Attachment A ELBOW RIVER AQUATIC MACROHABITAT DISTRIBUTION (FALL 2019)

SPRINGBANK OFF-STREAM RESERVOIR PROJECT
ELBOW RIVER AQUATIC HABITAT ASSESSMENT: REDWOOD MEADOWS TO DISCOVERY RIDGE (FALL 2019) TECHNICAL DATA REPORT

Attachment A Elbow River Aquatic Macrohabitat Distribution (Fall 2019)
June 2020

Stantec

A.1 RIFFLE

Shallow reaches with swiftly flowing, turbulent water sometimes contain partially exposed substrate. Substrates are typically cobble-dominant in the main channel or are smaller substrates (i.e., gravels) within side channels or inactive channels. All riffles identified in the survey are low gradient (less than 4%).

Figure A-1 Fall 2019 Orthoimagery Snapshot of Elbow River Riffle Macrohabitat Unit

Photo A-1 Fall 2019 photo of Elbow River Riffle Macrohabitat Unit

A.2 EDGEWATER

Shallow and still-water habitat are found at the margins of riffles or runs in active channels. Edgewater comprise part of a riffle or run at higher flows, and the presence of coarse substrates (e.g., cobble, gravel) are reflective of seasonal flow dynamics in these macrohabitat areas.

Figure A-2 Fall 2019 Orthoimagery Snapshot of Elbow River Edgewater Macrohabitat Unit

Photo A-2 Fall 2019 photo of Elbow River Edgewater Macrohabitat Unit

A.3 RUN

Runs are deep and relatively swift-flowing reaches with little surface agitation compared to riffles and have no major flow obstructions. They can appear as flooded riffles or elongated laterally scoured areas with water considered too swift to be described as pool habitat.

Figure A-3 Fall 2019 Orthoimagery Snapshot of Elbow River Run Macrohabitat Unit

Photo A-3 Fall 2019 Photo of Elbow River Run Macrohabitat Unit

A.4 POCKET WATER

This is a run habitat containing numerous boulders or other large obstructions that create eddies or scour holes (pockets) behind the obstructions.

Figure A-4 Fall 2019 Orthoimagery Snapshot of Elbow River Pocket Water Macrohabitat Unit

Photo A-4 Fall 2019 Photo of Elbow River Pocket Water Macrohabitat Unit

A.5 FAST GLIDE

This refers to a wide and uniform reach with a poorly defined thalweg, usually located downstream of a scoured pool or run macrohabitat unit. Fast glides are associated with high velocities in the main channel, and they are typically characterized as having low or nil embeddedness with significant contributions of coarse substrates, such as cobble or large gravel.

Figure A-5 Fall 2019 Orthoimagery Snapshot of Elbow River Fast Glide Macrohabitat Unit

Photo A-5 Fall 2019 Photo of Elbow River Fast Glide Macrohabitat Unit

A.6 SLOW GLIDE

These are glide sections with lower velocities than fast glides, which is reflected in substrate composition, including a low to medium embeddedness with significant contributions of smaller substrates such as small gravel, sand, or silt. They are distinguished from fast glides based on importance of habitat attributes to redd-constructing salmonids.

Figure A-6 Fall 2019 Orthoimagery Snapshot of Elbow River Slow Glide Macrohabitat Unit

Photo A-6 Fall 2019 Photo of Elbow River Slow Glide Macrohabitat Unit

A.7 POOL

These are markedly scoured sections of stream containing low velocities relative to other macrohabitat units in a reach. The following types of pools were identified during the Elbow River Habitat survey.

Mid-Channel Pools

Mid-Channel Scoured Pool

These are pools formed by mid-channel scouring of surface water. The scour hole typically encompasses more than 60% of the wetted channel. Water velocity is low, and the substrate is highly variable for mid-channel pools. They often occur immediately downstream of, or within, channel confinements (e.g., debris, bedrock, armouring).

Figure A-7 Fall 2019 Orthoimagery Snapshot of Elbow River Mid-Channel Pool Macrohabitat Unit

Photo A-7 Fall 2019 Photo of Elbow River Mid-Channel Pool Macrohabitat Unit

Mid-Channel Debris Pool

These are small mid-channel pools formed through scouring of large woody debris or root wads.

Figure A-8 Fall 2019 Orthoimagery Snapshot of Elbow River Mid-Channel Root-Wad Formed Pool Macrohabitat Unit

Photo A-8 Fall 2019 Photo of Elbow River Mid-Channel Root-Wad Formed Pool Macrohabitat Unit

Channel Confluence Pool

These pools formed at the confluence of two or more channels. Scour can be due to plunges, lateral obstructions or scour at the channel intersections. Velocity and turbulence are usually greater than those in other pool types.

Figure A-9 Fall 2019 Orthoimagery Snapshot of Elbow River Channel Confluence Pool Macrohabitat Unit

Photo A-9 Fall 2019 Photo of Elbow River Mid-Channel Channel Confluence Pool Macrohabitat Unit

Plunge Pool

These are found where surface water plunges over a channel obstruction (e.g., bedrock ledge, log jam) into the streambed below, scouring a depression. They are often large and deep. In disconnected channels, plunge pools are present at the upstream end of the channel where flood waters have plunged from the surrounding flood plain into the channel.

Figure A-10 Fall 2019 Orthoimagery Snapshot of Elbow River Channel Confluence Pool Macrohabitat Unit

Photo A-10 Fall 2019 Photo of Elbow River Mid-Channel Channel Confluence Pool Macrohabitat Unit

Laterally Scoured Pools

Lateral Scour Pool (aka "Corner Pool")

These are formed at the outside meander bend of a channel, and they are formed in alluvial banks and lack woody debris enhancement.

Figure A-11 Fall 2019 Orthoimagery Snapshot of Elbow River Lateral Scour Pool Macrohabitat Unit

Photo A-11 Fall 2019 Photo of Elbow River Lateral Scour Pool Macrohabitat Unit

Log-Enhanced Lateral Scour Pool

These are formed by surface waters impinging against a partial channel obstruction consisting of large woody debris. The associated scour is generally confined to less than 60% of the wetted channel width.

Figure A-12 Fall 2019 Orthoimagery Snapshot of Elbow River Log-Enhanced Lateral Scour Pool Macrohabitat Unit

Photo A-12 Fall 2019 Photo of Elbow River Log-Enhanced Lateral Scour Pool Macrohabitat Unit.

Root-Wad Enhanced Lateral Scour Pool

These are lateral scour pools formed by surface waters impinging against a partial channel obstruction consisting of a root wad. The associated scour is generally confined to less than 60% of the wetted channel width.

Figure A-13 Fall 2019 Orthoimagery Snapshot of Elbow River Root-Wad Enhanced Lateral Scour Pool Macrohabitat Unit

Photo A-13 Fall 2019 Photo of Elbow River Root-Wad Enhanced Lateral Scour Pool Macrohabitat Unit

Bedrock-Formed Lateral Scour Pool

These are lateral scour pools formed by surface waters impinging against a bedrock stream bank. The associated scour is generally confined to less than 60% of the wetted channel width.

Figure A-14 Fall 2019 Orthoimagery Snapshot of Elbow River Bedrock-Formed Lateral Scour Pool Macrohabitat Unit

Photo A-14 Fall 2019 Photo of Elbow River Bedrock-Formed Lateral Scour Pool Macrohabitat Unit

Boulder-Formed Lateral Scour Pool

These are lateral scour pools formed by surface waters impinging against partial channel obstructions consisting of a boulder or boulders. The associated scour is generally confined to less than 60% of the wetted channel width.

Figure A-15 Fall 2019 Orthoimagery Snapshot of Elbow River Boulder-Formed Lateral Scour Pool Macrohabitat Unit

Photo A-15 Fall 2019 Photo of Elbow River Boulder-Formed Lateral Scour Pool Macrohabitat Unit

Armoured Bank Lateral Scour Pool

These are lateral scour pools formed by surface waters impinging against an artificial armoured bank or spur.

Figure A-16 Fall 2019 Orthoimagery Snapshot of Elbow River Armoured Bank Lateral Scour Pool Macrohabitat Unit

Photo A-16 Fall 2019 Photo of Elbow River Armoured Bank Lateral Scour Pool Macrohabitat Unit

Backwater Pools

Bedrock-Formed Backwater Pool

These are found along channel margins and caused by eddies around a bedrock obstruction. These pools are usually shallow and are dominated by fine-grained substrate. Water velocities are quite low.

Figure A-17 Fall 2019 Orthoimagery Snapshot of Elbow River Bedrock-Formed Backwater Pool Macrohabitat Unit

Photo A-17 Fall 2019 Photo of Elbow River Bedrock-Formed Backwater Pool Macrohabitat Unit

Boulder-Formed Backwater Pool

These are found along channel margins and are caused by eddies around a boulder obstruction. These pools are usually shallow and are dominated by fine-grained substrate. Water velocities are quite low.

Figure A-18 Fall 2019 Orthoimagery Snapshot of Elbow River Boulder-Formed Backwater Pool Macrohabitat Unit

Photo A-18 Fall 2019 Photo of Elbow River Boulder-Formed Backwater Pool Macrohabitat Unit

Root-Wad Formed Backwater Pool

These are found along channel margins and caused by eddies around a root wad obstruction. These pools are usually shallow and are dominated by fine-grained substrate. Water velocities are quite low.

Figure A-19 Fall 2019 Orthoimagery Snapshot of Elbow River Root-Wad Formed Backwater Pool Macrohabitat Unit

Photo A-19 Fall 2019 Photo of Elbow River Root-Wad Formed Backwater Pool Macrohabitat Unit

Log-Formed Backwater Pool

These are found along channel margins and are caused by eddies around large woody debris obstruction. These pools are usually shallow and are dominated by fine-grained substrate. Water velocities are quite low.

Figure A-20 Fall 2019 Orthoimagery Snapshot of Elbow River Log-Formed Backwater Pool Macrohabitat Unit

Photo A-20 Fall 2019 Photo of Elbow River Log-Formed Backwater Pool Macrohabitat Unit

Armoured Bank Backwater Pool

These are backwater pools formed downstream of rock-armoured banks or river-training spurs.

Figure A-21 Fall 2019 Orthoimagery Snapshot of Elbow River Armoured Bank Backwater Pool Macrohabitat Unit

Photo A-21 Fall 2019 Photo of Elbow River Armoured Bank Backwater Pool Macrohabitat Unit.

A.8 BACKWATERED CHANNEL CONFLUENCE

Figure A-22 Fall 2019 Orthoimagery Snapshot of Elbow River Backwatered Channel Confluence Macrohabitat Unit

Photo A-22 Fall 2019 Photo of Elbow River Backwatered Channel Confluence Macrohabitat Unit

A.9 FLAT

This is a collective term for uniform sections of stream connecting riffle and pool habitat in secondary or inactive channels that are not flowing at the time of the field survey or exhibit low rates of flow that are not characteristic of run or glide macrohabitat definitions. Low flows in these areas have resulted in the deposition of fine materials that have embedded underlying coarse substrates. Flow is distributed across a wide area, resulting in sediment deposition.

Connected channels are maintained by higher flows seasonally (e.g., freshet) and fine materials are flushed from these areas periodically throughout the year. Flats in disconnected channels are maintained by flood flows only and sustain longer periods of baseline flows. As a result, flats in disconnected channels are typically more highly embedded and are more likely to support aquatic macrophytes.

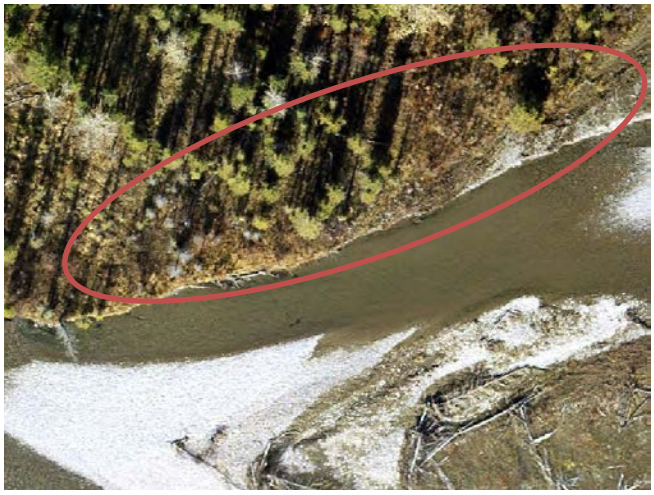

Figure A-23 Fall 2019 Orthoimagery Snapshot of Elbow River Flat Macrohabitat Unit in an Active Side Channel.

Photo A-23 Fall 2019 Photo of Elbow River Flat Macrohabitat Unit in an Active Side Channel

Photo A-24 Fall 2019 Photo of Elbow River Flat Macrohabitat Unit in an Inactive Connected Channel.

Photo A-25 Fall 2019 Photo of Elbow River Flat Macrohabitat Unit in an Inactive Disconnected Channel (Maintained By Flood Flows Only).

A.10 ELBOW RIVER FALLS TO GOOSEBERRY LAKE CAMPGROUND FISH SPAWNING AREAS (FALL 2019) FIGURES

SPRINGBANK OFF-STREAM RESERVOIR PROJECT
ELBOW RIVER AQUATIC HABITAT ASSESSMENT: REDWOOD MEADOWS TO DISCOVERY RIDGE (FALL 2019) TECHNICAL DATA REPORT

Attachment A Elbow River Aquatic Macrohabitat Distribution (Fall 2019)
June 2020

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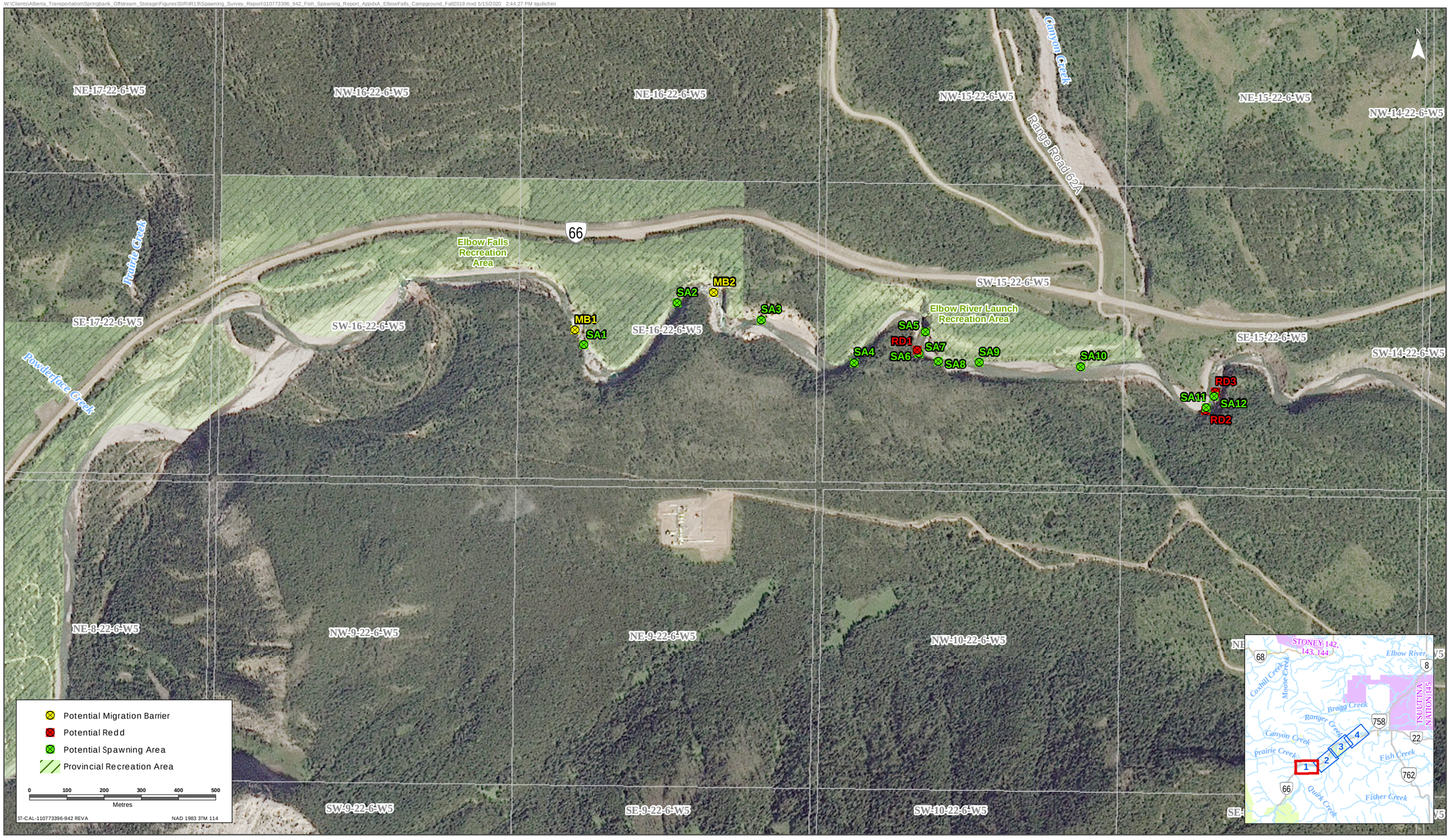

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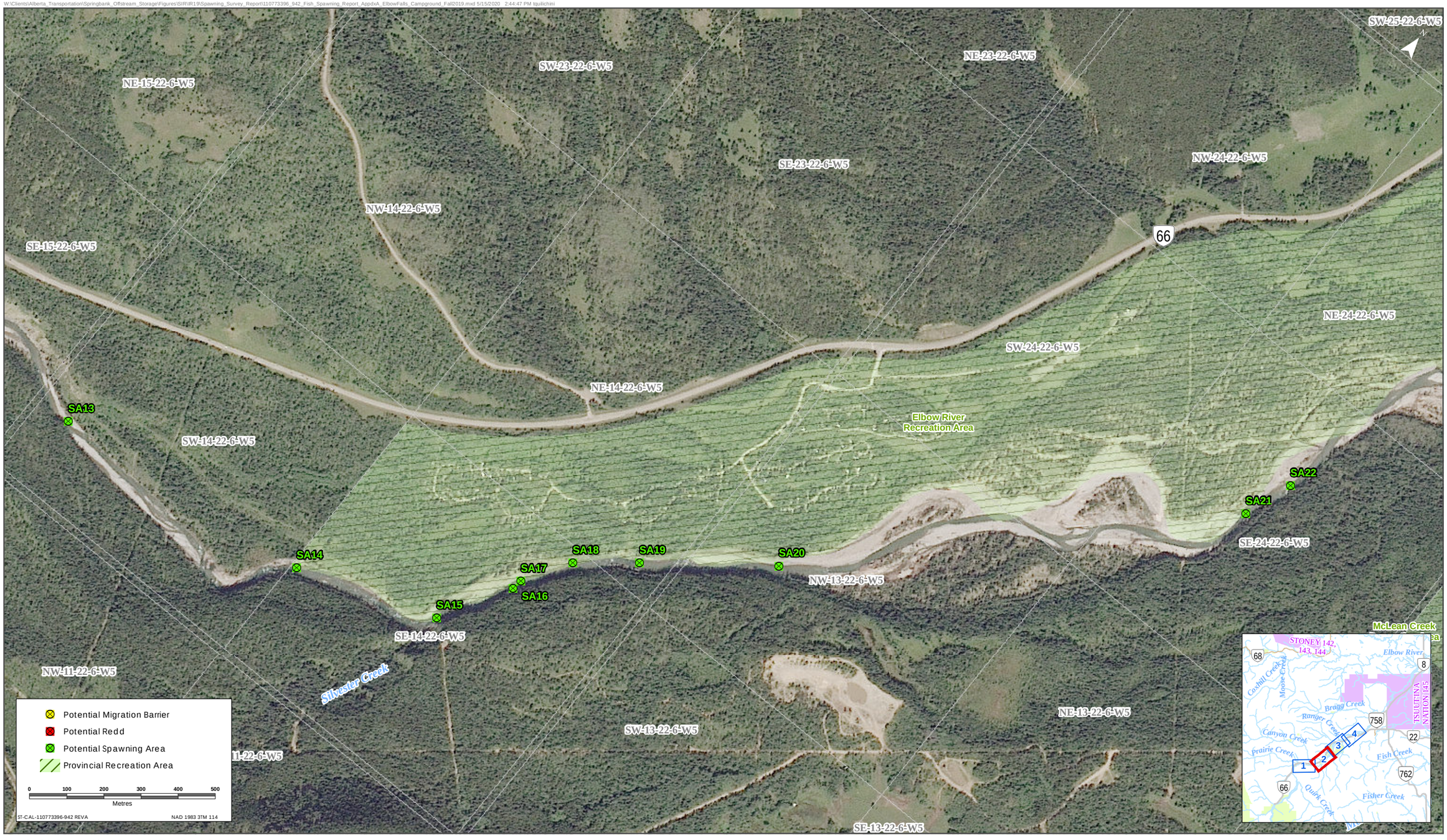
Imagery: ESRI basemap



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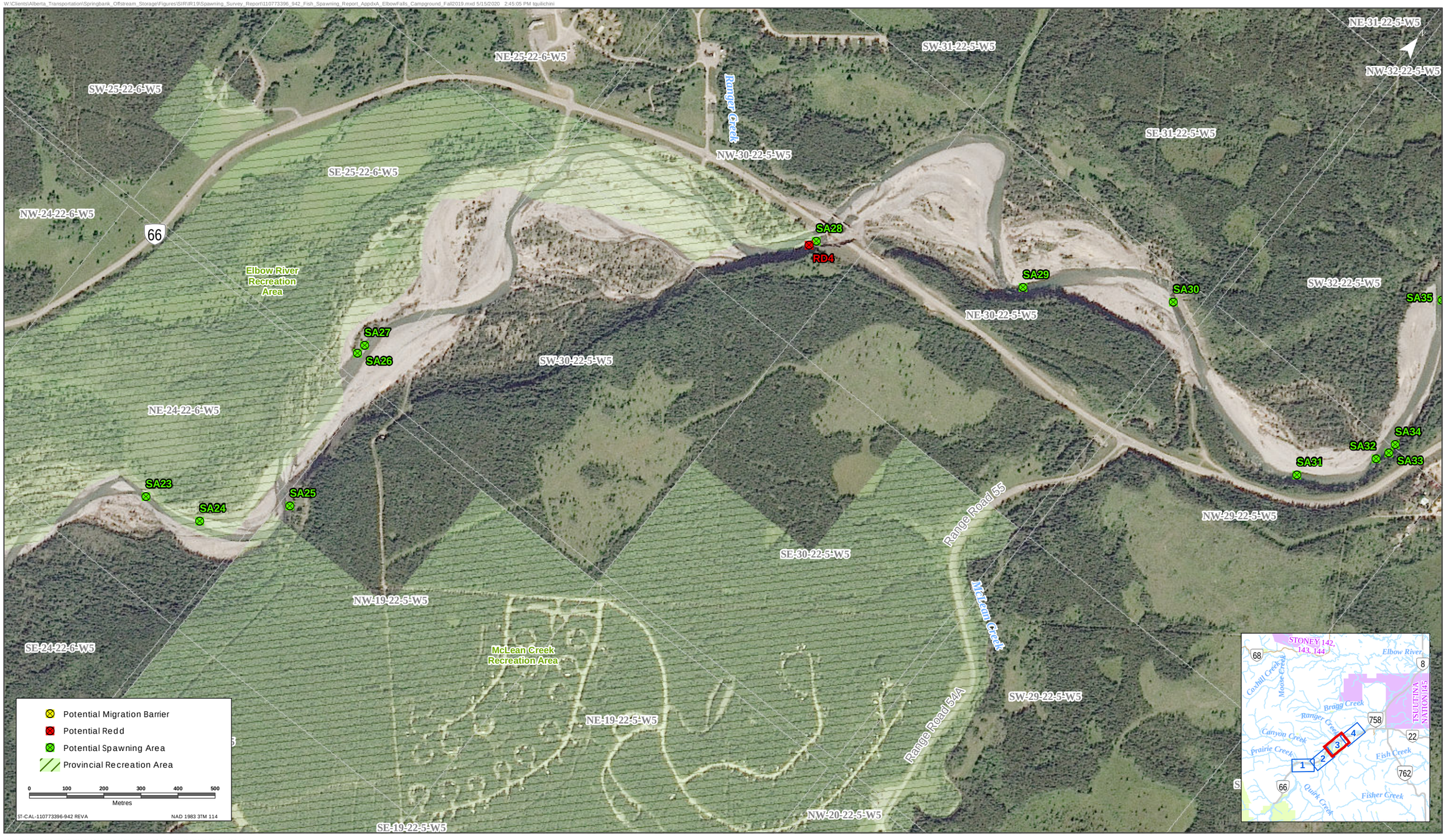

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Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
Imagery: ESRI basemap

A.11 SPAWNING SURVEY REDD AND AGE 0 MOUNTAIN WHITEFISH LOCATIONS (FALL 2019) FIGURES

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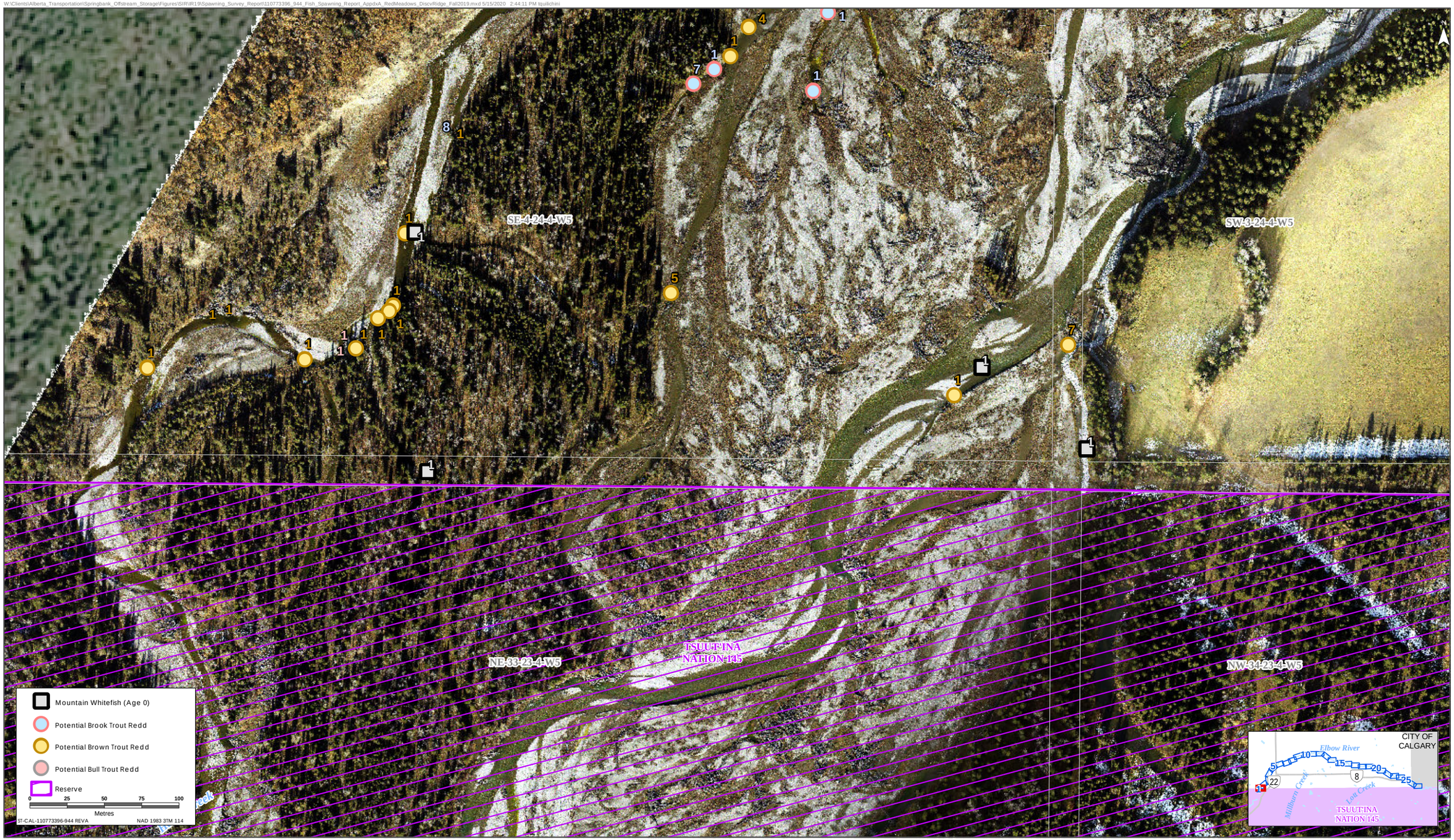

Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
Imagery: Z-Air 10cm resolution October 2019

Stantec

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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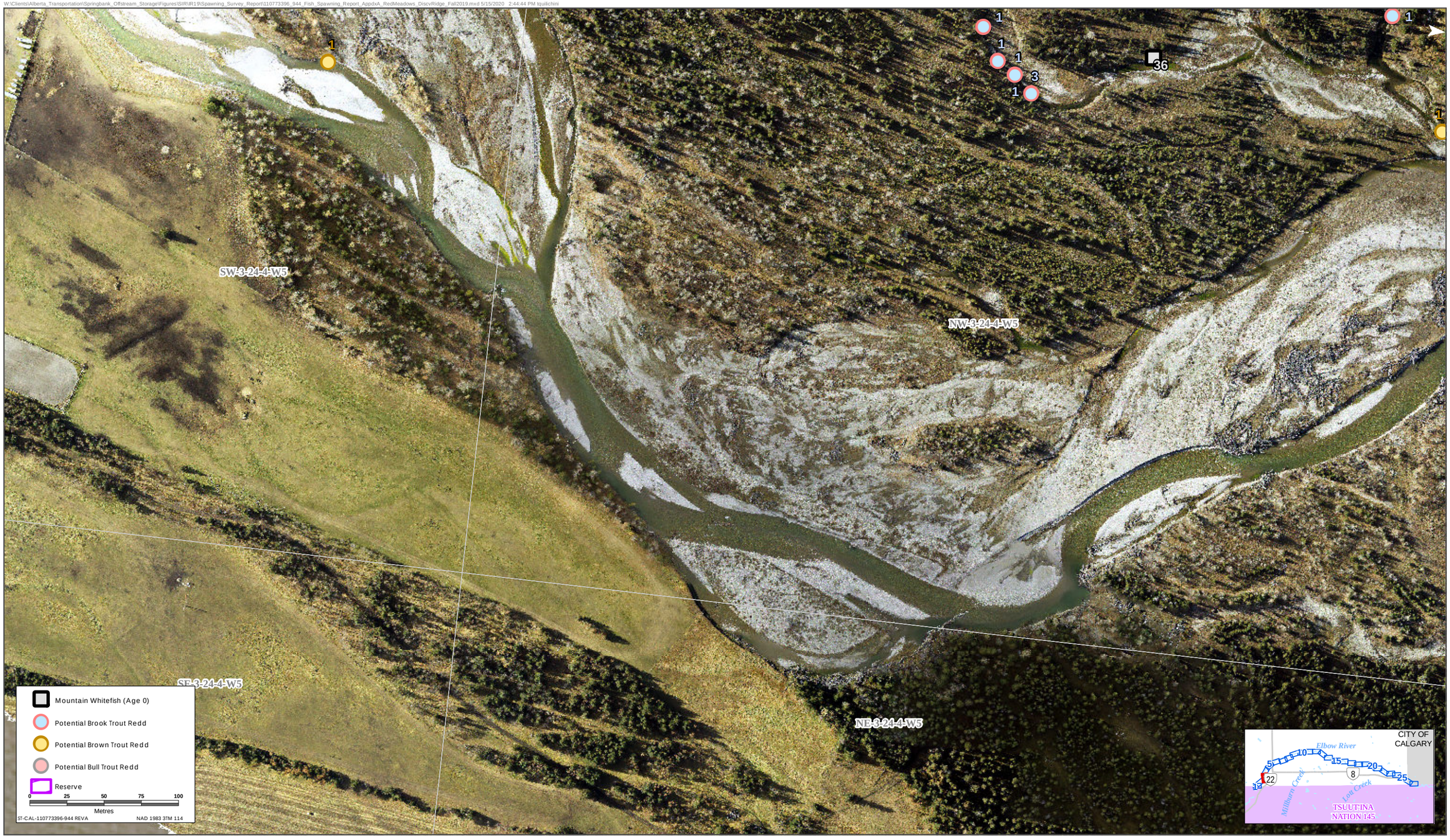

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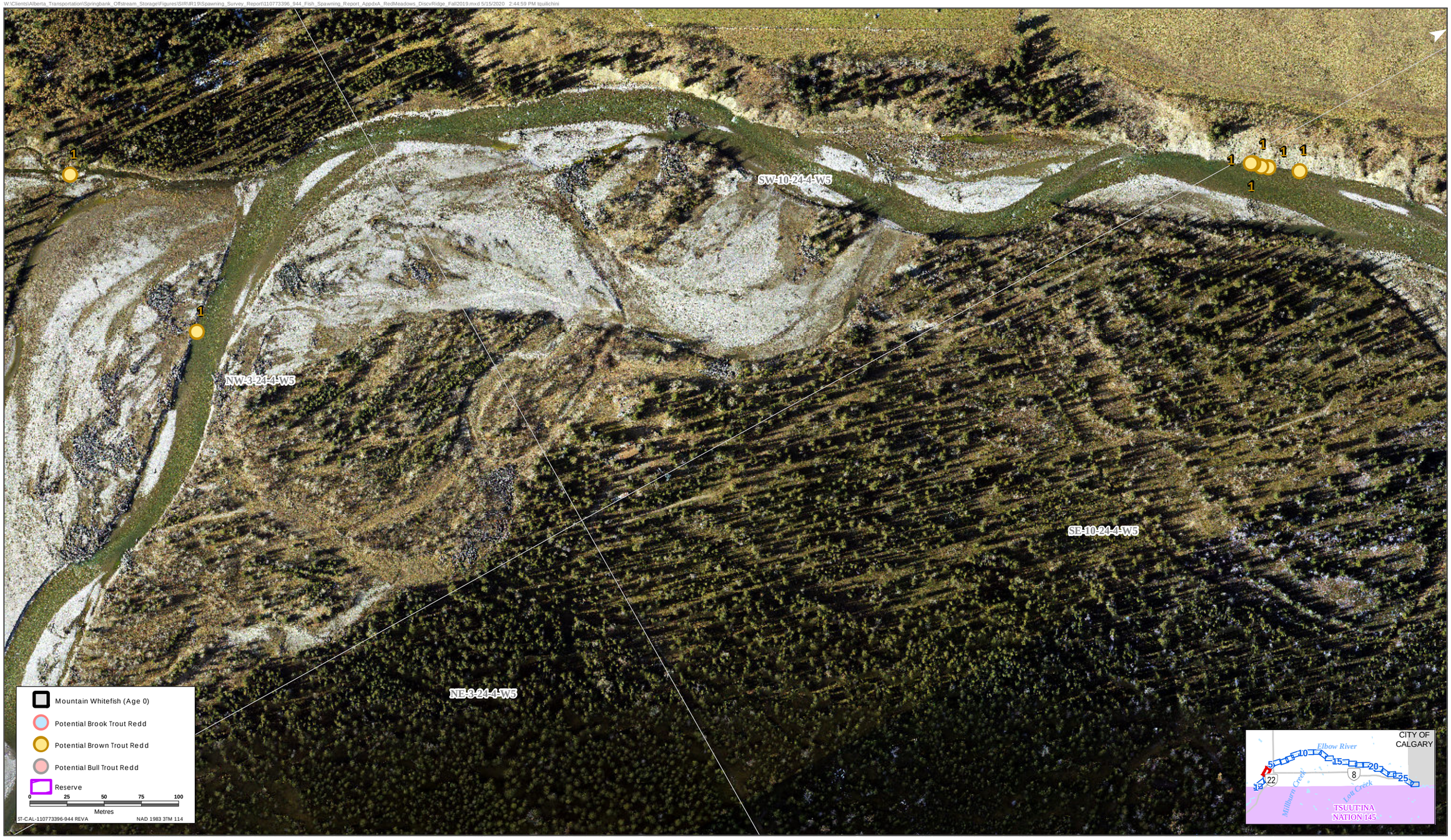

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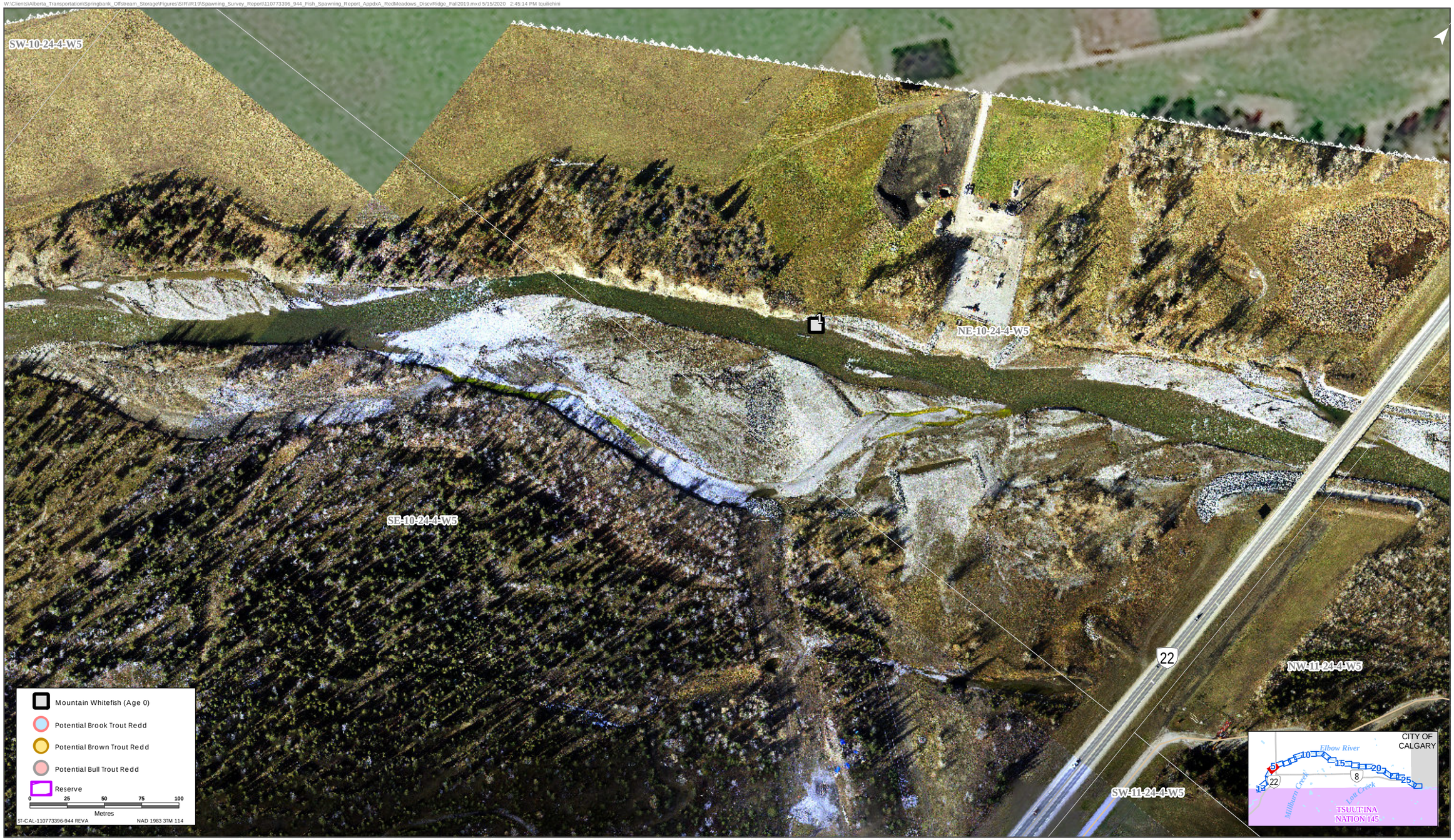

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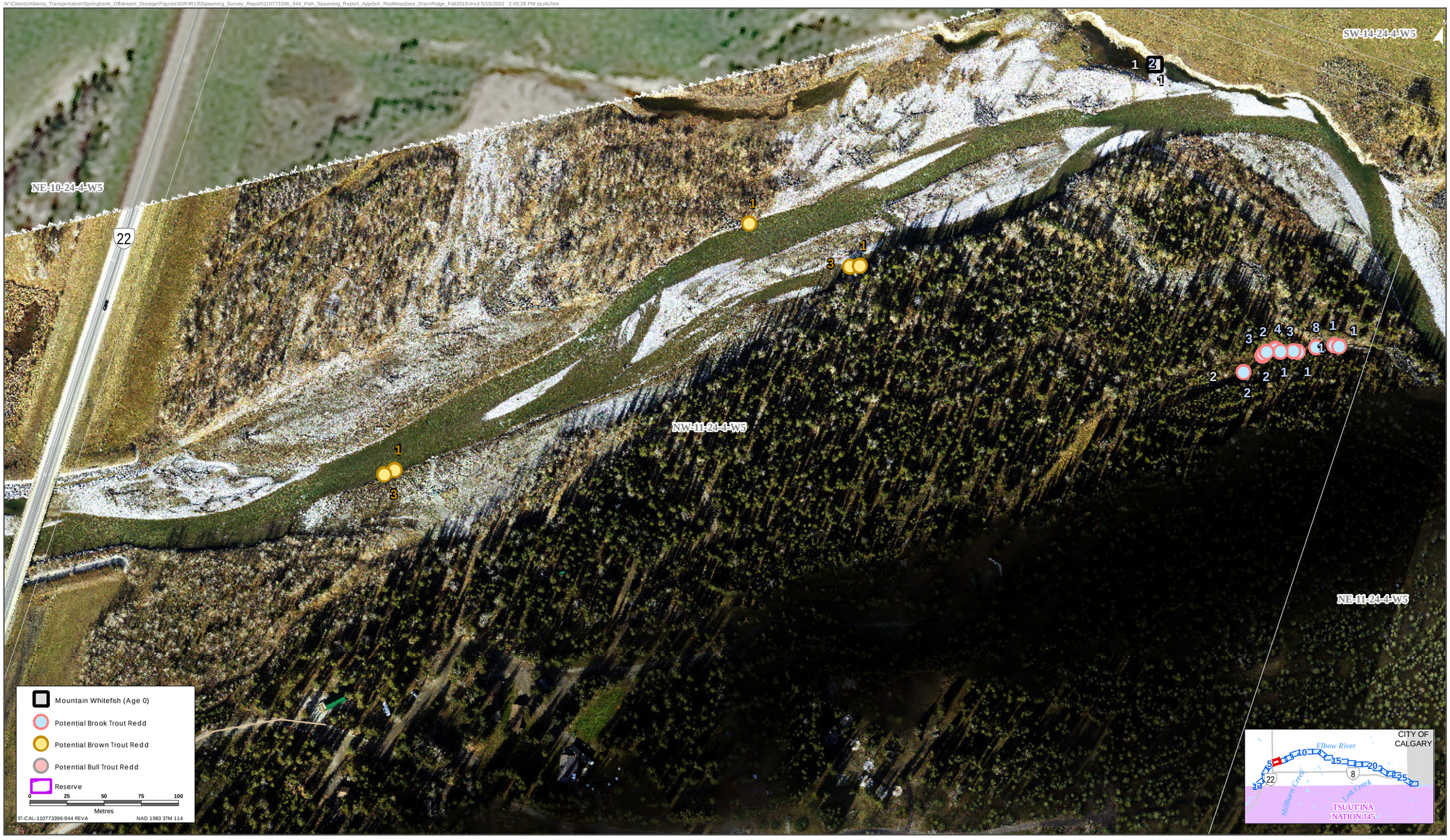

Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
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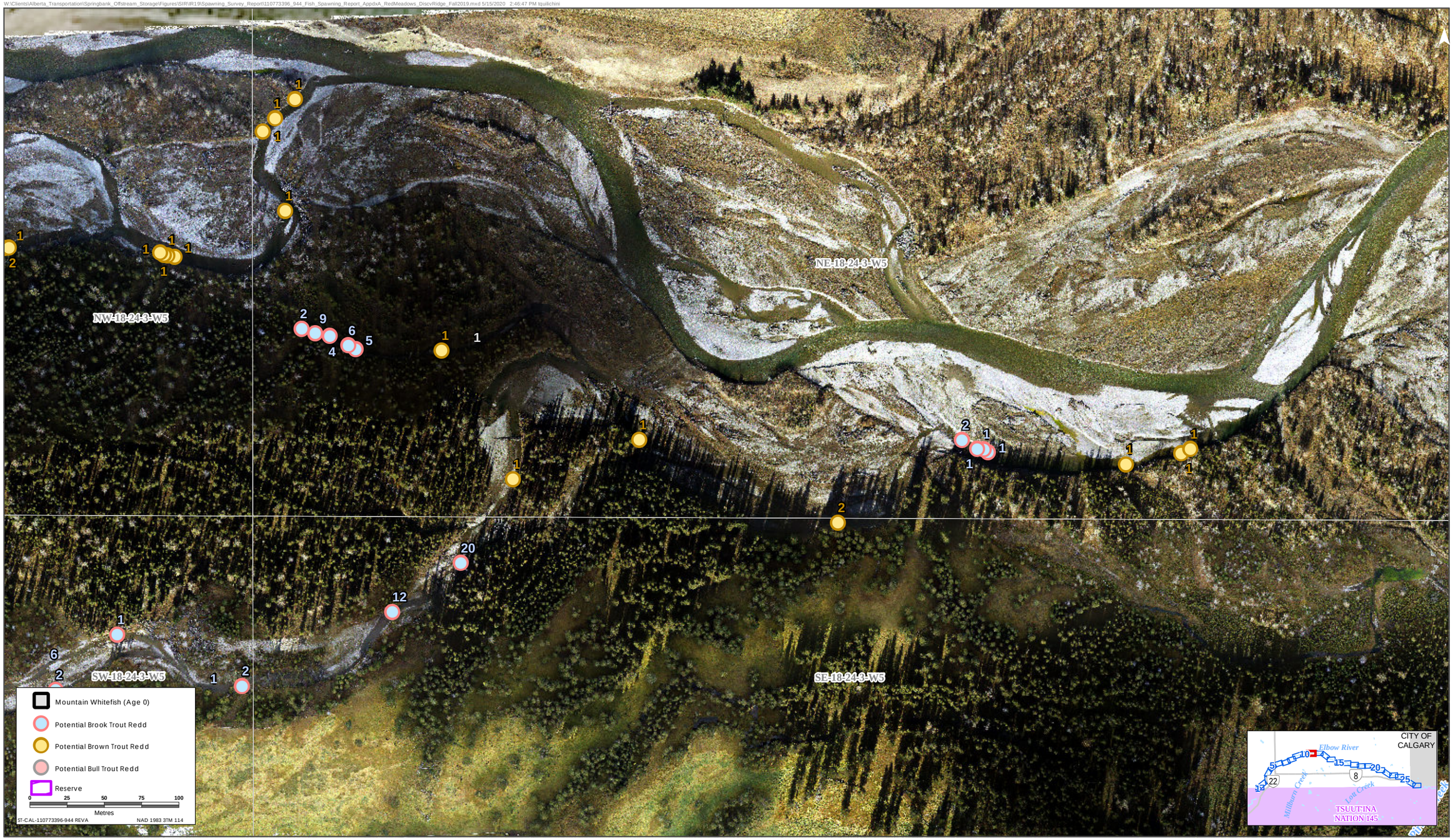

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Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
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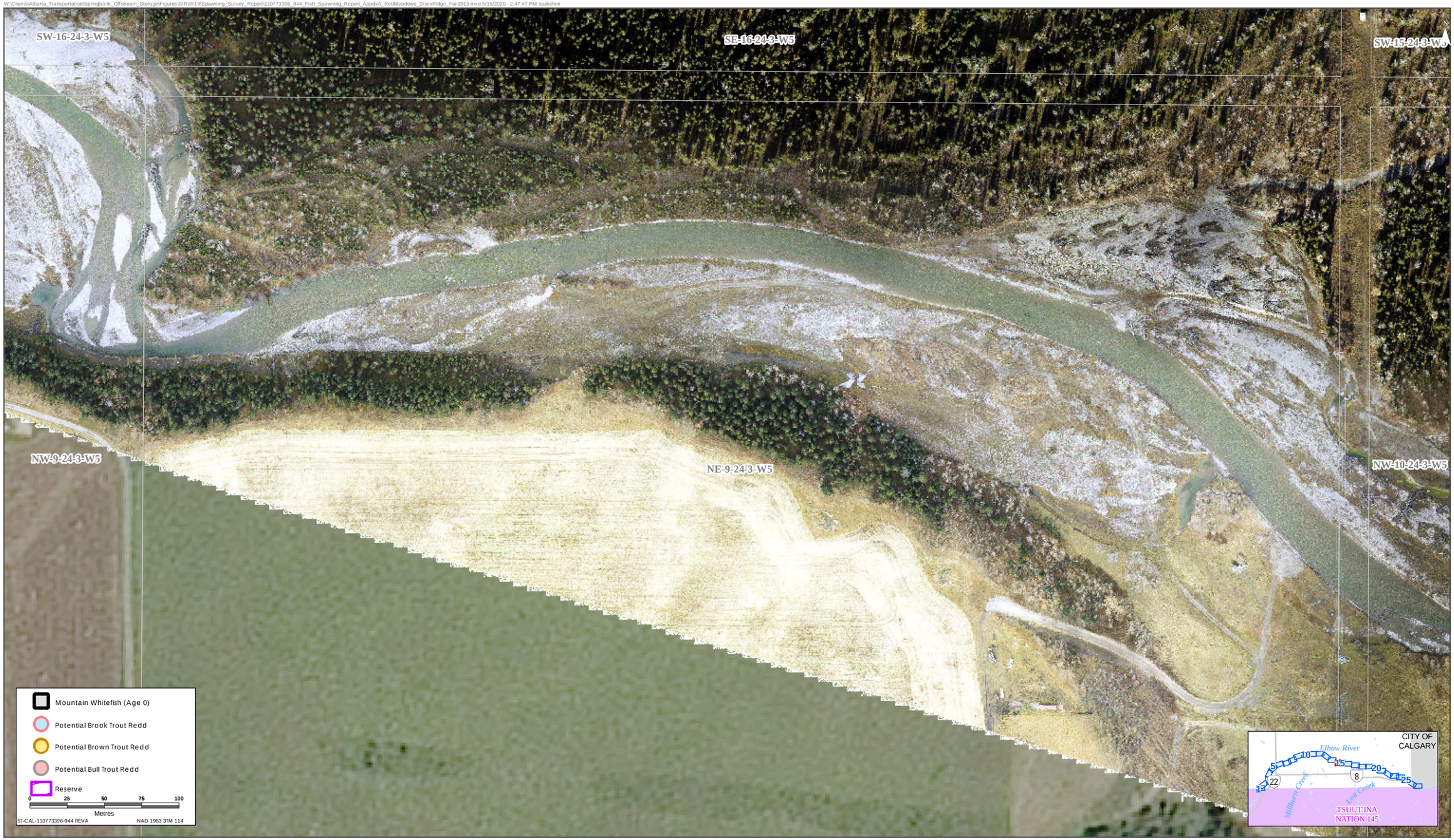

Sources: Base Data- Government of Alberta, Government of Canada. Thematic Data - Stantec Ltd.
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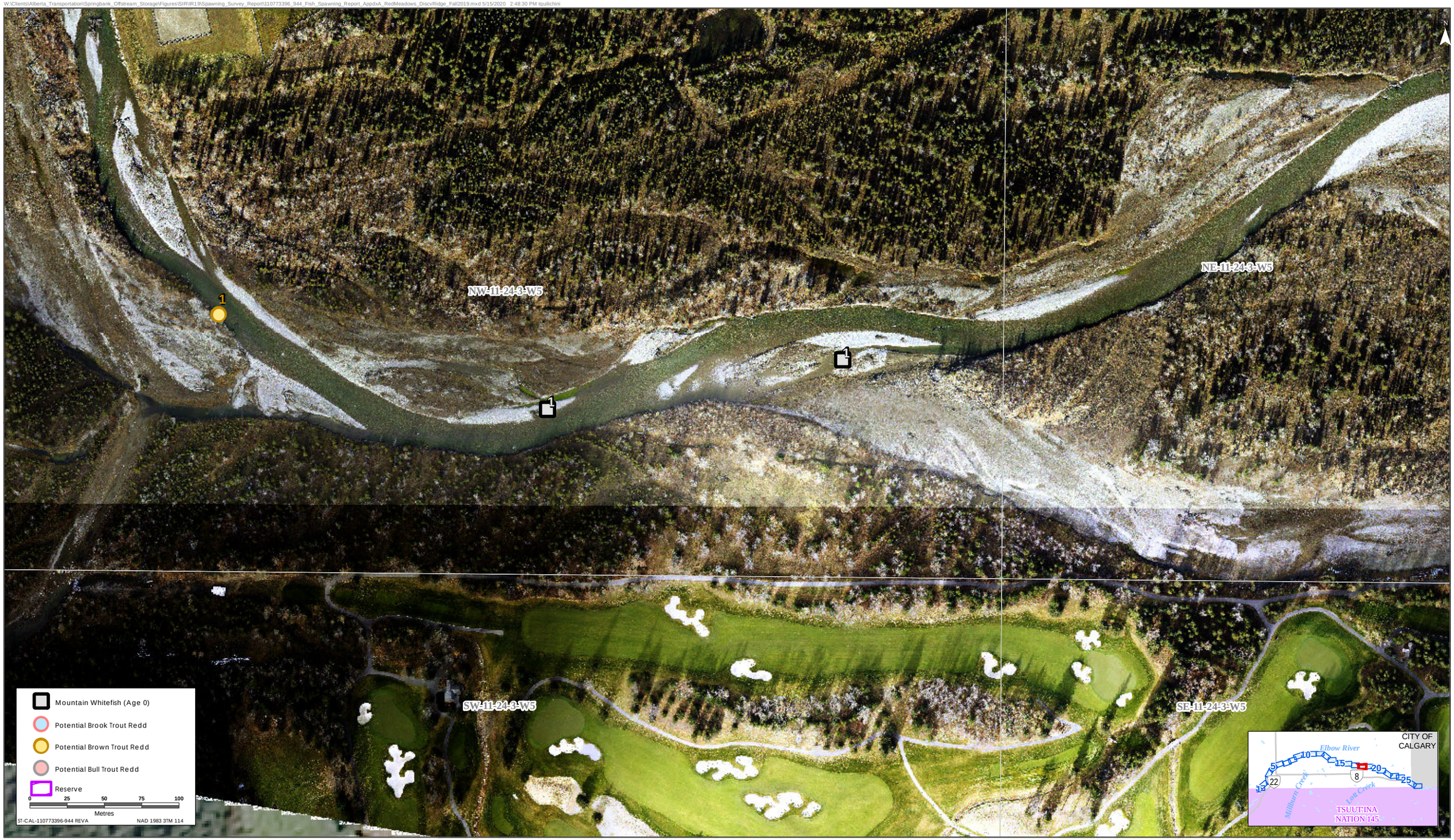

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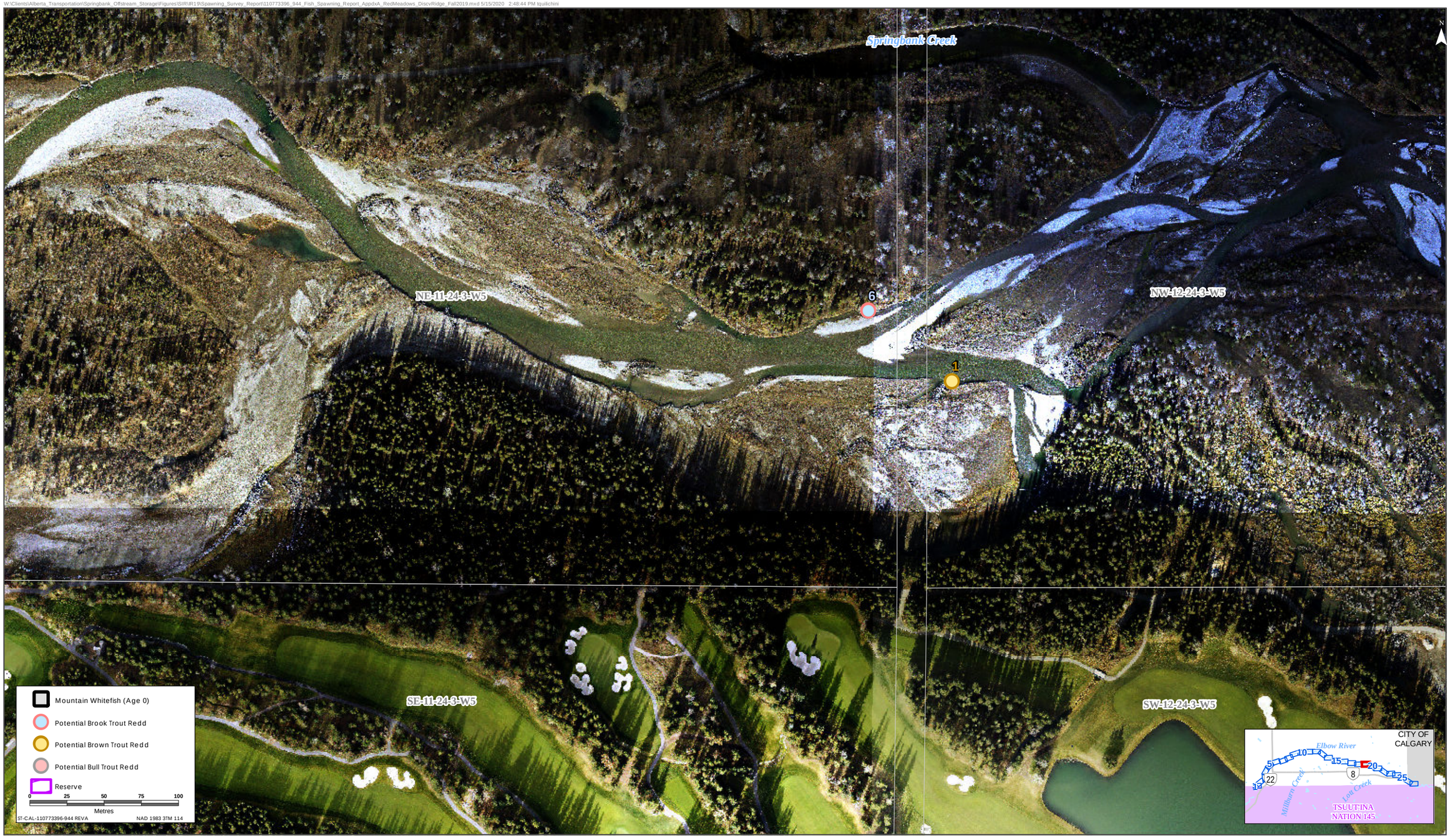

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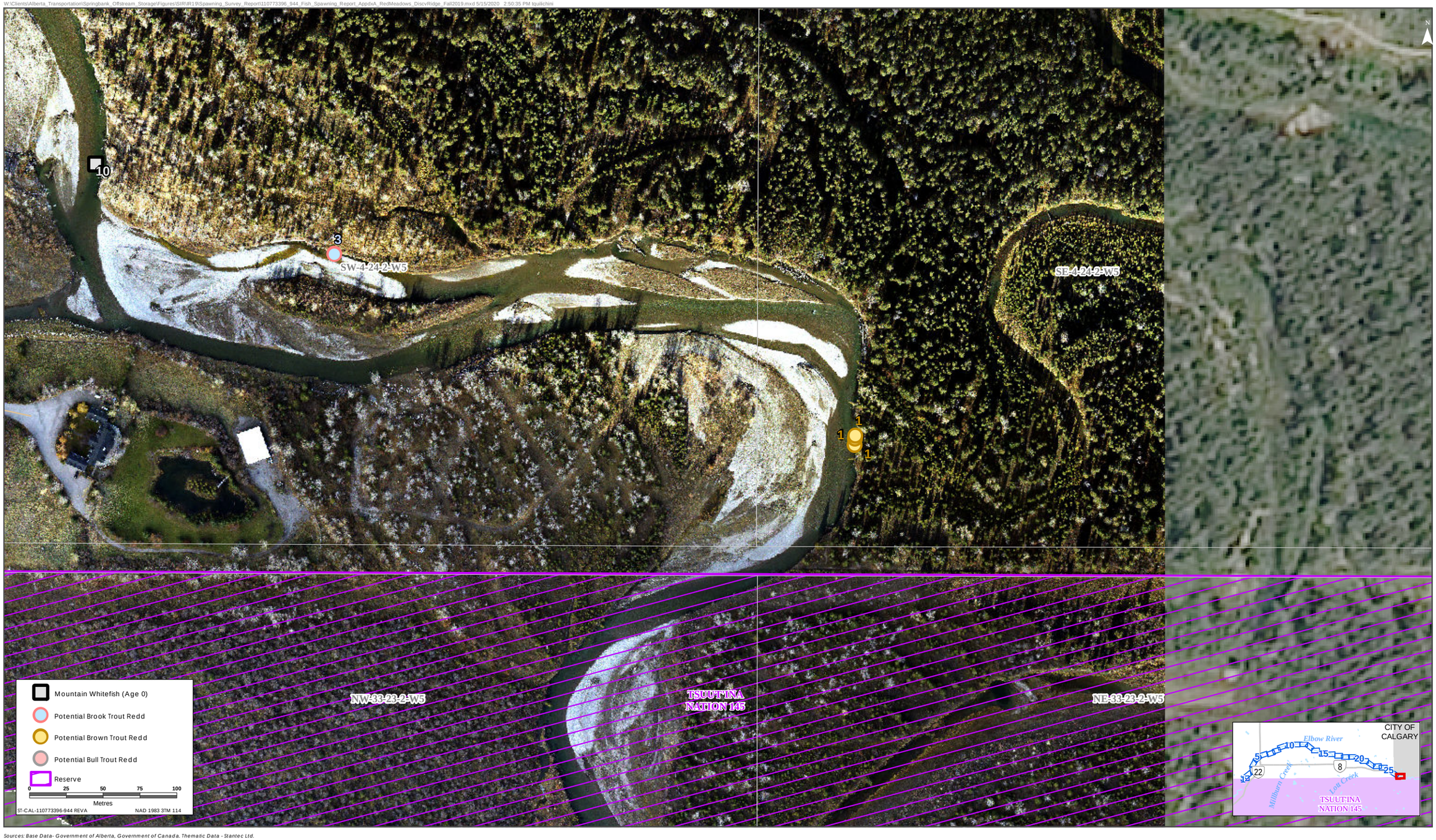

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