redd lengths of approximately 1.03 m to 1.47 m and an overall range of 0.7 m to 2.28 m. Bull trout typically target smaller rivers and tributary streams for spawning, in water depths ranging from 0.3 m to 0.6 m and with velocities from 0.14 m/s to 0.52 m/s. Redds consist of gravel and cobble substrates and are often found in areas with the presence of cover such as undercut banks, woody debris, pools, and overhanging vegetation (Table 2-5). Due to the similarities with brown trout spawning preferences, bull trout redds were primarily identified by locations with groundwater upwelling because groundwater is known to be an important habitat feature for spawning bull trout. Bull trout redds were also distinguished from brown trout by the presence of instream cover (Roberge et al. 2002; Table 2-5).

2.1.4 Mountain Whitefish Observations

Identifying specific mountain whitefish spawning locations has been shown to be difficult during field surveys due to the presence of ice on many systems. Mountain whitefish reach peak spawning from approximately November to January (Roberge et al. 2002), which, in most years, is during ice cover, making it difficult to observe spawning activity. Due to safety concerns with weather and ice conditions, surveys were finished on November 28, 2019. Therefore, this survey was likely completed around the beginning of spawning and was unable to capture specific information on mountain whitefish spawning locations.

Mountain whitefish are broadcast spawners and are known to spawn in a wide range of habitats from gravel to boulder areas and in low to fast water velocities. The results of Boyer (2016) suggest mountain whitefish may spawn near juvenile rearing locations, therefore, post-survey interpretations of potential spawning areas can be made using collected habitat information and juvenile whitefish observations. While conducting the detailed habitat mapping and redd surveys, observations of age-0 mountain whitefish (size class less than 100 mm) were recorded. Habitats that juvenile mountain whitefish favor, such as areas with high braiding and protected areas (e.g., edgewater, backwater, and snye habitats), were identified as potential spawning locations for adults. Juvenile mountain whitefish are most commonly associated with edgewater habitats that are shallow (less than 10 cm) and have little to no flow.

3.0 RESULTS

3.1 BROWN TROUT

A total of 115 brown trout redds were identified along a 24 km stretch of river making up the study area. Brown trout redds were irregularly distributed and the following observations were made:

- Two clusters of brown trout redds were observed. These redds were largely located in active side channel habitats within highly braided sections of the river. The two concentrations of redds were found in:
  - the uppermost reach of the study area from Redwood Meadows downstream for approximately 1.5 km (Attachment A)
  - the section of river upstream from the confluence with Pirmez Creek for a stretch of approximately 1 km (Attachment A)
- Redds within inactive channels were primarily found in the vicinity of the confluence with Pirmez Creek (Attachment A).
- The remaining redds were dispersed throughout the study area and were generally found in the main channel.

3.1.1 Channel Types

Most brown trout redds were found within active channels of Elbow River including side channels (n=62; 54%) and the main channel (n=40; 35%). Active channels are those that receive surface water flows directly from Elbow River. Active channels were assumed to be targeted by brown trout given they are more likely to contain flows resulting in clean, suitable sized substrates with a high probability of remaining wetted during the winter months. Brown trout occasionally constructed redds within inactive connected channels (n=11; 10%) and rarely within inactive disconnected channels (n=2; 2%; Figure 3-1). Given the low flows and higher rate of sediment deposition, inactive channels were considered less suitable for brown trout spawning.

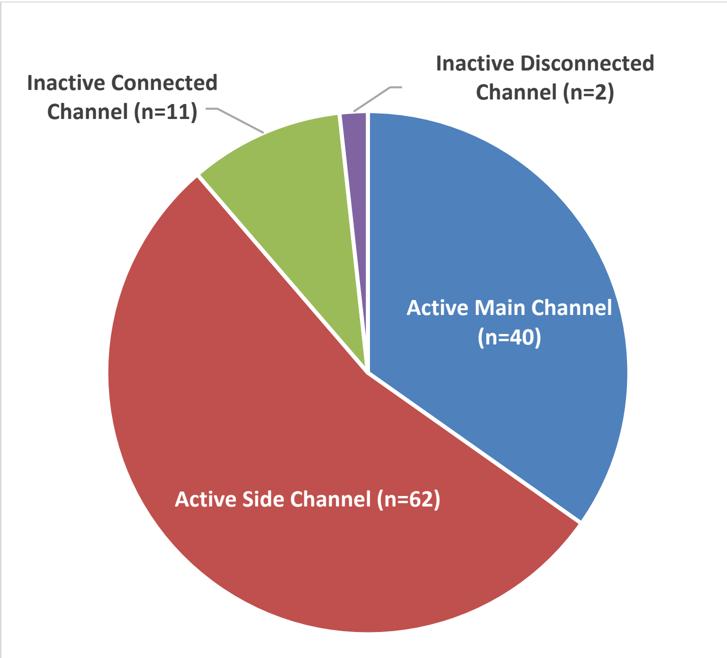


Figure 3-1 Brown Trout Redd Occurrence by Channel Type

3.1.2 Macrohabitat Types

Active Side Channels

Within the active side channels, most brown trout redds were constructed in slow glide macrohabitats (n=32; 52%; Figure 3-2). Slow glides are associated with shallow water depths and smaller substrates such as gravels with low to medium embeddedness, which are habitat important for salmonid spawning and redd construction. The slow glides observed during the survey were primarily associated with the tail end of scoured features (e.g., pools, runs) and were dominated by large gravel-substrates. Water depths and velocities at these redd locations averaged 0.34 m and 0.37 m/s, respectively. A large proportion of the communal redds identified during the survey were recorded in active side channels (11 of 14); six of these locations were in slow glide habitats (Photo 3-1 and Photo 3-2).

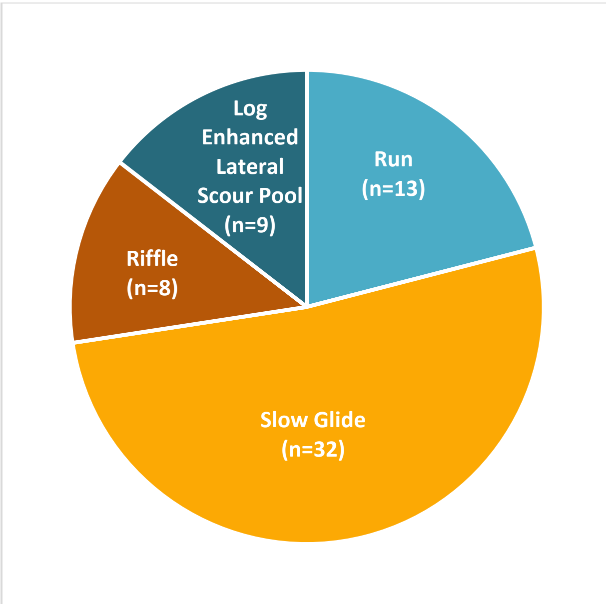


Figure 3-2 Brown Trout Redd Occurrence by Macrohabitat Type within Active Side Channels

Photo 3-1 Brown Trout Communal Redd Located within Slow Glide Macrohabitat in an Active Side Channel

Photo 3-2 Brown Trout Communal Redd Located within Slow Glide Macrohabitat in an Active Side Channel

The remaining redds were found in runs (n=13; 21%), log-enhanced lateral scour pools (n=9, 15%), and riffles (n=8, 13%; Figure 3-2). Although riffles and runs are considered higher flow types (Flosi et al. 2010) and may not be ideal for brown trout spawning, redds were often constructed on the fringes of these habitats in areas that provide suitable substrate, depth, and velocities for spawning (Photo 3-3). The mean water depth and velocity of redds constructed in riffles and runs were 0.26 m and 0.32 m/s, respectively. Substrate within these redds was predominantly large gravel and cobble. Cover was documented at most of the redd locations identified in active side channels, except for the riffle habitats, which had little to no cover. Cover consisted of instream and overhead woody debris, trees and shrubs, and undercut banks. A large proportion of communal redds (5 of 14) were also recorded in active side channels.

Photo 3-3 Brown Trout Redd within Riffle Macrohabitat in an Active Side Channel

Active Main Channels

In the main channel, brown trout redds were also highly associated with slow glides (n=32, 80%; Figure 3-3). Slow glide habitat within the main channel was generally restricted to small areas along scoured banks, immediately downstream of a scoured macrohabitat feature (i.e., such as on the edge of a pool tail; Photo 3-4). These areas in main channels were associated with higher amounts of cover (23% mean total cover) as compared to slow glides within the active side channels (13% mean total cover). Cover in the main channel consisted primarily as overhanging trees and shrubs, as well as overhead and instream woody debris (Photo 3-4). Substrate within redds was predominantly large gravel followed by small gravel and cobble. Water depths and velocities were slightly higher in the main channel slow glides (mean of 0.46 m and 0.50 m/s, respectively) as compared to the side channels; these main channel conditions are similar to those documented as suitable for brown trout spawning (Table 2-5).

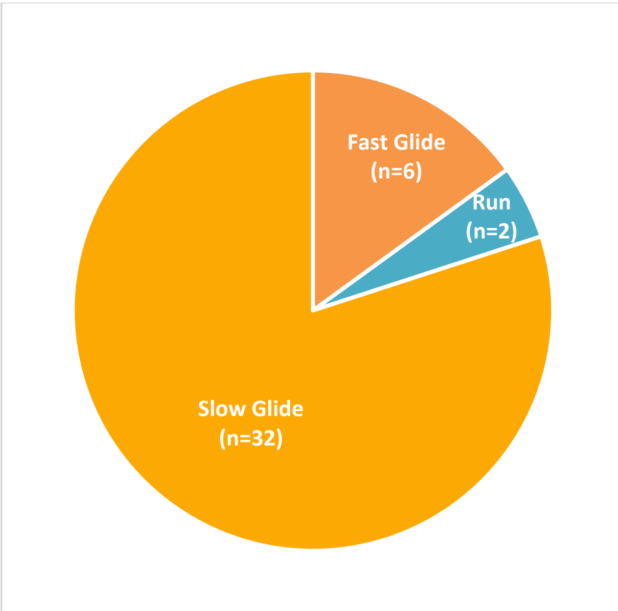


Figure 3-3 Brown Trout Redd Occurrence by Macrohabitat Type within the Main Channel

Photo 3-4 Brown Trout Redd Located within Slow Glide Macrohabitat in the Main Channel

Brown trout redds were also found in higher flow habitats such as fast glides (n=6, 15%) and runs (n=2, 5%; Figure 3-3). Fast glides and runs are distinguished from slow glides by higher velocities. Although deeper and faster flows are not typically targeted by brown trout for spawning, redds were constructed along the edges of these macrohabitat units where suitable substrate and flows were present (i.e., along the edge of scoured banks). Larger substrates (i.e., large gravels and cobbles) and higher flows (mean water depth and velocity of 0.6 m and 0.7 m/s, respectively) were recorded at these redd sites. Cover did not appear to be as critical in these macrohabitats because it was documented in low amounts at most redd locations.

Inactive Connected Channels

A total of 11 brown trout redds were observed in inactive connected channels. These channels were connected to Elbow River from their downstream end with flows maintained by either groundwater inputs or hyporheic flows from upstream. Brown trout redds in inactive channels were identified in the middle reaches of the study area where groundwater inputs were suspected, although given the lack of water quality data, this was not confirmed. Slow glides were the most commonly used macrohabitat within these channels (n=6, 55%), followed by run (n=2, 18%), flat (n=2, 18%), and riffle (n=1, 9%) habitats (Figure 3-4). All redds were characterized by large and small gravel substrates with a higher presence of fines as compared to redds found within the active channels. Mean water depth (0.27 m) and velocity (0.23 m/s) within the slow glides were slightly lower than within the active channels, resulting in higher deposition of fines (Photo 3-5). Cover was limited at redds within inactive connected channels. However, the two redds in run habitat were located beneath dense overhead woody debris and overhanging vegetation.

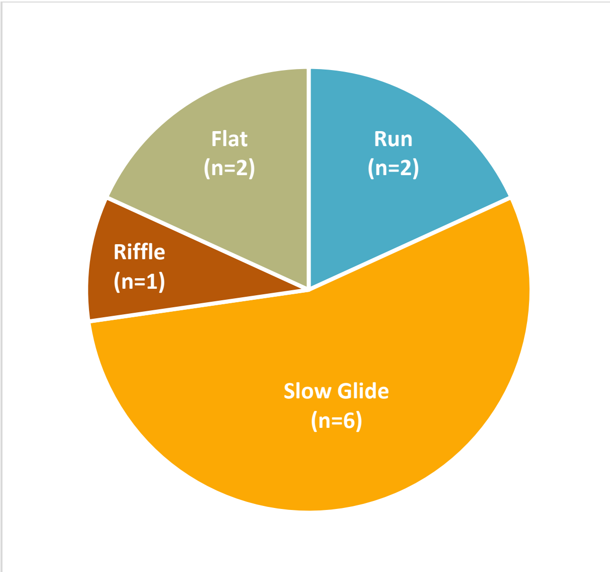


Figure 3-4 Brown Trout Redd Occurrence by Habitat Type within Inactive Connected Channels

Photo 3-5 Brown Trout Redd Located within Slow Glide Macrohabitat in an Inactive Connected Channel

Inactive Disconnected Channels

Although inactive disconnected channels are not typical habitat types preferred by brown trout for spawning, the two redds observed in these channels were in habitats considered on the margin, typically used for brown trout spawning. Both redds were documented in slow glide macrohabitats (Figure 3-5), with mean water depth and velocity of 0.31 m and 0.20 m/s, respectively, and with substrates dominated by large and small gravels. Cover consisted of overhead woody debris and grasses.

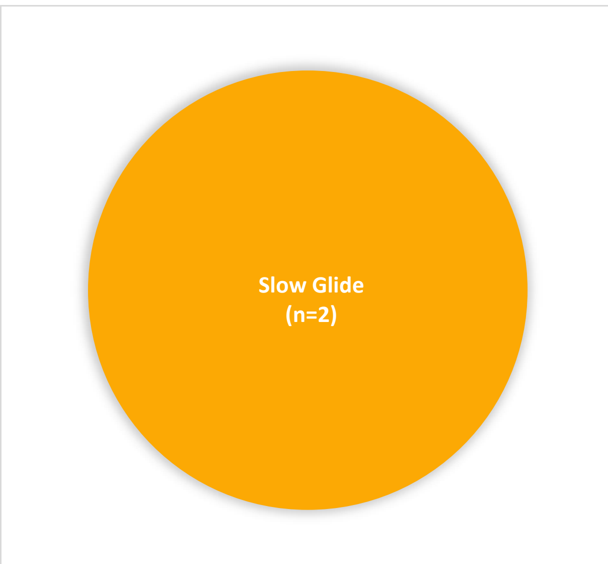


Figure 3-5 Brown Trout Redd Occurrence by Habitat Type within Inactive Disconnected Channels

3.1.3 Redd Measurements

Individual and communal brown trout redd measurements were reviewed separately. A total of 78 individual redds and 23 communal redds were recorded, resulting in a total of 115 redds. The mean total length of individual redds was 2.7 m and ranged from 0.7 m to 8.0 m. Several large redds with long tail spills were observed during the survey. Two of these individual redds were measured at 6 m, two at 7 m, and a third redd was 8 m long. The average maximum redd width was 0.9 m, ranging from 0.4 m to 2.0 m. Mean water depth was 0.38 m, ranging from 0.15 m to 0.70 m deep. Water velocity was 0.36 m/s on average and ranged from 0.10 m/s to 0.70 m/s. Overall, redds were found within habitats that aligned with data found in the literature.

Communal redds were, on average, longer and wider than single redds, averaging 4.3 m long and 1.5 m wide. The range of communal redd lengths was 2.0 m to 7.0 m; communal redd widths were 0.9 m to 2.5 m. Water depths were similar to individual redds, averaging 0.32 m and ranging from 0.10 m to 0.55 m. Water velocities were also similar to individual redds, averaging 0.34 m and between 0.10 m/s and 0.55 m/s (Table 3-1; Attachment B). Communal redds were predominantly found in active side channels within slow glide macrohabitats.

Table 3-1 Summary of Brown Trout Redd Measurements

		Total Redd Length (m)	Maximum Redd Width (m)	Water Depth (m)	Water Velocity (m/s)
Individual redds	**Mean**	2.7	0.9	0.38	0.36
	Range	0.7 - 8.0	0.4 - 2.0	0.15 - 0.70	0.10 - 0.70
Communal redds	**Mean**	4.3	1.5	0.32	0.34
	Range	2.0 - 7.0	0.9 - 2.5	0.10 – 0.55	0.10 - 0.55

3.2 BROOK TROUT

A total of 353 brook trout redds were observed during the surveys. Brook trout spawning was generally found in clusters throughout the study area and targeted specific habitats. A large concentration of redds were observed approximately 1 km upstream of Pirmez Creek along with a smaller cluster near the confluence with Elbow River (Attachment A). A common observation was to see multiple redds along a short section of channel.

3.2.1 Channel Types

Approximately half of the brook trout redds were found within inactive connected channels (n=183, 52%), with subsequent redds found in inactive disconnected channels (n=152, 43%) and only a few in active side channels (n=18, 5%; Figure 3-6). An important observation of these results is the connection between brown trout redds and inactive channels. These channel types are generally wetted from hyporheic flow or groundwater sources during low flow months of the year. Groundwater is known to be an important habitat feature for brook trout spawning (Table 2-5).

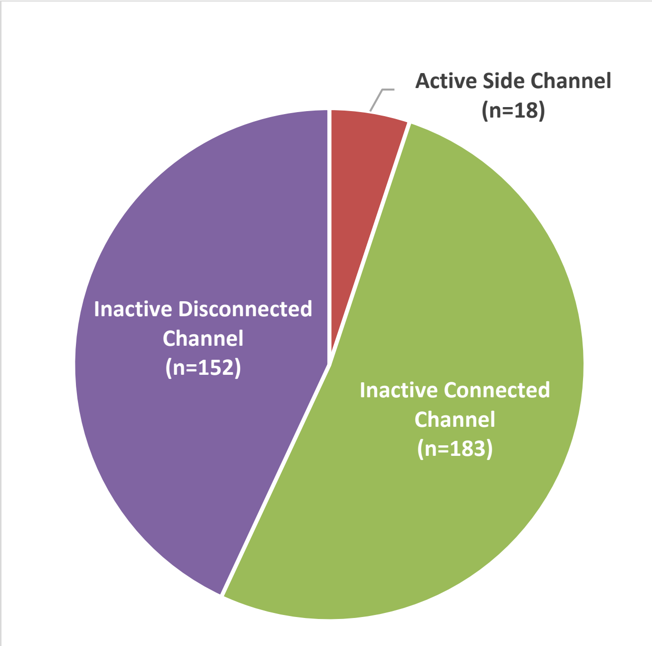


Figure 3-6 Brook Trout Redd Occurrence by Channel Type

3.2.2 Macrohabitat Types

Inactive Connected Channel

Within the inactive connected channels, a variety of macrohabitat types were selected; however, based on redd distribution, three primary macrohabitats were preferred. Nearly half of the redds were constructed in flat macrohabitats (n=80; 44%;), followed by channel confluence pools (n=42, 23%); and log-enhanced lateral scour pools (n=37, 20%). The remaining redds were found in slow glides (n=10, 5%), backwatered channel confluences (n=6, 3%), mid-channel pools (n=5, 3%), and runs (n=3, 2%; Figure 3-7).

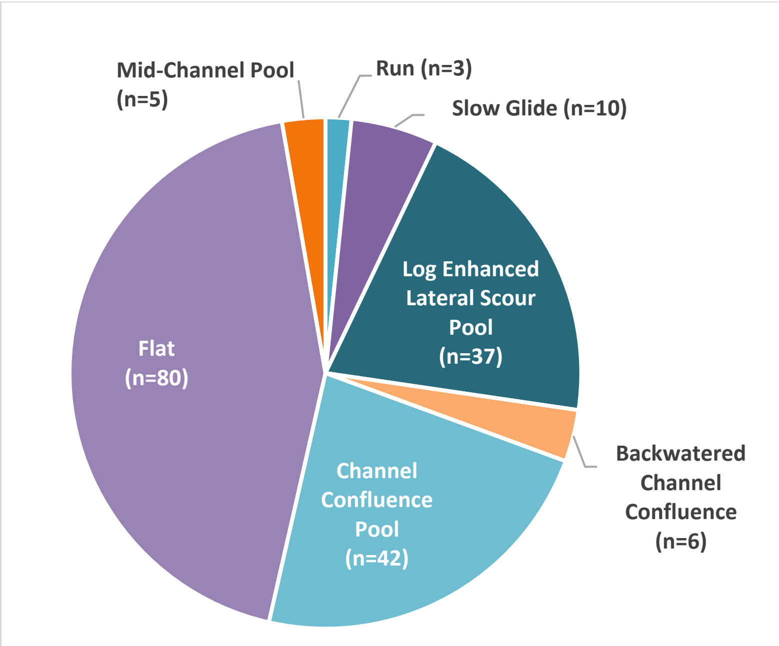


Figure 3-7 Brook Trout Redd Occurrence by Macrohabitat Type within Inactive Connected Channels

Although flat macrohabitats were the most common, there were many similarities among all macrohabitats that brook trout selected. Channels were shallow with low flows and substrate types indicative of these low flows. Substrates tended to be dominated by either large gravels or fines, with a mix of embedded course substates underneath. Pool habitats were also common, totaling 46% of the redd locations; substrates were dominated by fine materials. Cover was common at nearly all brook trout spawning sites, likely due to being in small, narrow channels. Cover generally consisted of instream and overhead woody debris and trees and/or shrubs with some grasses. A higher presence of instream vegetation such as grasses and filamentous algae was also noted for brook trout spawning sites, another indicator of low velocity and still water habitats (Photo 3-6 and Photo 3-7).

Photo 3-6 Brook Trout Redd Located within Flat Macrohabitat in an Inactive Connected Channel

Photo 3-7 Brook Trout Redd Located within Flat Macrohabitat in an Inactive Connected Channel

Brook trout redds were also highly grouped, with observations of multiple redds within a short section of channel. Brook trout were targeting specific habitat features such as areas of groundwater upwelling. A total of 183 brook trout redds were found at only 45 redd locations, resulting in a mean of four redds per site (ranging from 1 to 28). Although some communal redds were observed (n=8), most were individual redds located close to each other.

Inactive Disconnected Channels

Brook trout selected similar macrohabitats in inactive disconnected channels; however, flat macrohabitats accounted for a greater proportion of redd locations (n=11, 73%) in the disconnected channels. Other habitats used for spawning by brown trout included lateral scour pools (n=18, 12%), plunge pools (n=10, 7%), backwatered channel confluences (n=8, 5%), and riffles (n=5, 3%; Figure 3-8). The mean water depth for a subsample of redds within flat macrohabitats (n=13) was 0.13 m. Dominant substrate types among most redds included either fines, large gravels, or cobbles, with fine materials. The remaining redd site locations were dominated by either large gravels or cobbles but had fewer fines than the flat habitats, likely a result of more flow. Cover was documented at most redd sites throughout all macrohabitats and consisted of trees and/or shrubs with a mix of instream vegetation, overhanging woody debris, and some undercut banks (Photo 3-8). Redds were also grouped within the inactive disconnected channels, similar to what was observed in the connected channels.

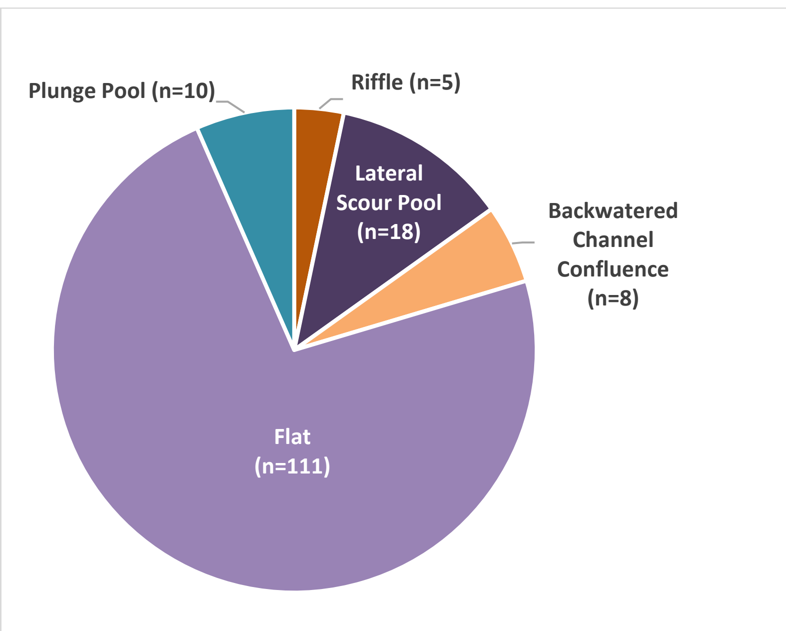


Figure 3-8 Brook Trout Redd Occurrence by Macrohabitat Type within Inactive Disconnected Channels

Photo 3-8 Multiple Brook Trout Redds Located within Backwatered Channel Confluence Macrohabitat in an Inactive Disconnected Channel

Groundwater upwelling was suspected in many areas of brook trout spawning, particularly where there were inactive disconnected channels. Nearly all the pool habitats in disconnected channels were noted to be potentially groundwater sourced. Considering the amount of spawning in these low flow areas and a drop in ambient air temperature with the onset of winter, some of the disconnected channels appeared to remain ice free longer than the active channels, indicating potential warmer water inputs (i.e., groundwater upwelling). However, with the current information and lack of water quality data, it cannot be definitively determined if these channels were influenced from groundwater upwelling or from hyporheic flows (i.e., surface water flow at or below the streambed within the substrates).

Active Side Channels

Brook trout redds were found in only two macrohabitats within active side channels; slow glides (n=11, 61%) and log-enhanced lateral scour pools (n=7, 39%; Figure 3-9). Substrates consisted of large and small gravels covered in fines. If present, cover consisted of low amounts of instream and overhead woody debris. Brook trout spawning conditions within these macrohabitats were similar to those found in the inactive channels. Substrates consisted of silt covered gravels and mean water depth and velocity were low and slow flowing (0.29 m and 0.15 m/s, respectively).

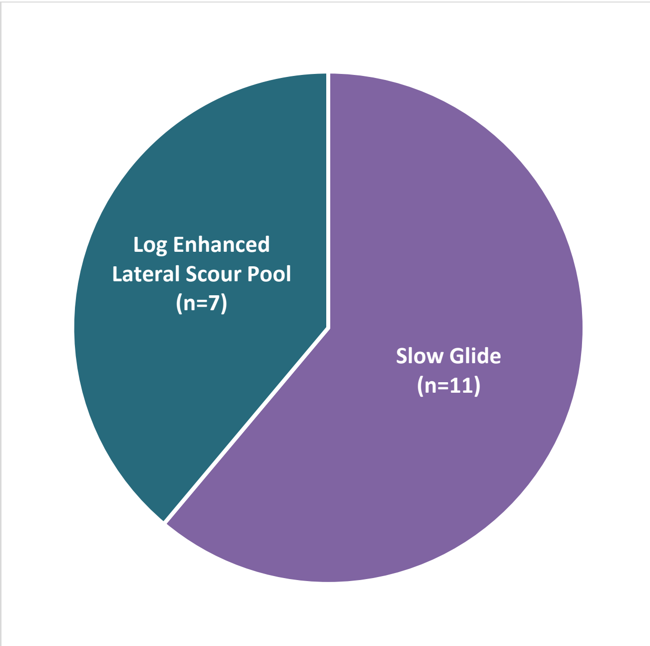


Figure 3-9 Brook Trout Redd Selection by Macrohabitat Type within Active Side Channels

3.2.3 Redd Measurements

Due to the large number of brook trout redds observed during the spawning survey (n=353), only a subset of redds were measured (n=12). Brook trout redds were considerably smaller than brown trout redds and consisted of a small pot, lacked tail spills, and were generally constructed in habitats with silt-covered substrates (Photo 3-6 to Photo 3-8). The lack of spill tails is likely due to being in inactive channels with little to no flow. The average size of brook trout redds was 0.4 m long and 0.3 m wide. Mean water depths were shallow (0.17 m) with low velocities (0.20 m/s), likely a result of many redds being located in inactive groundwater-sourced channels (Table 3-2).

Table 3-2 Brook Trout Redd Measurements Summarized

	Total Redd Length (m)	Max. Redd Width (m)	Water Depth (m)	Water Velocity (m/s)
Average	0.4	0.3	0.17	0.20
Range	0.2 - 0.6	0.2 - 0.4	0.05 - 0.45	0.10 - 0.30

3.3 BULL TROUT

One potential bull trout redd was observed on November 22, 2019 (Attachment A). This redd was believed to be older due to the presence of periphyton (Photo 3-9) and was located in an inactive disconnected channel within a slow glide macrohabitat (Photo 3-10). The pot size was large (1.0 m long by 0.7 m wide) and substrate was dominated by large gravels with the presence of small gravels and cobbles. No cover was documented at this redd location.

Bull trout are known to spawn from August to December but typically peak in the month of September (Table 2-5). Previous surveys on Elbow River upstream of the study area also indicate bull trout finish spawning by the end of September (Popowich and Eisler 2008). Given the timing of the fall spawning survey in the study area, bull trout redds may have become indistinguishable. Alternatively, as reported by (Popowich and Eisler 2008), bull trout spawning activity is primarily limited to river reaches below Elbow Falls and upstream from where this survey was completed.

Photo 3-9 Potential Bull Trout Redd with Periphyton on Substrate in Slow Glide Macrohabitat in an Inactive Disconnected Channel

Photo 3-10 View of Potential Bull Trout Redd Habitat in Slow Glide Macrohabitat in an Inactive Disconnected Channel

3.4 MOUNTAIN WHITEFISH

Mountain whitefish spawning can be difficult to document because it often occurs under ice during winter months (Table 2-5). A study completed in Montana, looked at adult mountain whitefish spawning habitat preferences and concluded adults spawn close to rearing habitat (Boyer 2016). To gain more specific information on potential whitefish spawning in Elbow River, age-0 mountain whitefish (i.e., size class less than 100 mm) observations and their associated macrohabitat were documented and georeferenced during the field surveys. Where a school of mountain whitefish was identified and the exact count was difficult to determine, an estimated 36 fish was used. For all other observations, the actual count of fish was reported. All further references to mountain whitefish observations in this section refer to the age-0, size class less than 00 mm fish.

Mountain whitefish were found dispersed throughout the surveyed length of river, although a higher concentration was found in the uppermost reach of the study area near Redwood Meadows (Attachment A). No observations were made near, or immediately upstream of, the confluence with Pirmez Creek where a notable amount of brown and brook trout spawning had occurred. Mountain whitefish were most commonly found in active side channels (n=124), followed by inactive disconnected (n=87), and inactive connected channels (n=78). Fewer observations were documented in the main channels (n=17; Table 3-3).

Four different macrohabitats contained almost all the mountain whitefish observations; flats (n=197), slow glides (n=41), log-enhanced lateral scour pools (n=37), and edgewater habitats (n=23). These habitats are characterized by low water velocities (or still water in the case of edgewater habitats), and many of the mountain whitefish observations were located in areas with silt-covered gravel substrates.

Table 3-3 Summary of Mountain Whitefish Age-0 Observations by Macrohabitat Units and Channel Type

Habitat Type	Main Channel	Side Channel	Inactive Connected Channels	Inactive Disconnected Channels	Total
Riffle		1		1	**2**
Run	1	1			**2**
Log-enhanced lateral scour pool		36*	1		**37**
Bedrock-formed lateral scour pool			2		**2**
Slow glide	1	40*			**41**
Edgewater	15	7	1		**23**
Backwatered channel confluence			2		**2**
Flat		39*	72*	86*	**197**
Total	**17**	**124**	**78**	**87**	

NOTE:
* Denotes where a school of three dozen mountain whitefish were estimated. A total of six schools were observed.

Although specific mountain whitefish observations were not highly associated with brown or brook trout spawning areas, the macrohabitat type for the mountain whitefish was very similar to habitat that brook trout selected for spawning. In the inactive channels, flat macrohabitats were the unit type where most mountain whitefish were found (Photo 3-11). Brook trout were also highly selective for the flat macrohabitats within the inactive channels. Within the active side channels, mountain whitefish were found in higher numbers in slow glides and log-enhanced lateral scour pools; also similar for the brook trout spawning. This indicates these macrohabitats likely remain wetted during the winter incubation period and could potentially be used for mountain whitefish spawning.

Photo 3-11 School of Mountain Whitefish Age-0 Shown in a Flat Macrohabitat within an Inactive Disconnected Channel

Within the main channel, mountain whitefish were primarily found in edgewater habitats which are located along the margins of riffles and runs in active channels. The riffle and run habitats located adjacent to the edgewater habitats may be where mountain whitefish spawning occurs. Although there is no direct link between age-0 mountain whitefish locations and spawning, these observations may provide some indication of the macrohabitats used for spawning.

4.0 CONCLUSIONS

Brown trout spawning was predominantly found in slow glide macrohabitats throughout all the channel types; redds observed in slow glide habitats accounted for 62% of the total brown trout redds observed. Substrate types, water depths, and velocities in these spawning locations were consistent with findings in the literature. Brook trout spawning was most highly associated with inactive flat macrohabitats and slow flowing pools with substrates dominated by silt-covered gravels. Instream vegetation such as grasses and macrophytes were commonly associated with many brook trout spawning locations.

Only one potential bull trout redd was observed in an inactive disconnected channel. Previous studies have indicated bull trout spawning is more commonly found upstream of the survey area; however, field studies were completed after the peak spawning period and some redds may have been indistinguishable. Due to these circumstances, it is difficult to determine to what extent the study area may be used for bull trout spawning; however, Popowich and Eisler (2008) reported most Elbow River bull trout spawning likely occurs upstream of the study area. Water quality data and additional information on potential groundwater influence may provide a better idea of whether these habitats are suitable for bull trout.

Age-0 mountain whitefish were largely found within flat macrohabitats, many of which were located in inactive channels, similar to the macrohabitats where brook trout spawning was found. Mountain whitefish were also observed in slow glides, lateral scour pools, and edgewater habitats next to riffle and run habitats. Some studies indicate mountain whitefish spawning may occur close to juvenile rearing habitats. No definitive conclusions could be made on precise mountain whitefish spawning locations; however, these field studies highlight potential areas provided they spawn near rearing habitats.

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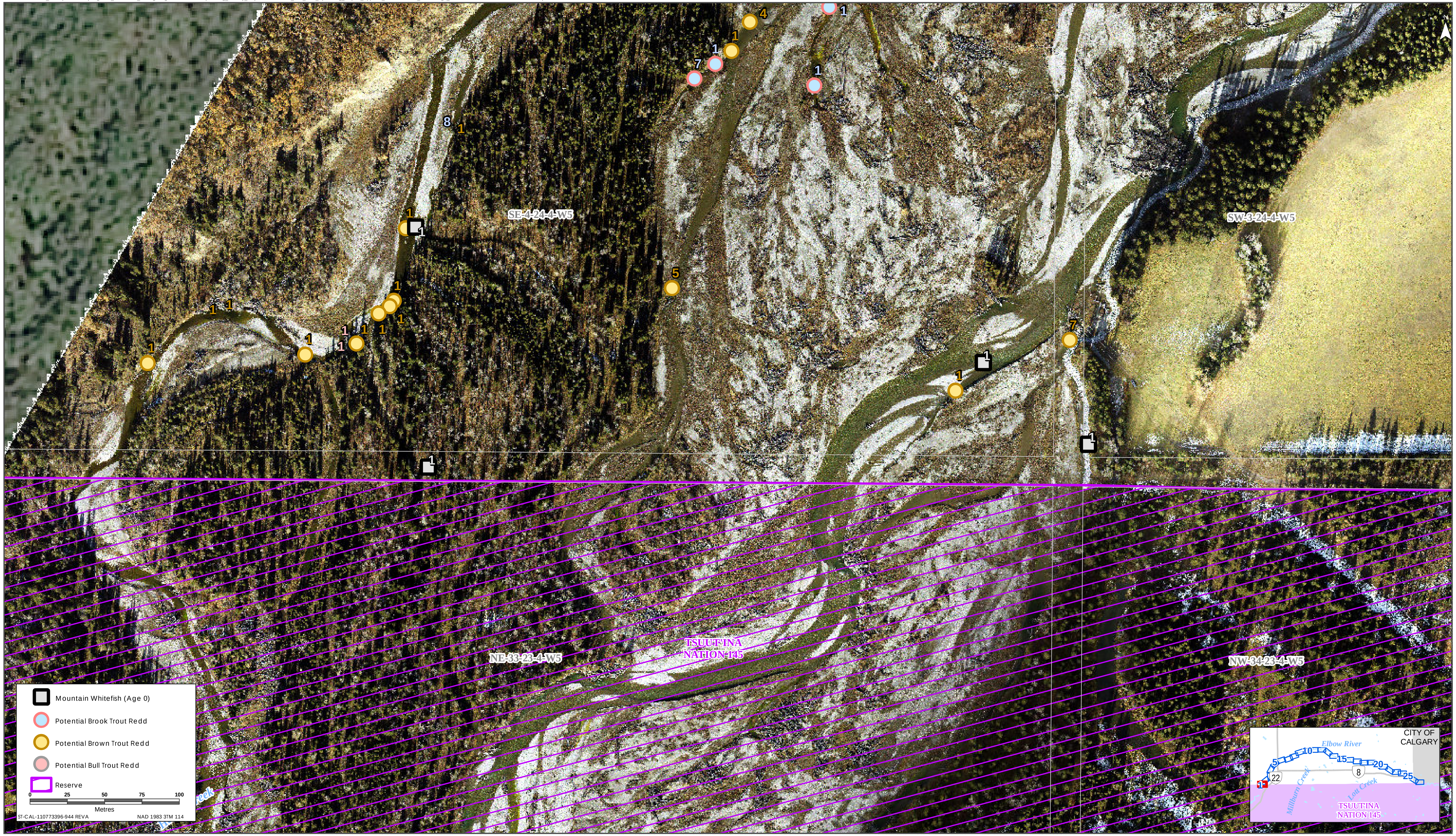
Attachment A SPAWNING SURVEY REDD AND AGE-0 MOUNTAIN WHITEFISH LOCATIONS (FALL 2019)

W:\Clients\Alberta_Transportation\Springbank_Offstream_Storage\Figures\SIR\IR19\Spawning_Survey_Report\110773396_944_Fish_Spawning_Report_AppdxA_RedMeadows_DiscvRidge_Fall2019.mxd 5/15/2020 2:44:11 PM tquilichini



Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
Imagery: Z-Air 10cm resolution October 2019

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ALBERTA TRANSPORTATION SPRINGBANK OFF-STREAM RESERVOIR PROJECT ENVIRONMENTAL IMPACT ASSESSMENT

Spawning Survey Redd and Age 0 Mountain Whitefish Locations (Fall 2019)
Attachment A

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Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
Imagery: Z-Air 10cm resolution October 2019

Spawning Survey Redd and Age 0 Mountain Whitefish Locations (Fall 2019)
Attachment A

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ALBERTA TRANSPORTATION SPRINGBANK OFF-STREAM RESEVOIR PROJECT ENVIRONMENTAL IMPACT ASSESSMENT

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Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
Imagery: Z-Air 10cm resolution October 2019

Spawning Survey Redd and Age 0 Mountain Whitefish Locations (Fall 2019)
Attachment A

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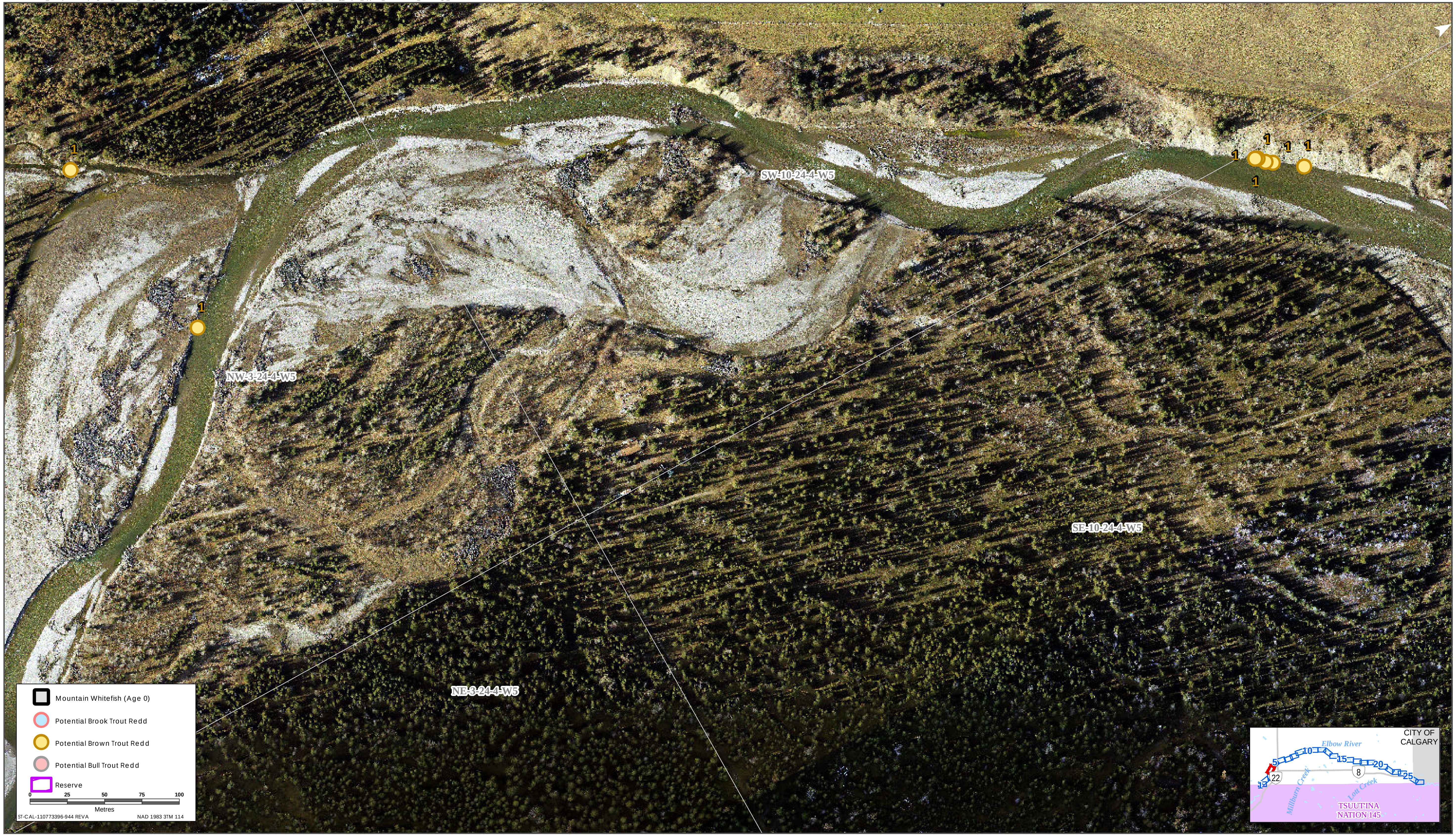

Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
Imagery: Z-Air 10cm resolution October 2019

Spawning Survey Redd and Age 0 Mountain Whitefish Locations (Fall 2019)
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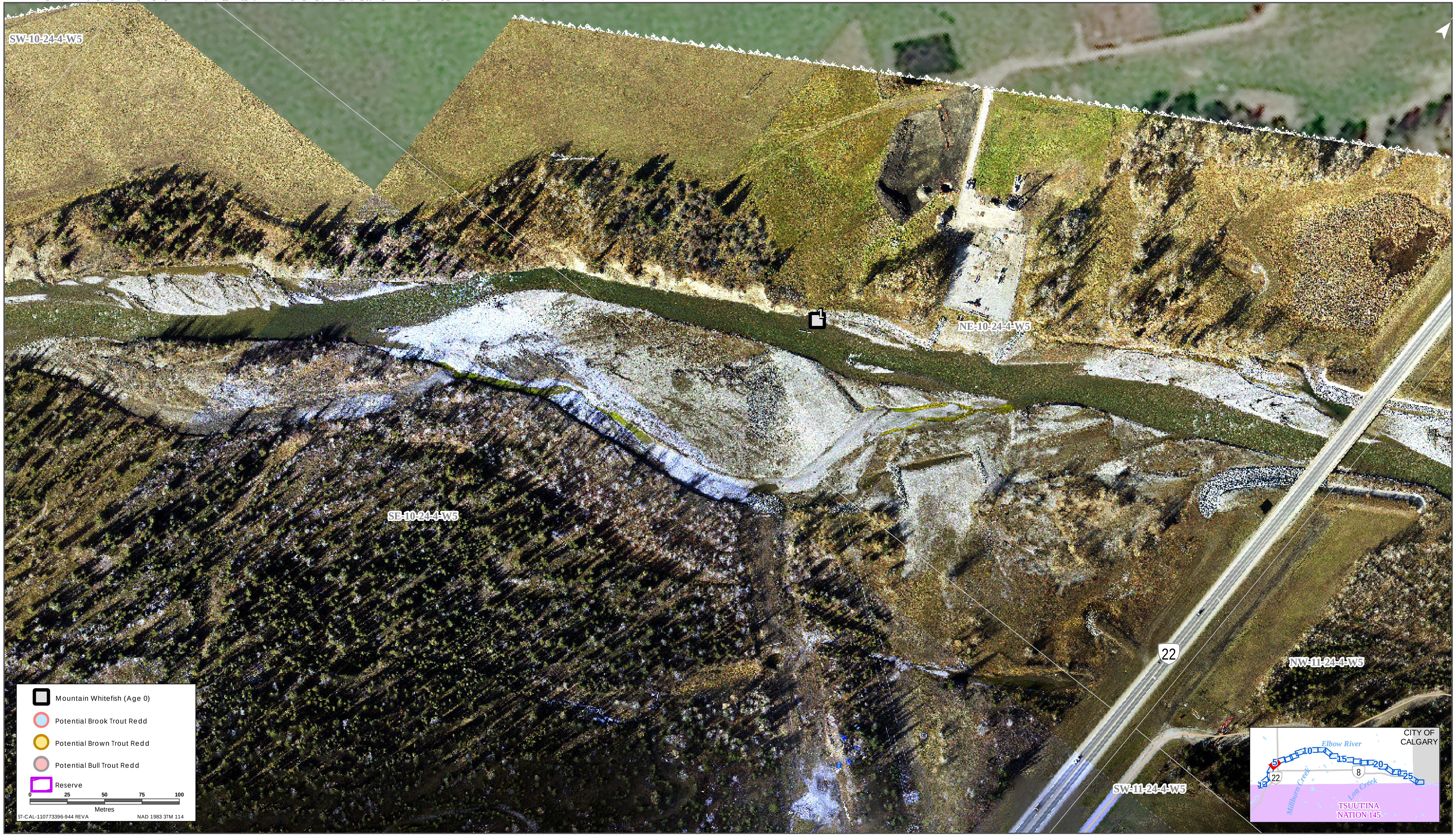

Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
Imagery: Z-Air 10cm resolution October 2019

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ALBERTA TRANSPORTATION SPRINGBANK OFF-STREAM RESERVOIR PROJECT ENVIRONMENTAL IMPACT ASSESSMENT

Spawning Survey Redd and Age 0 Mountain Whitefish Locations (Fall 2019)
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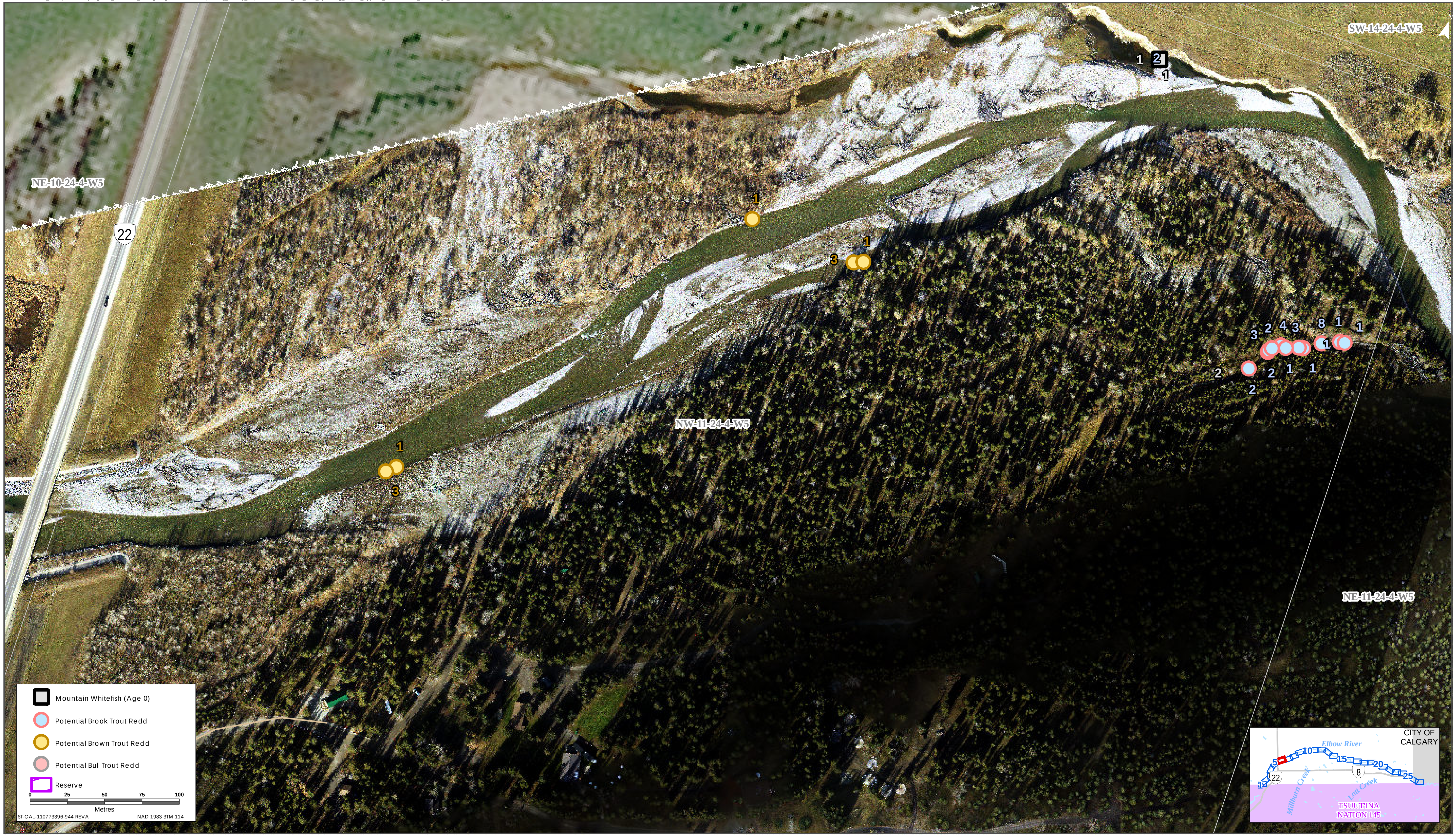

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Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
Imagery: Z-Air 10cm resolution October 2019

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ALBERTA TRANSPORTATION SPRINGBANK OFF-STREAM RESEVOIR PROJECT ENVIRONMENTAL IMPACT ASSESSMENT

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Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
Imagery: 2-Air 10cm resolution October 2019

Spawning Survey Redd and Age 0 Mountain Whitefish Locations (Fall 2019)
Attachment A

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Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
Imagery: Z-Air 10cm resolution October 2019

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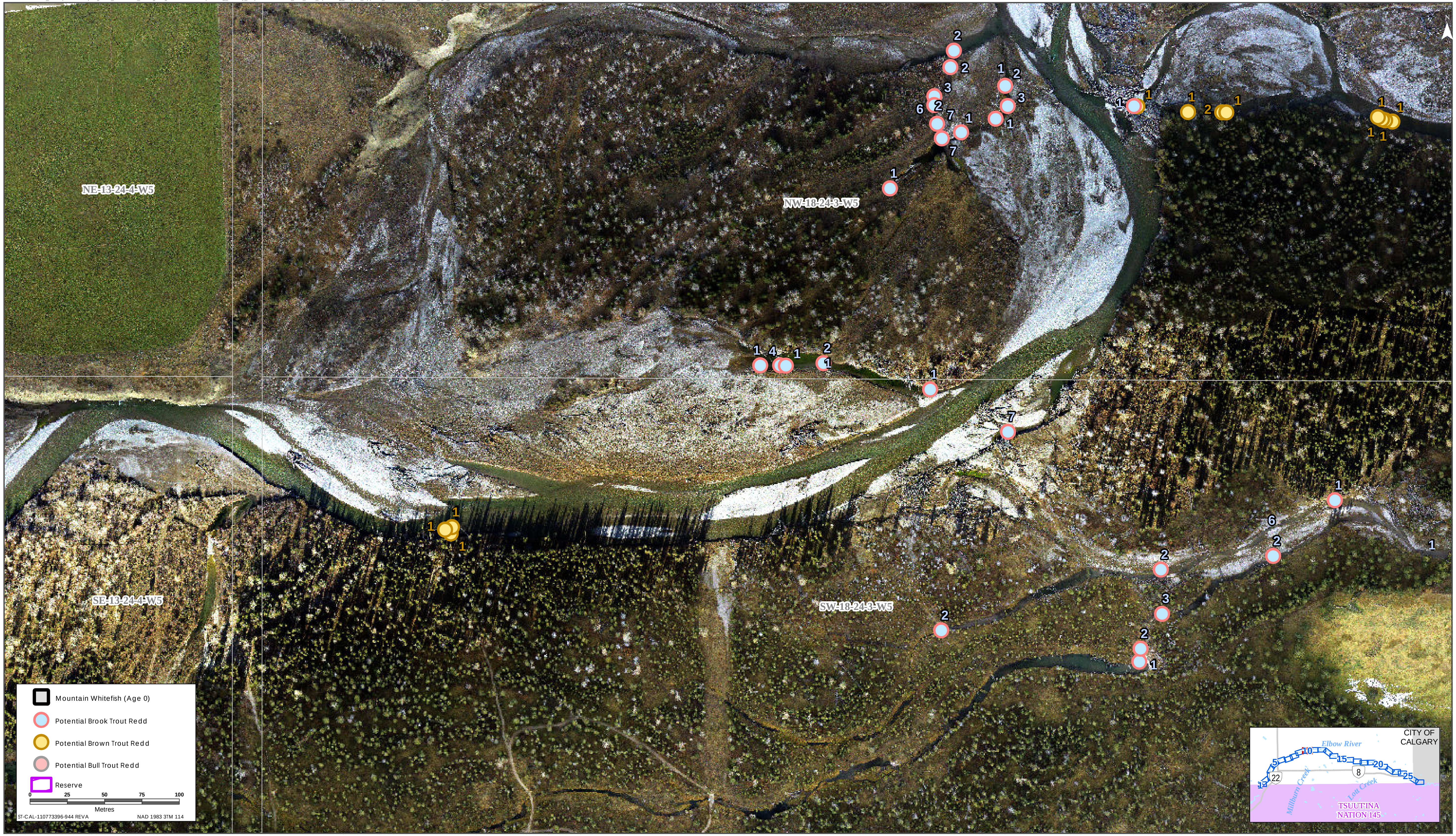
ALBERTA TRANSPORTATION SPRINGBANK OFF-STREAM RESERVOIR PROJECT ENVIRONMENTAL IMPACT ASSESSMENT

Spawning Survey Redd and Age 0 Mountain Whitefish Locations (Fall 2019)
Attachment A



Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
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Spawning Survey Redd and Age 0 Mountain Whitefish Locations (Fall 2019)
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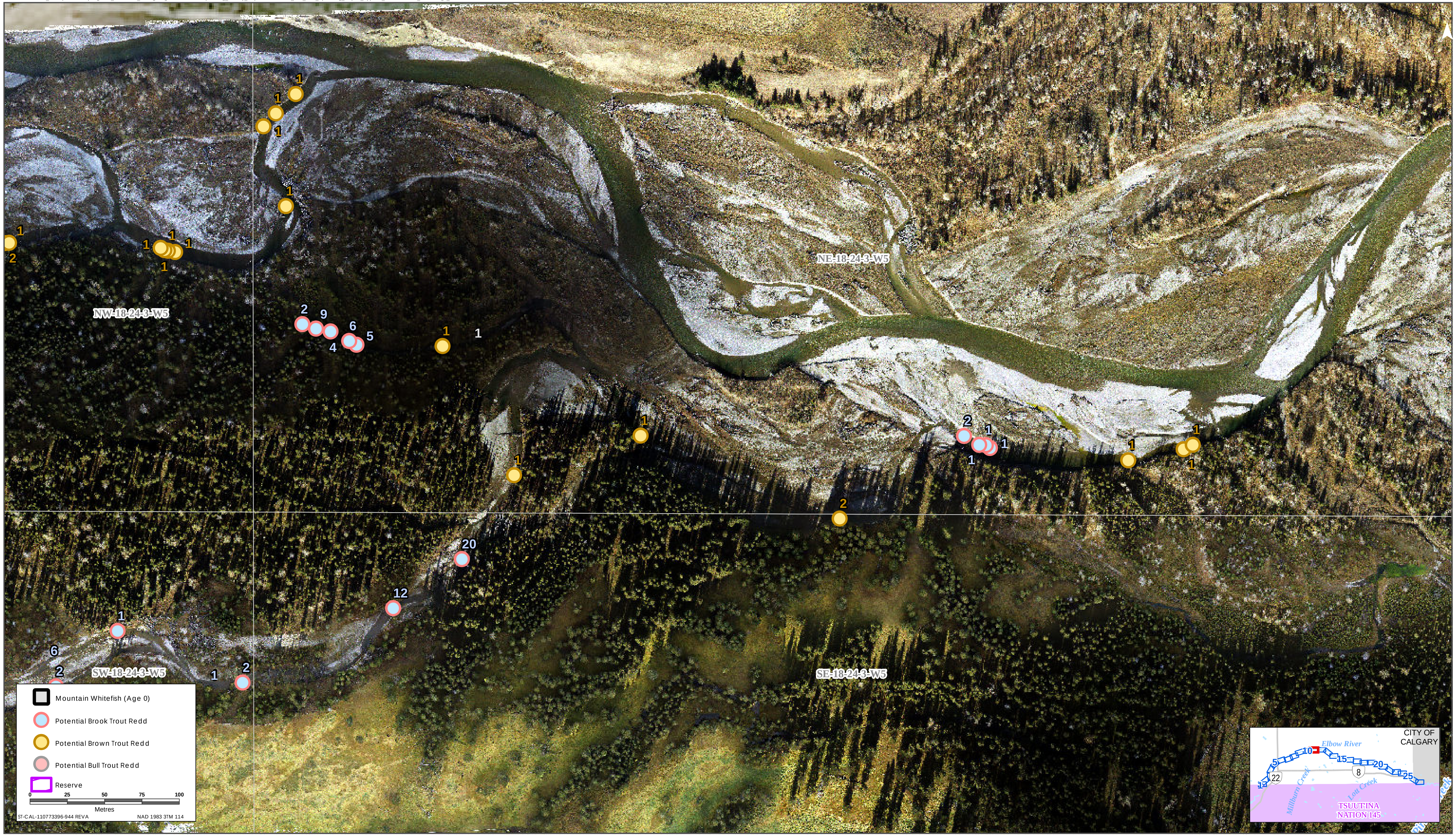

Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
Imagery: Z-Air 10cm resolution October 2019

Spawning Survey Redd and Age 0 Mountain Whitefish Locations (Fall 2019)
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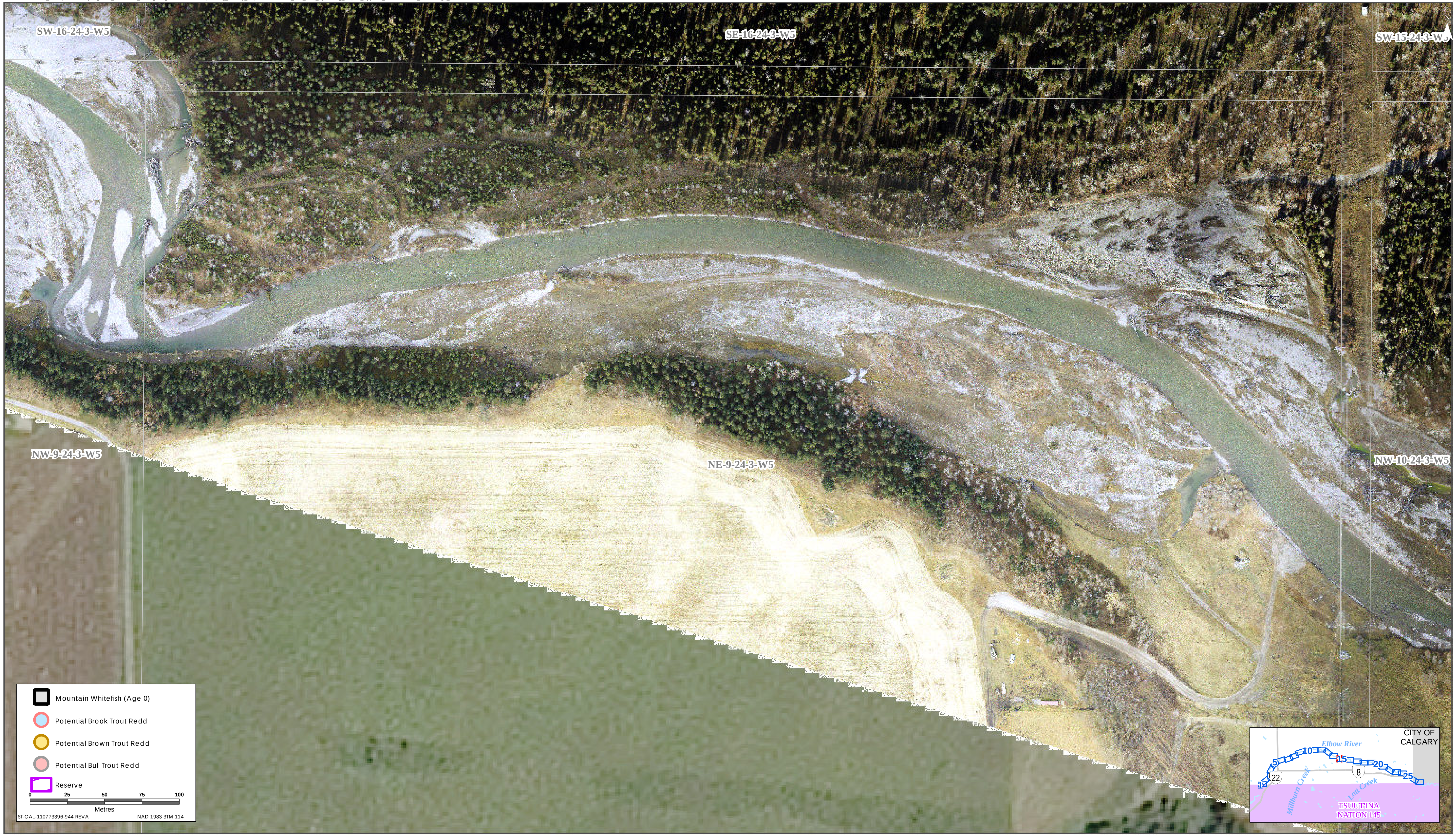
Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
Imagery: Z-Air 10cm resolution October 2019

Spawning Survey Redd and Age 0 Mountain Whitefish Locations (Fall 2019)
Attachment A



Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
Imagery: Z-Air 10cm resolution October 2019

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Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
Imagery: Z-Air 10cm resolution October 2019

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Spawning Survey Redd and Age 0 Mountain Whitefish Locations (Fall 2019)
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Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
Imagery: Z-Air 10cm resolution October 2019

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ALBERTA TRANSPORTATION SPRINGBANK OFF-STREAM RESEVOIR PROJECT ENVIRONMENTAL IMPACT ASSESSMENT

Spawning Survey Redd and Age 0 Mountain Whitefish Locations (Fall 2019)
Attachment A

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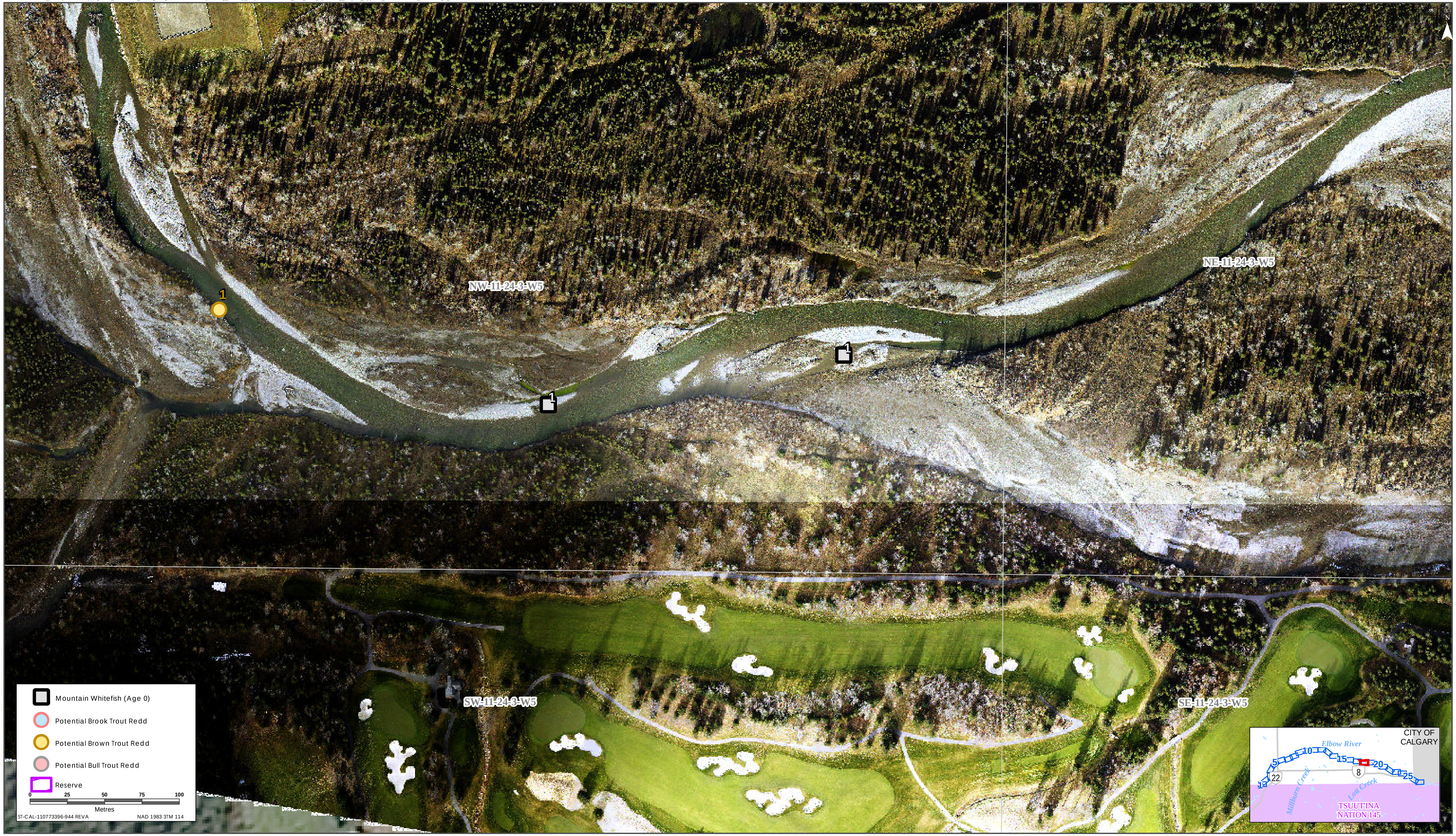

Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
Imagery: Z-Air 10cm resolution October 2019

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Spawning Survey Redd and Age 0 Mountain Whitefish Locations (Fall 2019)
Attachment A

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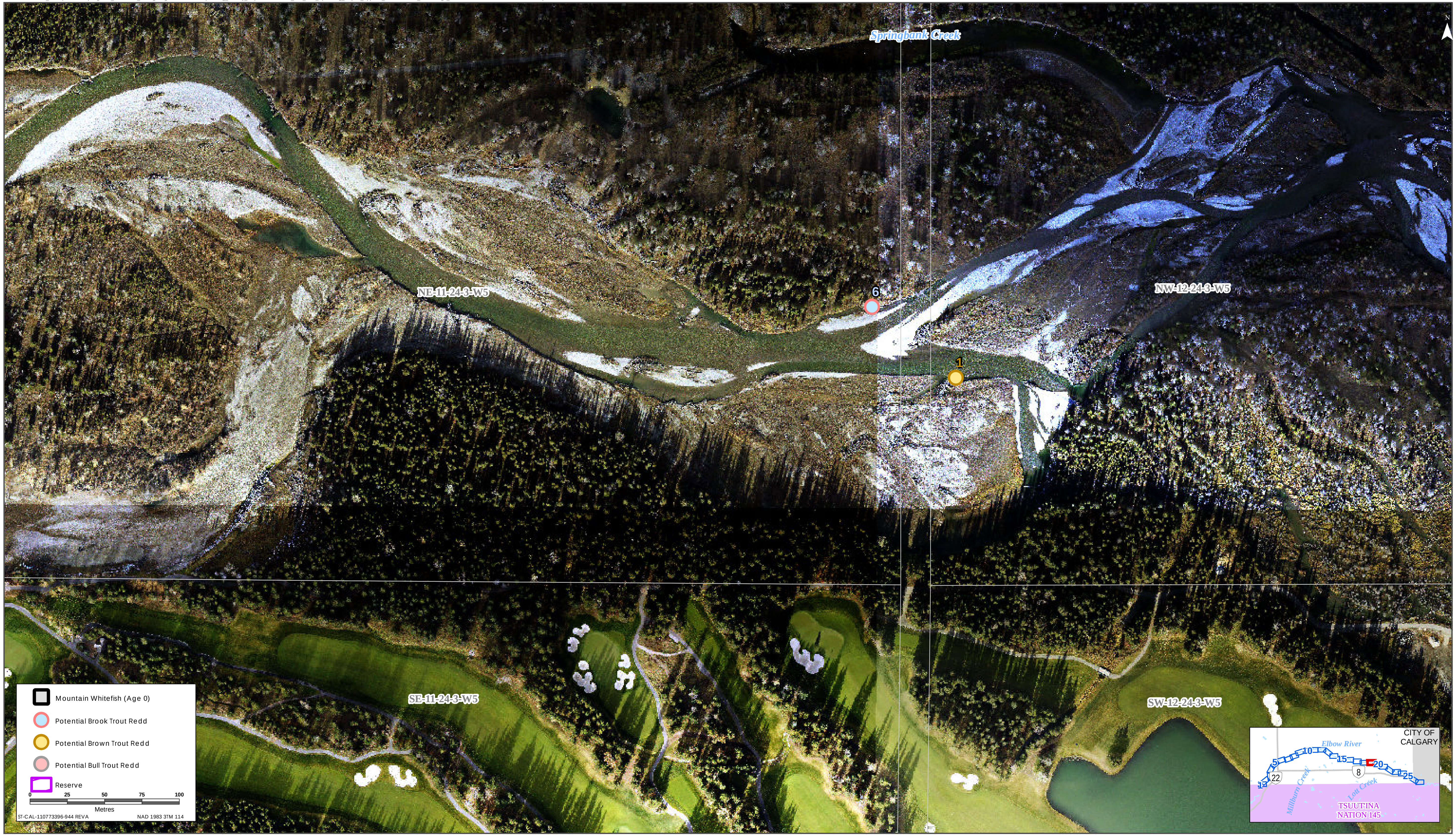

Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
Imagery: Z-Air 10cm resolution October 2019

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ALBERTA TRANSPORTATION SPRINGBANK OFF-STREAM RESERVOIR PROJECT ENVIRONMENTAL IMPACT ASSESSMENT

Spawning Survey Redd and Age 0 Mountain Whitefish Locations (Fall 2019)
Attachment A

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Spawning Survey Redd and Age 0 Mountain Whitefish Locations (Fall 2019)
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Spawning Survey Redd and Age 0 Mountain Whitefish Locations (Fall 2019)
Attachment A

Sources: Base Data - Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
Imagery: 2-Air 10cm resolution October 2019

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Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
Imagery: Z-Air 10cm resolution October 2019

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Attachment A

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Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
Imagery: Z-Air 10cm resolution October 2019

Spawning Survey Redd and Age 0 Mountain Whitefish Locations (Fall 2019)
Attachment A

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Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
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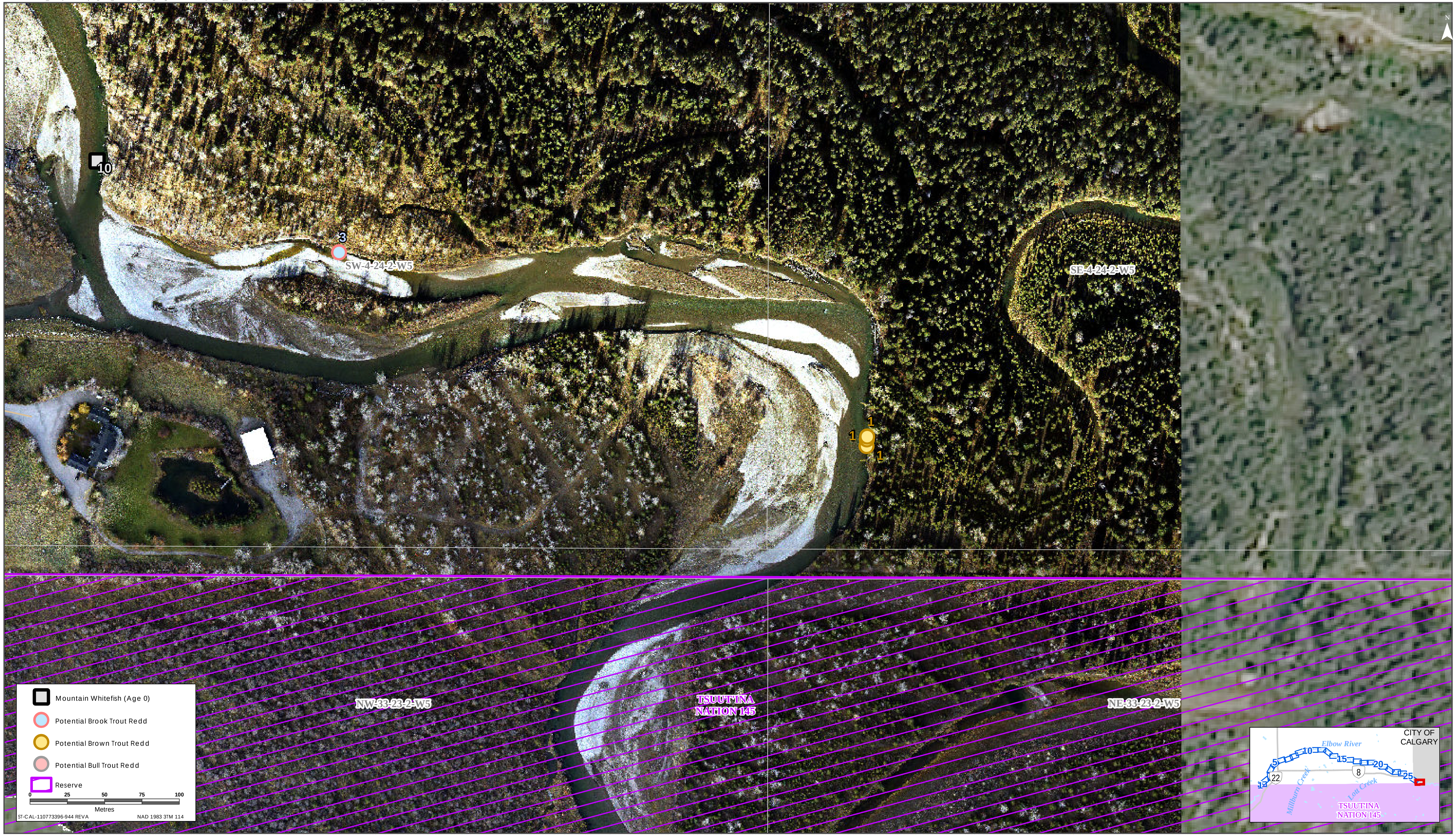
Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
Imagery: Z-Air 10cm resolution October 2019

Spawning Survey Redd and Age 0 Mountain Whitefish Locations (Fall 2019)
Attachment A

Stantec



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Imagery: Z-Air 10cm resolution October 2019

Spawning Survey Redd and Age 0 Mountain Whitefish Locations (Fall 2019)
Attachment A

Attachment B BROWN TROUT REDD MEASUREMENT DATA

Table B-1 Brown Trout Redd Measurements

Redd Class Designation	Total Redd Length (m)	Maximum Redd Width (m)	Water Depth (m)	Water Velocity (m/s)	Substrate 1	Substrate 2	Substrate 3	Substrate 4	Fish Observed on Redd (Y/N)	Suspected Communal Redd (Y/N)	Number of Redds
Possible	-	-	-	-	LG	SG	FI	-	N	N	1
Definite	1	0.8	0.55	0.65	LG	SG	-	-	N	N	1
Definite	1.1	0.8	0.22	0.26	LG	SG	CB	-	N	N	1
Definite	7	1.8	0.3	0.1	FI	LG	CB	-	Y	Y	1
Probable	6	0.8	0.3	0.1	LG	SG	CB	-	N	N	1
Definite	5	2	0.28	0.1	LG	CB	SG	FI	N	Y	7
Definite	-	-	-	-	LG	SG	-	-	N	N	1
Definite	1.2	0.7	0.5	-	LG	CB	-	-	N	N	1
Definite	2.5	1.5	0.55	-	LG	SG	-	-	N	Y	2
Definite	-	-	-	-	CB	LG	-	-	Y	N	1
Definite	1.2	0.4	0.55	0.11	LG	FI	-	-	N	N	1
Definite	1.9	0.8	0.4	0.15	LG	SG	FI	CB	N	N	1
Definite	3	1.6	0.3	0.15	LG	SG	FI	-	N	N	1
Definite	1.6	0.8	0.22	0.19	LG	CB	SG	FI	N	N	1
Definite	3	1	0.3	0.2	CB	LG	SB	-	N	N	2
Definite	7	2.5	0.1	0.2	CB	LG	SG	-	N	Y	1
Probable	1.3	0.5	0.31	0.2	LG	SG	-	-	N	N	1

Table B-1 Brown Trout Redd Measurements

Redd Class Designation	Total Redd Length (m)	Maximum Redd Width (m)	Water Depth (m)	Water Velocity (m/s)	Substrate 1	Substrate 2	Substrate 3	Substrate 4	Fish Observed on Redd (Y/N)	Suspected Communal Redd (Y/N)	Number of Redds
Definite	2.5	0.6	0.5	0.2	LG	SG	FI	-	N	N	1
Definite	0.7	0.4	0.15	0.2	CB	LG	FI	-	N	N	1
Definite	4.5	1.2	0.45	0.25	LG	SG	FI	-	N	N	1
Definite	6	1.2	0.4	0.45	LG	SG	FI	-	N	N	1
Definite	4	1.3	0.5	0.4	LG	SG	CB	FI	N	N	1
Definite	5	1	0.5	0.5	LG	SG	CB	FI	N	Y	2
Definite	8	1.4	0.25	0.23	LG	SG	CB	-	N	N	1
Probable	-	-	0.2	0.25	LG	CB	SG	FI	N	N	1
Definite	1.3	0.5	0.2	0.29	LG	CB	FI	-	N	N	1
Definite	2	0.6	0.25	0.3	CB	LG	SB	-	N	N	1
Possible	-	-	-	-	LG	SG	-	-	N	N	1
Definite	2.3	0.8	0.3	0.3	LG	SG	-	-	N	N	1
Definite	2.2	0.9	0.35	0.3	LG	SG	FI	-	N	Y	1
Definite	7	2	0.25	0.3	LG	CB	FI	-	N	N	1
Definite	1	0.9	0.3	0.3	LG	CB	FI	-	N	N	1
Definite	3	0.6	0.3	0.3	LG	CB	FI	-	N	N	1
Definite	1	0.6	0.3	0.35	CB	LG	FI	-	N	N	1

Table B-1 Brown Trout Redd Measurements

Redd Class Designation	Total Redd Length (m)	Maximum Redd Width (m)	Water Depth (m)	Water Velocity (m/s)	Substrate 1	Substrate 2	Substrate 3	Substrate 4	Fish Observed on Redd (Y/N)	Suspected Communal Redd (Y/N)	Number of Redds
Definite	1	0.7	0.2	0.4	CB	LG	SB	-	N	N	1
Possible	1.5	1	0.25	0.4	CB	SB	LG	-	N	N	1
Probable	5	2.5	0.4	0.4	LG	CB	SA	SG	N	Y	1
Definite	4.5	0.9	0.25	0.4	LG	SG	CB	-	N	Y	3
Definite	2.3	0.9	0.4	0.42	LG	SG	FI	-	N	Y	1
Definite	7	0.9	0.25	0.46	LG	SG	FI	-	N	Y	2
Definite	3.5	1.2	0.45	0.46	LG	SG	-	-	N	N	1
Probable	2.5	0.7	0.3	0.5	LG	CB	FI	-	N	N	1
Definite	1.9	1	0.3	0.5	LG	SG	CB	FI	N	N	1
Probable	0.75	0.5	0.4	0.5	LG	SG	CB	FI	N	N	1
Probable	2.5	0.6	0.4	0.5	LG	SG	SA	-	N	N	1
Definite	2	1	0.4	0.5	LG	CB	-	-	N	Y	4
Probable	4	1.8	0.3	0.55	LG	CB	-	-	N	Y	5
Definite	4.5	1.3	0.4	0.55	LG	SG	FI	-	N	N	1
Definite	1.1	0.7	0.4	0.55	LG	CB	-	-	N	N	1
Possible	1	0.6	0.5	0.65	LG	CB	-	-	N	N	1
Definite	2	1.1	0.65	0.7	LG	CB	-	-	N	N	1

Table B-1 Brown Trout Redd Measurements

Redd Class Designation	Total Redd Length (m)	Maximum Redd Width (m)	Water Depth (m)	Water Velocity (m/s)	Substrate 1	Substrate 2	Substrate 3	Substrate 4	Fish Observed on Redd (Y/N)	Suspected Communal Redd (Y/N)	Number of Redds
Definite	7	0.9	0.5	0.7	LG	SG	FI	CB	N	N	1
Definite	3	1.5	0.305	-	LG	CB	-	-	N	N	1
Definite	1	0.9	0.7	-	LG	SG	-	-	N	N	1
Definite	4	1	0.7	-	LG	SG	-	-	N	N	1
Definite	2	1	0.7	-	LG	SG	-	-	N	N	1
Definite	-	-	-	-	LG	CB	-	-	N	N	1
Definite	-	-	-	-	LG	SG	CB	-	N	N	1
Definite	-	-	-	-	LG	SG	CB	-	N	N	1
Definite	-	-	-	-	LG	SG	CB	-	N	N	1
Definite	-	-	-	-	LG	SG	CB	-	N	N	1
Possible	-	-	-	-	LG	SG	CB	-	N	N	1
Definite	-	-	-	-	LG	SG	SB	-	N	Y	3
Definite	-	-	-	-	LG	SG	SB	-	N	N	1
Definite	3	0.9	0.3	-	LG	SG	-	-	N	Y	3
Definite	-	-	-	-	CB	LG	-	-	N	N	1
Definite	3	1.1	0.25	-	LG	SG	-	-	N	N	1
Definite	7	-	-	-	LG	CB	SG	-	N	N	1

Table B-1 Brown Trout Redd Measurements

Redd Class Designation	Total Redd Length (m)	Maximum Redd Width (m)	Water Depth (m)	Water Velocity (m/s)	Substrate 1	Substrate 2	Substrate 3	Substrate 4	Fish Observed on Redd (Y/N)	Suspected Communal Redd (Y/N)	Number of Redds
Probable	-	-	-	-	LG	CB	SG	-	N	N	1
Definite	-	-	-	-	LG	CB	SG	-	Y	N	1
Definite	-	-	-	-	LG	CB	SG	-	N	N	1
Definite	-	-	-	-	LG	CB	SG	-	N	N	1
Definite	-	-	-	-	LG	CB	SG	-	N	N	1
Definite	-	-	-	-	LG	CB	SG	-	N	N	1
Definite	-	-	-	-	LG	CB	SG	-	N	N	1
Definite	-	-	-	-	LG	CB	SG	-	N	N	1
Possible	-	-	-	-	LG	SG	CB	-	N	N	1
Definite	-	-	-	-	LG	SG	CB	-	N	N	1
Definite	-	-	-	-	LG	CB	-	-	N	N	1
Probable	-	-	-	-	LG	CB	-	-	N	N	1
Definite	1.5	-	-	-	LG	CB	-	-	N	N	1
Definite	-	-	-	-	LG	CB	-	-	N	N	1
Definite	3	-	-	-	LG	CB	-	-	N	N	1
Definite	1.2	-	-	-	CB	LG	FI	-	N	N	1
Probable	2.5	-	-	-	CB	LG	FI	-	N	N	1

Table B-1 Brown Trout Redd Measurements

Redd Class Designation	Total Redd Length (m)	Maximum Redd Width (m)	Water Depth (m)	Water Velocity (m/s)	Substrate 1	Substrate 2	Substrate 3	Substrate 4	Fish Observed on Redd (Y/N)	Suspected Communal Redd (Y/N)	Number of Redds
Probable	-	-	-	-	CB	LG	SG	-	N	N	1
Definite	-	-	-	-	LG	SG	FI	-	N	N	1
Definite	-	-	-	-	LG	SG	-	-	N	N	1
Definite	2	-	-	-	LG	SG	CB	-	N	N	1
Definite	2.8	-	-	-	SG	LG	FI	-	N	N	1
Definite	-	-	0.6	0.57	LG	SG	-	-	N	N	1
Possible	-	-	0.25	-	LG	SG	CB	-	N	N	1

NOTES:
Substrate codes:
FI: Fines
SM: Small Gravel
LG: Large Gravel
CB: Cobble
SB: Small Boulder

APPENDIX 87-1 DRAFT GUIDING PRINCIPLES AND DIRECTION FOR FUTURE LAND USE

This appendix was included in the May 15, 2020 filing. The text has not been altered.

DRAFT GUIDING PRINCIPLES AND DIRECTION FOR FUTURE LAND USE

PROPOSED SPRINGBANK OFF-STREAM RESERVOIR PROJECT

Introduction

The Elbow River flood of 2013 was a devastating event both socially and economically for many Albertans. The flood tragically resulted in 5 deaths and forced the evacuation of over 80,000 people (one of the largest evacuations in Canadian history). A study completed by IBI Group estimated that should a 2013 level flood event on the Elbow River occur again without adequate protection, up to $1.5 billion of property and infrastructure damage is at risk which could result in permanent damage to the economic future of the region.

For reference, the 2013 flood was the most significant flood of record in Alberta on the Elbow River and had an estimated peak flow of 1,240 cubic meters per second (m^3/s). Statistically, the 2013 flood has been estimated to be slightly greater than a 1:200-year flood. To put it another way, there is 0.5% chance of a similar flood occurring each year on the Elbow River.

Following the flood of 2013, the Government of Alberta undertook an assessment of mitigation strategies that could be used to reduce the risk of future floods. Communities in Calgary along the Bow and Elbow rivers were among the most heavily impacted. The proposed Springbank Off-Stream Reservoir (SR1 or the Project) was identified as the preferred option to mitigate flooding upstream of Calgary along the Elbow River.

The construction and management of a dry reservoir presents a unique opportunity with the conversion of private land to Crown land. If the proposed Project is approved, upon commissioning of the Springbank dam and diversion, Alberta Environment and Parks (AEP) will be responsible for land management and operation of the project infrastructure, and management of the associated Crown land for the reservoir.

This land is currently not accessible to the public without permission from the landowners. The future uses of the Land Use Area (LUA) will be determined, after engagement with First Nations and stakeholders regarding such future uses, in accordance with any applicable Government of Alberta policies and procedures at the time of engagement. This document provides direction around government intentions related to future land use, and the process for setting the management intent for these lands, if the project proceeds.

Alberta Transportation (AT) is seeking regulatory approval of SR1 which also includes securing any required private lands to be converted to Crown lands. AT is undertaking initial First Nations and stakeholder discussion around desired future land use and access. This document is intended to support AT's engagement during the regulatory process of SR1 and provide high level direction and certainty for land use by future users. Detailed land use planning will be undertaken following regulatory decisions on the Project. This detailed planning will be informed by the information gathered during the engagement conducted during the regulatory process, as well as by future engagement processes with First Nations and stakeholders.

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Guiding Principles for Future Land Use

1. The primary and overarching use of the Crown land within the reservoir footprint is for flood mitigation. No activities may limit or otherwise hinder the ability of the reservoir to fill to full supply level for the purpose of flood mitigation or water management within the watershed.
2. The reservoir may fill at any point in the year without warning, including during periods below peak floods and may be inaccessible for an undetermined amount of time, post drawdown, due to silt and debris buildup or other unintended consequences requiring remediation.
3. Compensation will not be provided by the Crown for any impacts to land use activities resulting from operation of the Project infrastructure.
4. Safety is paramount in any decisions that allow for access onto the reservoir lands. Restrictions on some or all land uses will be issued during specified periods of the year as required to reduce risks to safety and property from flooding.
5. There will be no access permitted on or across the Project infrastructure at any time or for any purpose (see attached map and refer to dark pink areas). The Project infrastructure will include the intake structure on the Elbow River and main diversion canal, main dam, emergency spillway and outlet canal to the Elbow River in its entirety.
6. Use of the lands by First Nations may be considered a priority outside of flood and remediation periods in order to enable treaty rights and traditional uses.
7. Non-motorized recreational access may be considered, in accordance with approved land uses.
8. Access for specific purposes such as grazing may be considered and used as a tool to manage and maintain the grassland landscape in the SR1 area consistent with operational plans set by AEP.
9. All land use decision making will remain under the authority of AEP.
10. No non-flood related permanent or temporary infrastructure will be permitted in the reservoir or setback area.

Direction for Future Land Use Planning

The future uses of the LUA will be determined after engagement with First Nations and stakeholders regarding such future uses, in accordance with any applicable Government of Alberta policies and procedures at the time of engagement.

Land-use planning decisions will be implemented using the appropriate land-management tools available to the Government of Alberta, in accordance with legislation applicable at the relevant time.

The purpose of conducting engagement is to inform and gather input to be incorporated in the development of a future land use plan for the LUA. Through a series of engagement activities with First Nations and stakeholders, Government staff will gather information and analyze feedback to develop direction for future land use, having regard to the Government's need for flood mitigation and the information expressed by First Nations and stakeholders. The direction for future land use will be provided to First Nations and stakeholders for comment. It is expected that there will be a separate engagement process for First Nations.

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First Nation engagement:

Use of existing forums that involve First Nations in Government planning may be used to initiate discussions. Through the South Saskatchewan Regional Planning process, there is a venue for regular discussions and sharing of information between First Nations and Government. Additional one-on-one meetings will be arranged with interested First Nations to allow for meaningful discussions.

Stakeholder engagement:

Stakeholders will be invited to a series of workshops and meetings to allow for the sharing of perspectives, issues/concerns, and desired use of the LUA. This could include technical workshops, online information, multi-stakeholder meetings and/or sector based meetings.

1. Primary Use - Flood mitigation and water management

Outcome: The land use is managed for the primary purpose of providing storage for flood mitigation to communities and infrastructure downstream of SR1.

Strategies:

1.1. SR1 will be used to divert and store water from the Elbow River for the purpose of flood mitigation and water management.
1.2. The timing and volume of water both stored and released from the SR1 reservoir will be coordinated with the larger water management system in the watershed.
1.3. AEP will be responsible for ongoing operation, management and maintenance of the reservoir footprint and flood management infrastructure.
1.4. AEP will engage with First Nations, stakeholders, municipalities and, local landowners as per the facilities engagement/communication plan.

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2. Secondary Uses

In light of the Primary Use, the safety of anyone with access or land users will be an overriding factor.

A. First Nation Use

Outcome: Traditional First Nation access and use of land will be informed by the "Guiding Principles" outlined in this document.

Strategies:

2.1. The Government of Alberta commits to engaging with First Nations in the process to finalize the land use plan for the LUA.
2.2. In general, First Nations' traditional activities, including the exercise of treaty rights such as hunting, will be allowed.

2.3. The Government of Alberta will utilize regulations and policies enabling hunting access and staging areas.

B. Other activities

Outcome: Other activities will be considered where they align and are compatible with the overarching management intent of flood mitigation as per the Guiding Principles outlined in this document.

Strategies:

2.4. Vegetation and habitat management as well as any post-flood remediation actions will be in compliance and consistent with the regulatory approvals for the Project. Opportunities for Indigenous participation in these aspects are addressed in the project's Indigenous Participation Plan.
2.5. In general, only uses and activities that have a minimal impact on the land will be allowed. Therefore, the availability of surface dispositions will be limited.
2.6. Grazing permits may be issued for pasture land within designated zones, and at certain times, where determined by AEP as the appropriate tool to manage grasslands for ecosystem health or wildfire mitigation.
2.7. Non-motorized recreational access may be considered (e.g. hiking, biking, cross country skiing).

Land Use Planning Process

During the Project application period, Alberta Transportation will continue to explore opportunities and desired uses of the lands should the lands be acquired by the Crown and SR1 be approved. This will include meetings with First Nations, stakeholders and local landowners during the engagement process to discuss desired uses. Should the Project be approved, meeting results and desired direction determined during the approval period will be provided to AEP for incorporation or consideration into the land use planning process. AEP will initiate detailed land use planning if the Project receives all necessary provincial and federal approvals.

The land use plan will focus on how the Project lands are used and managed and will not include the operations of the SR1 infrastructure or water management planning in the watershed beyond the reservoir footprint. AEP will be the final decision maker in the land use planning process and management of all Crown lands associated with the Project. AEP is accountable to ensure objectives and outcomes of the Project are met.

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