Appendix 12-E

Crown Mountain Conceptual Fish Habitat Offsetting Plan

DILLON CONSULTING

NWP COAL CANADA

Crown Mountain Conceptual Fish Habitat Offsetting Plan

Crown Mountain Coking Coal Project

December 2023 – 22-4558

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1.0 Introduction

This *Conceptual Offsetting Plan* (the Plan) document has been prepared to support the application for an Environmental Assessment Certificate/Environmental Impact Statement (the Application; Chapter 12: Fish and Fish Habitat Assessment; NWP, 2023) prepared by Dillon Consulting Limited (Dillon) for the proposed Crown Mountain Coking Coal Project (the Project) in southeastern British Columbia (B.C.).

This Plan outlines information required as per Section 8 of Schedule 1 of Fisheries and Oceans Canada (DFO)'s Authorizations Concerning Fish and Fish Habitat Protection Regulations (DFO, 2019a), providing technical information regarding the proposed habitat offsetting concepts for the Project. Federal policy and legislation require that adverse residual impacts to fish and fish habitat resulting from works, undertakings, and/or activities are offset to address the residual harmful alteration, disruption, and destruction (HADD) of fish habitat (DFO, 2019b) resulting from a Project. Offsetting measures may include the restoration, enhancement, and/or creation of productive and sustainable fish habitat.

At the conceptual stage, candidate sites are reviewed for alignment with management objectives (in collaboration with government, Indigenous communities, and other stakeholders), feasibility (e.g., construction, costs), anticipated success, and approximate area of restored or enhanced fish habitat to offset the habitat loss resulting from the Project. Following approval of the Project, conceptual plans are refined to detailed designs during the next phase of offsetting plans, which includes site specific information such as, but not limited to, detailed feasibility, engineered drawings, riparian planting details, review of the net gain of fish habitat from designs, and additional consultation and engagement. The sections below describe the conceptual stages that have been completed and include a summary of the net loss of fish habitat as a result of the Project, methodology for site evaluation and selection, preliminary offsetting measures at each selected site through restoration and/or enhancement of fish habitat, preliminary feasibility for each concept, an overview of the current characterization of offsetting value, and net gain for area of habitat offset for each selected site.

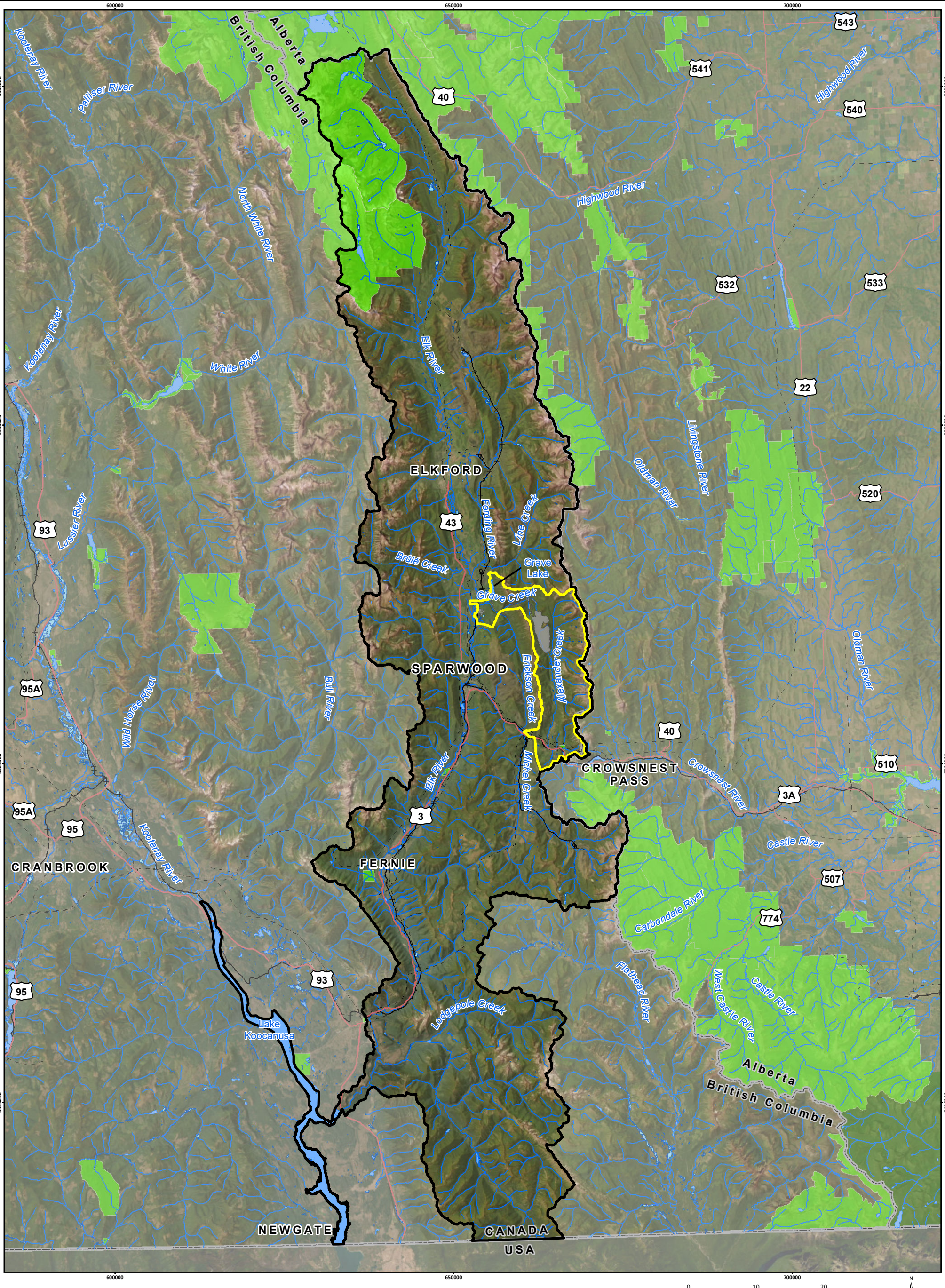
2.0 Project Background and Summary of Residual Effects

2.1 Project Background

NWP Coal Canada Ltd (NWP) is proposing to develop the Crown Mountain Coking Coal Project, which is intended as an open pit metallurgical coal mine located within the Elk Valley coal field in the East Kootenay region of southeastern British Columbia (B.C.; Figure 1). NWP is a jointly owned subsidiary of Jameson Resources Limited and Bathurst Resources Limited. The Project is located approximately 30 km by road from Sparwood, B.C., 85 km from the United States border, and is accessible by several Forest Service Roads (FSRs), including Grave Creek Road in the northwest and Alexander Creek Road off of Highway 3 from the south. The Project is located adjacent to other existing metallurgical coal mines in the Elk Valley and Crowsnest coal fields, with Teck Resources Limited's (Teck) Elkview Mine located approximately eight kilometres (km) southwest of the Project and the Line Creek Mine located approximately 12 km north of the Project.

The proposed Project design will result in direct loss of fish habitat in West Alexander Creek, a second order, small permanent stream and tributary of Alexander Creek (Figure 1 and Figure 2; Section 2.1.1). Studies conducted by Lotic Environmental (Lotic Environmental [Lotic], 2020; 2022) concluded that West Alexander Creek supports Westslope Cutthroat Trout (*Oncorhynchus clarkii lewisi*; WCT) and Bull Trout (*Salvelinus confluentus*; BT). Additional information regarding the Project, watershed, and fish community can be found in Chapter 12 of the Application.

As per the *Fisheries Act* (RSC, 1985), any project resulting in the harmful alteration, disruption, and destruction (HADD) of fish habitat can only proceed with Authorization from the Minister of Fisheries and Oceans. In order to obtain Authorization under the *Fisheries Act*, any residual habitat loss must be addressed in an approved offsetting plan (DFO, 2019b). The goal of an offsetting plan is to protect and conserve fish and fish habitat, with measures aimed to counterbalance fish mortalities or a HADD of fish habitat when it is unavoidable. As outlined by DFO (2019c), measures in an offsetting plan should also support local restoration and management objectives following DFO's offsetting policy. Details describing the existing fish habitat and fish community of West Alexander Creek are described in the sections below. Other details regarding the Project are located in the Application.



Crown Mountain Fish Habitat Conceptual Offsetting Plan

Figure 1
Project Location and Study Areas

LEGEND

- Aquatic Regional Study Area
- Fish and Fish Habitat Local Study Area
- Project Footprint
- Highway
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- National Park
- British Columbia/ Alberta Border

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Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada, Elk Valley Water Quality Plan.
Imagery Provided By ESRI.

Map Created By: JFC
Map Checked By: HEB
Map Coordinate System: NAD 1983 UTM Zone 11N

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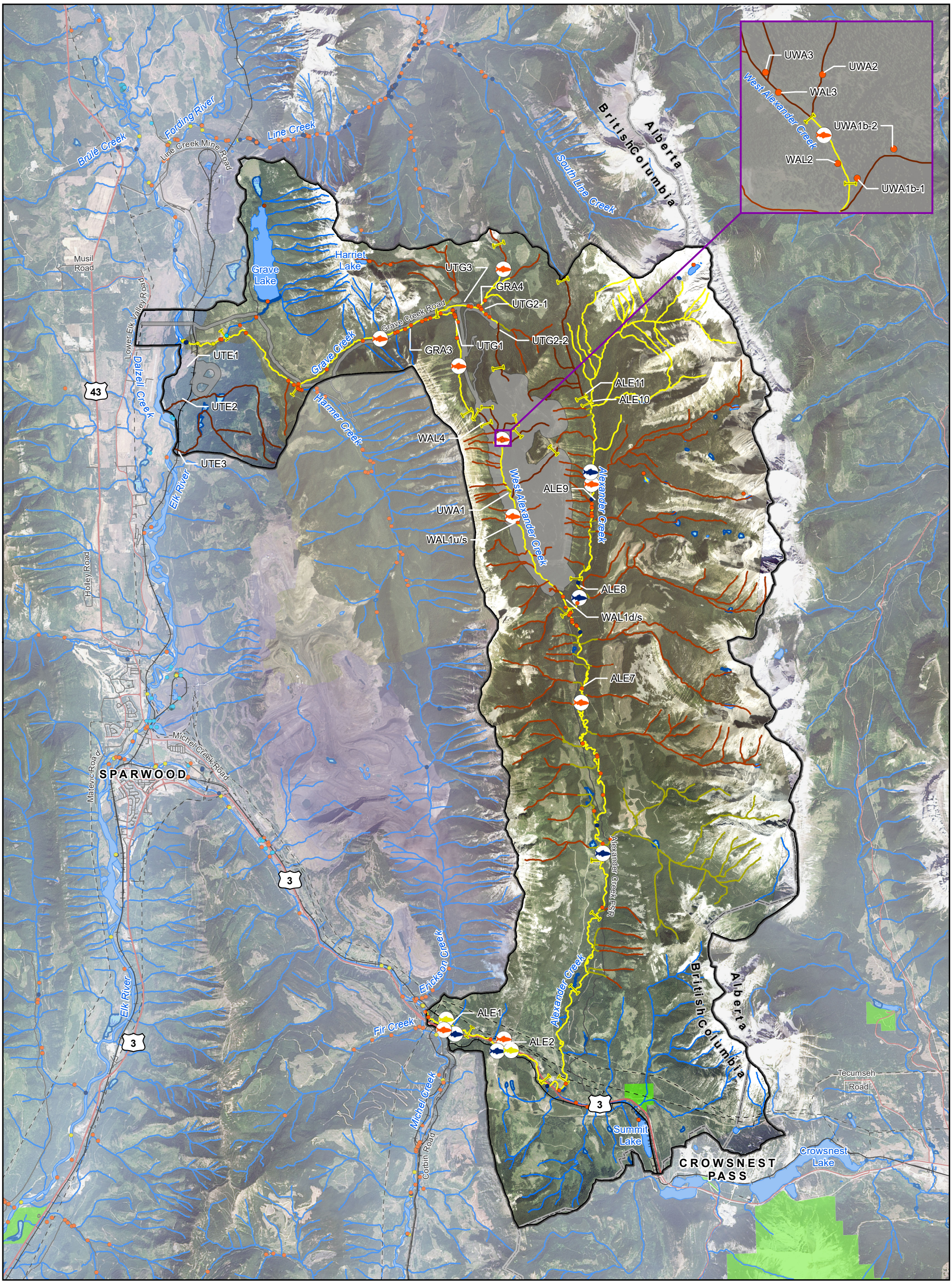
Project: 224558
Status: DRAFT
Date: 2022-12-16

Document Path: K:\2022\224558\Product\Client\FishHabitatConceptualOffsettingPlan\ProjectLocationStudyAreas.mxd



Crown Mountain Fish Habitat Conceptual Offsetting Plan

Figure 2
Fish and Fish Habitat Lotic Surveys Locations within the Fish and Fish Habitat LSA

LEGEND

Fish Bearing Status
- Fish Bearing
- Defaults to Fish Bearing
- Non Fish Bearing
- Defaults to Non Fish Bearing

Lotic Environmental Observations
- Westslope Cutthroat Trout
- Bull Trout
- Mountain Whitefish

B.C. Fish Observations and Distributions
- Westslope Cutthroat Trout
- Bull Trout
- Mountain Whitefish
- Kokanee
- Longnose Sucker
- Reach Break
- Fish and Fish Habitat Local Study Area
- Project Footprint

- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- British Columbia/Alberta Border

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Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada, MoE (March 2021).
Imagery Provided By Landsat 8 (Aug 2018), and GeoBC Ortho Imagery (Aug 2016).

Map Created By: JFC
Map Checked By: MO, HEB
Map Coordinate System: NAD 1983 UTM Zone 11N

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Date: 2022-12-20

Document Path: K:\2022\224558\Product\Client\FishHabitatConceptualOffsettingPlan\Fish_FishHabitatLoticSurveysLocation_Fish_FishHabitatLSA.mxd

2.1.1 Fish Habitat

West Alexander Creek is dominated by cascade-riffle/cascade-glide morphology. During assessments conducted by Lotic (2020; 2022; NWP, 2023), moderate cover was observed to be provided by small and large woody debris and boulders throughout the reaches surveyed. Riparian vegetation consisted primarily of mature coniferous forest, and substrate was dominated by cobble and gravel. One section approximately 4.5 km upstream from the confluence of West Alexander and Alexander creeks (i.e., WAL3; Figure 2) is considered non-fish bearing as per the Fish-stream Identification Guidebook (FPCBC, 1998) due to a 45% gradient for over 200 m, and areas that frequently dewater thereby preventing fish passage upstream. A second area (i.e., WAL4; Figure 2) including a wetland at the headwaters of the West Alexander Creek watershed were also confirmed to be non-fish bearing through minnow trapping and visual assessment. No tributaries were observed entering the wetland.

2.1.2 Fish Community

Fish inventory sampling was conducted in West Alexander Creek by Lotic Environmental (Lotic) in 2014 and 2017 (Lotic, 2020; NWP, 2023). According to Lotic (2020; 2022; NWP, 2023), both WCT and BT were detected in West Alexander Creek. WCT are provincially Blue-listed in B.C. and federally listed as Special Concern on Schedule 1 of the *Species at Risk Act* (SC, 2002), and BT are provincially Blue-listed (Special Concern) in B.C.

Additional fish community sampling was completed in 2017 and 2019 to provide a more detailed and quantifiable assessment of fish density in the local area (Lotic Environmental, 2020; 2022; NWP, 2023). WCT were abundant throughout the Alexander Creek watershed with the highest site-specific density in West Alexander Creek and the upper reaches of Alexander Creek. Estimated fish density immediately above the confluence with Alexander Creek (i.e., WAL1; Figure 2) ranged from 4 to 14 fish/100 m^2 during 2017 surveys conducted between July and August. Estimated fish density in Alexander Creek downstream of the confluence with West Alexander Creek ranged from <1 to approximately 8 fish/100 m^2 (Lotic Environmental, 2020; 2022; NWP, 2023).

Based on 2014 and 2017 spring and fall spawning surveys conducted by Lotic (2020; 2022; NWP, 2023), WAL1 provides good spawning potential with high WCT fry density observed during fish community surveys (Figure 2). Steep gradients and a lack of suitable spawning substrate limited the spawning potential in WAL2 (Figure 2). In 2021, Lotic (2020; 2022; NWP, 2023) observed seven redds in WAL1. Due to seasonally shallow water depth, limited spawning potential was observed for fall-spawning species (e.g., BT). No evidence of spawning fish or redds were observed during either fall spawning survey. Additional details regarding spawning surveys conducted can be found in Chapter 12 of the Application (NWP, 2023)

To improve knowledge on WCT habitat use, Lotic (2020; 2022; NWP, 2023) conducted a population study over a one-year period from 2020 to 2021 using radio tags to track WCT movements. This

information contributed to the knowledge and understanding of habitat use during winter periods, spawning periods, and year-round movements in remote areas of the Alexander and West Alexander creeks and is further detailed in Chapter 12 of the Application (NWP, 2023). Thirty tagged WCT were split into groups by capture/release methods for analysis. Seven fish were captured and released in West Alexander Creek, six in Upper Alexander Creek, five in Middle Alexander Creek, and 12 in Lower Alexander Creek (Lotic Environmental, 2020; 2022; NWP, 2023). All seven fish with radio tags remained in West Alexander Creek, including during winter and spawning seasons, for the life of the tags (to approximately June 2021). These fish are suspected to have overwintered in interstitial spaces, likely influenced by groundwater, as observed in other areas and sub-populations (Cope et al., 2016; NWP, 2023).

The results of Lotic's population study (Lotic Environmental, 2021; 2022; NWP, 2023) indicated a potential fluvial-resident life-history strategy that inhabits the upper portion of the Alexander Creek watershed and a fluvial-migratory life history strategy that does not reach beyond ALE4 (Figure 2). Of those suspected fluvial-resident fish, those tagged in West Alexander Creek were almost exclusively found to remain in West Alexander Creek for all life-history stages (Lotic Environmental, 2020; 2022; NWP, 2023).

2.2 Summary of Mitigation Measures

A summary of the key mitigation measures outlined in Chapter 12 of the Application include:

- Transportation, storage, and use of hazardous materials will be conducted in a manner to mitigate spills;
- Washing, refueling and servicing machinery and storage of fuel and other materials will be conducted in a manner that prevents deleterious substances from entering water bodies;
- Spills will be quickly and effectively responded to and cleaned up to mitigate hazardous materials from entering water bodies;
- Regular inspections to allow for early identification of problematic areas, and stabilization;
- Avoidance of earthworks during heavy rainfall events;
- Implementation of dust control measures including road watering and application of benign dust suppressants as needed;
- Implementation of erosion control measures (erosion control fencing, ditching, and sediment control ponds);
- Seeding and stabilization of topsoil stockpiles;
- Effective placement and design of sediment control ponds;
- Fill or other temporary or permanent structures will only be placed above the high-water mark;
- Materials such as sand, rocks, aquatic vegetation and natural woody debris from banks, shoreline, and waterbodies will not be disturbed or removed;

- Structures will not be built in areas that are inherently unstable like riverbeds, meanders, floodplains, alluvial fans, and braided streams unless appropriate permitting has been obtained to do so;
- The Erosion and Sediment Control Plan (ESCP; Chapter 33 of the Application [NWP, 2023]) will be implemented throughout the lifecycle of the mine (including settling ponds) and will be installed to stabilize erodible and exposed areas to prevent impacts to receiving bodies such as the downstream fish habitat;
- Hazardous wastes will be appropriately cleaned up, stored, transported, and disposed of in a manner that keeps hazardous materials away from waterways and protects fish and fish habitat;
- Solid waste, including sewage treatment product will be appropriately cleaned up, stored, transported, and disposed of in a manner that keeps hazardous materials away from waterways and protects fish and fish habitat;
- Design and construction of ditches and ponds in a manner that minimizes the potential for erosion;
- Construction of clean water diversions to lessen water interaction with mine-related disturbances;
- If required, organic phosphate anti-scalants will be added to protect receiving fish habitat from calcite precipitation and concretion;
- Where fish habitat will be permanently removed due to the design constraints of the Project, fish catch, and release activities will be utilized to move fish. Specific plans will be developed in coordination with Fisheries and Oceans Canada to move the suspected resident population of Westslope Cutthroat Trout to a new suitable location given that their habitat will be removed. The feasibility of a large-scale fish salvage is provided in **Section 2.2.1**;
- Blasting will be controlled and conducted in a manner to meet the vibration criterion of less than 100 kilopascals (kPa) and peak particle velocity (PPV) of 13 millimetres per second (mm/s) in Alexander Creek Watershed;
- Large charges will be subdivided into a series of smaller discrete detonations or explosions using time-delay detonation initiators (a procedure known as decking) to reduce the overall detonation to a series of smaller discrete detonations or explosions (Wright and Hopky, 1998). Monitoring of fish and fish habitat will be conducted during blasting to determine if there are any negative impacts associated with this disturbance;
- Selenium concentrations will be monitored in water quality, sediments and periphyton, benthic invertebrates, and fish;
- If selenium results for a given compartment (i.e., water, sediment, periphyton, benthic invertebrates or fish tissue) indicate an increased risk of selenium-related effects, additional actions and monitoring are triggered. The monitoring program is designed so that monitoring and mine actions may be escalated depending on the relative selenium risk observed;
- Activities around water will only be conducted during periods that will not harm fish, their eggs, juveniles, spawning adults, and the organisms they feed on. **Section 33.4.1.5.1** in Chapter 33 of the Application (NWP, 2023) presents the least risk timing windows for service in and around water for VCs occurring in the Fish and Fish Habitat LSA;

- Undisturbed riparian vegetation buffers will be retained between areas of on-land activity and the high-water mark of any water body; and
- Flow volumes downstream of the Main Sediment Pond will be monitored to ensure B.C. Instream Flow Guidelines are achieved.

2.2.1 Fish Catch and Release Plan and Feasibility

DFO issued IAAC a letter on January 10, 2023 highlighting concerns regarding potential effects of the Project on the British Columbia WCT population. Additional information was requested during conformity in reference to NWP's proposed fish catch and release activities (i.e., fish salvage), which is detailed in this subsection.

Upon issuance of an authorization under Section 35 of the *Fisheries Act*, additional permits required for fish capture include a provincial Scientific Fish Collection Permit to handle fish, and may include a B.C. introductions and transfers licence to transfer fish between waterbodies. A detailed fish salvage plan will be provided to DFO during the permitting phase of the Project.

The fish salvage will be completed by a team of qualified fisheries biologists experienced in the collection, handling, and transfer of fish. The fish salvage will be conducted in stages moving from downstream to upstream. A semi-permanent fish barrier (e.g., a fish fence or steel weir with a fish screen to prevent upstream movement) will be installed at the downstream extent of West Alexander Creek at the confluence with Alexander Creek, with an additional exclusion net installed approximately 100 m upstream of the barrier. A fish salvage will then be conducted within the isolated segment of the watercourse, completing passes from downstream to upstream. Once two consecutive passes without observing or capturing fish have been completed, the salvage will be considered complete in that segment. A new exclusion net will be placed approximately 100 m upstream of the salvaged area, or to a reasonable length of watercourse suitable for the complexity of habitat, and another salvage will be conducted. These methods will be repeated until the entire stretch of West Alexander Creek has been salvaged. Segment length will be reduced or expanded depending on the complexity of the habitat and adjusted in order to be most efficient in fish capture. Salvages will be conducted in multiple seasons as-needed, to allow for any young-of-year or fry missed during the original salvage to mature, as they may evade capture due to their ability to hide in the interstitial spaces of coarse substrates.

The specific fish salvage methodology will vary based on factors such as depth, substrate, wadeability, water temperature, cover (e.g., woody debris), and turbidity. The following techniques will be used either alone or in combination, until an appropriate depletion target is reached.

- Passive trapping (i.e., minnow traps);
- Seine netting;
- Electrofishing; and
- Dip-netting.

Captured fish will be relocated downstream to a suitable area within Alexander Creek or to another suitable location as approved by DFO. Release locations will consist of areas with suitable depth, velocity, and cover and will be utilized as appropriate based on catch. Based on the low number of fish captured in West Alexander Creek during the fish and fish habitat baseline programs, fish numbers are anticipated to be low enough such that Alexander Creek downstream of the confluence with West Alexander Creek can accommodate the numbers of transferred fish.

The fish salvage will be completed with the intent to minimize handling of fish, particularly if completed during warmer months, to reduce stress to fish. Measures such as oxygen supplementation and water cooling (e.g., regular site water changes, air pumps, coolers) may be used as required. A sub-sample of individuals per species will be sampled (physical measurements only), with the remaining to be identified to species level and enumerated only, unless requested by DFO. Personnel will remain on site during de-watering to remove any remaining fish in the channel, wherever safely practical. Data collection and other conditions will be followed as indicated on fisheries permits.

2.3 Summary of Residual Effects

The Project has been assessed for potential residual effects on fish and fish habitat following the application of the mitigation measures described above. As presented, the goal of the proposed suite of mitigation measures is to avoid or mitigate potential direct and indirect Project effects on fish and fish habitat; residual effects; however, are predicted to occur including the potential death of fish and HADD. These residual effects are discussed below.

2.3.1 Harmful Alteration, Disruption or Destruction of Fish Habitat as a Residual Effect

Based on the evaluation of potential Project effects on fish and fish habitat presented in the Application (NWP, 2023), potential residual effects on fish habitat that will remain after implementation of proposed mitigation measures and require offsetting include:

- Instream habitat loss due to mine design and development;
- Habitat loss due to changes in water quantity; and
- Functional riparian disturbance.

The residual losses of the Project are anticipated to be 35,165 m^2 of instream fish habitat (i.e., 31,262 m^2 for instream habitat loss due to mine design and development, plus 3,237 m^2 for habitat loss due to changes in water quantity), 11,182 m^2 of non-fish bearing habitat, and 361,300 m^2 of riparian habitat in West Alexander Creek.

Summarized below is the amount of fish bearing instream habitat resulting from habitat loss due to mine design and habitat loss due to changes in water quantity (Table 1; Figure 2), and the non-fish bearing habitat immediately upstream of the fish bearing habitat loss anticipated to be removed by the Project (Table 2; Figure 2).

Table 1: Summary of Fish Bearing Habitat Loss Due to the Project (from NWP, 2023)

Site ID	Fish Bearing	Type	Reach Length (m)	Average Bankfull Width (m)	Area (m^2)	Riparian Habitat (m^2)
WAL1 u/s and WAL1 d/s up to downstream end of the Spillway	Yes	Due to Mine Design	5,002	6.3	31,262	275,300
WAL2	Yes	Due to Mine Design	174	3.8	665.6	9,000
WAL1 d/s of the Spillway up to confluence with Alexander Creek	Yes	Due to Changes in Water Quantity	550	5.6	3,237	77,000
				Total	35,165	361,300

Table 2: Summary of Non-Fish Bearing Habitat Loss Due to the Project (from NWP, 2023)

Site ID	Fish Bearing	Reach Length (m)	Average Bankfull Width (m)	Area (m^2)
WAL3	No	578	2.1	1,197
WAL4	No	425	5.9	2,503
UWA1	No	2,041	-	-
UWA1b-1	No	182	2.9	518.9
UWA1b-2	No	1,386	2.8	3,881
UWA2	No	777	1.7	1,283
UWA3	No	870	2.1	1,800
			Total	11,182

2.3.2 Death of Fish as a Residual Effect

An extensive suite of mitigation measures have been proposed to effectively mitigate the potential for death of fish as a result of different Project activities. Additionally, the potential for death of fish was assessed in the event of accidents or malfunctions. Accidents or malfunctions are considered to be not significant for all phases of the project, with a high level of confidence in the prediction. Additional information is provided in Chapter 12 and Chapter 21 of the Application (NWP, 2023).

3.0 Conceptual Offsetting Plan

3.1 Offsetting Strategy

Federal policy and legislation require that adverse residual impacts to fish and fish habitat resulting from works, undertakings, and/or activities are offset to address the residual HADD (DFO, 2019b) resulting from a Project. Offsetting measures may include, but not be limited to the restoration, enhancement, and/or creation of productive and sustainable fish habitat. NWP is committed to habitat offsetting measures to compensate for the residual HADD resulting from the proposed Project (Section 0) per the requirements outlined under the *Fisheries Act*.

The conceptual offsetting strategy adopted for the Project follows guidance provided in DFO's Policy to Applying Measures to Offset Adverse Effects on Fish and Fish Habitat Under the *Fisheries Act* (DFO, 2019c) and specific requirements outlined in the *Fisheries Act*'s Authorizations Concerning Fish and Fish Habitat Protection Regulations (SOR/2019-286).

Key guiding offsetting strategies include:

- Enhance or create productive and sustainable fish habitat, aligned with local fisheries management objectives and priorities that complement and diversify local habitat types;
- Improve connectivity between habitats; and
- Create opportunity for establishment of a WCT population in isolated habitat.

3.2 Selection and Evaluation of Offsetting Measures

A range of potential offsetting measures were identified and evaluated against the following DFO guiding principles:

1. Measures to offset should support fisheries management objectives and give priority to the restoration of degraded fish habitat;
2. Benefits from measures to offset should balance the adverse effects resulting from the works, undertakings or activities;
3. Measures to offset should provide additional benefits to the ecosystem; and
4. Measures to offset should generate self-sustaining benefits over the long-term.

The following sections summarize the consideration of offsetting measures for the Project to address DFO's guiding principles leading to the selection of conceptual fish habitat offsetting measures proposed to be implemented.

3.2.1 Local Fisheries Management Objectives

A key element of the selection of appropriate habitat offsetting is alignment with local fisheries management objectives and restoration and enhancement priorities. Local fisheries management objectives and restoration priorities for the Elk Valley region were identified through a review of DFO documents, consideration of successful habitat offsetting activities completed in the area, and engagement with regulators, and other local groups (e.g., Nature Conservancy Canada, Canadian Wildlife Federation, Elk River Alliance).

3.2.2 Indigenous Communities Engagement

No specific feedback on fish habitat offsetting has been provided to NWP by Indigenous communities. NWP is committed to continuing engagement with Indigenous communities to develop offsetting measures and including fisheries management objectives.

3.2.3 Stakeholder Engagement

NWP has engaged with DFO, provincial and federal government and regional stakeholders to discuss the potential for habitat offsetting locations within the Aquatic LSA and Fish and Fish Habitat Local Study Area (LSA) and Regional Study Area (RSA). Table 3 provides a summary of the engagement held with regional stakeholders to date. Engagement with these stakeholders is ongoing.

NWP reached out to the Sparwood and District Fish and Wildlife Association via email on July 21, 2022 regarding restoration opportunities, but the Association declined to engage.

Table 3: **Summary of Stakeholder Engagement on Fish Habitat Offsetting for Crown Mountain**

Date	Stakeholder(s)	Description	Response or Actions Identified
November 30, 2021	DFO, Impact Assessment Agency of Canada (IAAC), Environmental Assessment Office (IAAC)	Meeting to review key baseline findings, the fish and fish habitat project effects assessment, offsetting requirements and proposed offsetting measures	DFO and IAAC outlined the process and expectations for fish habitat offsetting for the Project
July 26, 2022	Elk River Alliance (ERA)	NWP and Dillon met virtually with a representative from the Elk River Alliance to discuss potential collaboration on fish habitat restoration initiatives	ERA provided NWP with an overview of current cottonwood riparian planting initiatives underway in the Elk Valley and potential opportunities for collaboration

Date	Stakeholder(s)	Description	Response or Actions Identified
July 26, 2022	Nature Conservancy of Canada (NCC)	NWP and Dillon met virtually with a representative from NCC's Canadian Rockies Program to discuss fish habitat restoration	NCC provided NWP with information on NCC lands
July 27, 2022	Canadian Wildlife Federation (CWF)	NWP and Dillon met virtually with a representative from CWF's B.C. Fish Passage Restoration Initiative to discuss potential collaboration on fish habitat restoration initiatives	CWF provided NWP with information on priority barriers to fish habitat identified within the Elk Valley and shared data on recent fish passage and habitat confirmation assessments
January 10, 2023	DFO, IAAC	DFO issued IAAC a letter intended to highlight DFO concerns regarding potential effects of the Project on the British Columbia Westslope Cutthroat Trout population	NWP has considered DFO's concerns, and specific requests outlined in the letter throughout this document

3.3 Offsetting Option Assessment Methods

3.3.1 Desktop Assessment

Following stakeholder engagement, desktop assessments were completed to conduct a preliminary evaluation of the candidate locations for fish habitat offsetting. Each location was assessed for available fish and fish habitat data, offsetting potential (including restoration and/or enhancement type and value), surrounding land use, land ownership, proximity to the Project, and feasibility. Satellite imagery and B.C.'s Habitat Wizard (Province of B.C., 2022), were also used to identify other potential watercourses within the RSA and approximately 40 km of the Project that may also benefit from restoration or enhancement of fish habitat due to degraded crossing structures, impacts to riparian habitat, and/or other forms of habitat degradation.

The list of candidate sites was compiled and further refined to consist of those with the greatest potential for conceptual offsetting based on the desktop evaluation, and the need to conduct a more detailed assessment in the field to further evaluate and describe conceptual offsetting opportunities.

3.3.2 Field Assessment

Field assessments were conducted by four qualified Dillon fisheries biologists from September 13-15, 2022. The field assessments targeted the fall low flow period to maximize visibility of instream habitat and determine potential seasonality of flows, but prior to the potential BT spawning season to avoid potential disturbance of spawning activity and/or redds. No fish collection occurred during the field assessments; therefore, no Scientific Fish Collection Permit was required. No BT or evidence of spawning activity was observed during the field program.

Site locations were established based on meetings with stakeholders, background data review, and local knowledge of the area. At each site, a reconnaissance level survey was conducted that involved a site walkthrough and evaluation of existing habitat conditions and offsetting potential. Potential issues outlined by meetings with stakeholders were confirmed with supporting notes and measurements collected as needed (e.g., composition/shape of eroding bank, functional riparian characteristics, etc.).

Geospatial data was collected in ArcGIS Field Maps (ESRI, 2022) including site coordinates and descriptions, delineation of areas of interest, site descriptions, and photos in order to aid future designs. Sketches of the existing habitat and potential offsetting measures were also prepared in the field at sites with offsetting potential.

3.3.3 Field Assessment Evaluation

Field assessments were conducted at the following locations within the Aquatic RSA:

- Brûlé Creek;
- Coal Creek;
- Elk River Oxbow;
- Elk Valley Heritage Conservation Area (multiple sites);
- Hosmer Creek;
- Ingham Channel (at Ingham Rest Area);
- Morrissey Meadows Conservation Area; and
- Weigert Creek.

A field assessment was also conducted at the following location within the Fish and Fish Habitat LSA:

- Alexander Creek.

Each location listed above was evaluated against a set of criteria leading to the selection of a proposed conceptual plan. Criteria considered feasibility and included, but were not limited to:

- Location/accessibility: whether the offsetting measures are within the LSA or RSA, within the same watershed, and accessibility for feasibility of construction;
- Alignment of the objectives of the proposed offsetting measures with local regulatory and Indigenous fishery management objectives/priorities;

- Habitat function (i.e., similarities of the habitat gained to the habitat proposed to be lost);
- Constructability: feasibility of construction, including land tenure considerations;
- Durability/resiliency: likelihood of offsetting measure to remain functional long-term, based on similar projects;
- Implementation certainty/success: anticipated overall success of the offsetting measure based previous projects or professional experience;
- Capital/maintenance costs relative to other projects; and
- Alignment with DFO offsetting principles.

Table 4: **Evaluation Criteria for Conceptual Fish Habitat Offsetting Measures for Crown Mountain**

Evaluation Criteria	Evaluation Criteria Definition	Assessment Level	Assessment Level Definition
Location	The location of the proposed offsetting measures	LSA	Proposed offsetting measures will be located within or associated with a watercourse located in the LSA
		RSA	Proposed offsetting measures will be located within or associated with a watercourse located in the RSA
Habitat Function	How similar the anticipated habitat function of the offsetting measure will be to the proposed impacts	Similar	The anticipated habitat function of the proposed offsetting measures will be similar to the habitat anticipated to be lost within West Alexander Creek (e.g., habitat for sensitive life stages of WCT)
		Not Similar	The anticipated habitat function of the proposed offsetting measures will not be similar to the habitat anticipated to be lost within West Alexander Creek
Alignment with Local Priorities	Are the proposed offsetting measures aligned with local priorities (e.g., DFO recovery strategies, priorities outlined by Indigenous communities, stakeholders or special interest groups)	Yes	Proposed offsetting measures are aligned with local priorities
		No	Proposed offsetting measures are not aligned with local priorities

Evaluation Criteria	Evaluation Criteria Definition	Assessment Level	Assessment Level Definition
Technical Feasibility and Long-Term Success	The anticipated feasibility of the construction and implementation of the proposed offsetting measures (e.g., is the measure specific and achievable?)	High	Proposed offsetting measures have well-defined construction methodology that is known to be feasible at the site (e.g., easy access for construction equipment, locally sourced materials). Measures are well established in literature and several known examples of previously successful offsetting projects exist
		Moderate	Proposed offsetting measures have moderately-defined construction methodology and/or examples of previous implementation of the measures have mixed success
		Low	Proposed offsetting measures have poorly defined or non-existent construction methodology. Little or no relevant examples of previous implementation. Site conditions may prevent construction or cause construction to become cost-prohibitive (e.g., no road access for construction equipment)
		Unknown	Constructability is unknown either because the measures are novel, or data gaps exist
Feasibility of Monitoring Programs	The anticipated feasibility of post-construction monitoring programs, including program design and reliability of results (e.g., is the success of the measure measurable and verifiable?)	High	Monitoring is simple, routine and/or standard with well-defined best practices
		Moderate	Monitoring is moderately challenging, partially dependant on outside factors and/or has limited defined best practices
		Low	Monitoring is challenging, completely dependent on outside factors and/or has limited defined best practices
		Unknown	Feasibility of monitoring programs is unknown either because the measures are novel, or data gaps exist

Evaluation Criteria	Evaluation Criteria Definition	Assessment Level	Assessment Level Definition
Land Tenure Certainty	Certainty that land can be used for offsetting	High	Land is owned by the client or partner organization with existing land use agreements with the client, and/or land tenure has been confirmed
		Moderate	Land is owned by federal or provincial governments, or an organization or person outside of the client, and where potential for land tenure has been confirmed
		Low	Land tenure has not yet been confirmed
Capital/ Maintenance Costs	Relative costs of construction and maintenance	High	Anticipated costs are high relative to other proposed offsetting measures
		Moderate	Anticipated costs are moderate relative to other proposed offsetting measures
		Low	Anticipated costs are low relative to other proposed offsetting measures

A breakdown of sites that were selected as candidate sites are detailed in Table 5 based on the assessment criteria provided above.

Table 5: **Evaluation of Proposed Offsetting Concepts**

Habitat Offsetting Concepts	Description	Evaluation Criteria							Comments
		Location	Habitat Function	Alignment with Local Priorities	Technical Feasibility and Long-Term Success	Feasibility of Monitoring Measures	Land Tenure Certainty	Capital/ Maintenance Costs	
Weigert Creek	Replacement of fords with bailey bridges, decommissioning and restoration of old fords	RSA	Similar: Similar size creek, same species, within Elk River watershed	Yes: Restoration of connectivity is one of DFO's key guiding offsetting strategies	High: Bailey bridges are a common practice locally, and could be easily sourced. Footings are already present and could be recommissioned with only minor updates. Channel and bank restoration and stabilization are common techniques with many successful examples, and would be expected to be durable.	High: Monitoring (i.e., trail cameras to monitor vehicle use, monitoring of restored habitat) is simple, routine and standard with well-defined best practices, and is measurable and verifiable.	High	Moderate	Good potential; footings for bailey bridges already constructed; site is well known; fish present
Grace Creek	Replacement (e.g., bridge or culvert) or improvement of road culverts to improve connectivity of watercourse	RSA	Similar: Similar sized creek, same species, within Elk River watershed	Yes: Restoration of connectivity is one of DFO's key guiding offsetting strategies, and road culvert crossings are identified as priority barriers for local special interest groups.	High: Replacement of road culverts with structures passable by fish (e.g., bridge or culvert) is a common practice, and materials could be sourced locally.	High: Monitoring (i.e., confirming structural integrity, fish mark-recapture, and eDNA studies) is routine and standard with well-defined best practices, and is measurable and verifiable.	High	High	Good potential; will improve connectivity; fish present
Brûlé Creek	Introduction of WCT upstream of the existing barrier	RSA	Similar: Similar size creek, same species, within Elk River watershed	Yes: WCT are important locally and valued as an important species by several indigenous communities	Unknown: Establishment of new WCT is, to Dillon's knowledge, a novel approach to offsetting death of fish or HADD. However, other organizations (Parks Canada, Trout Unlimited Canada) have used headwater refugia (e.g., lakes with downstream barriers) to restore WCT populations in several locations, and have provided detailed methodology for reintroduction.	High: Fish mark-recapture and eDNA studies are routine and standard with well-defined best practices, and is measurable and verifiable.	Moderate	Moderate	Presence of fish upstream of the barrier has not been detected by previous surveys/assessments, yet suitable habitat is present that could support a fish population; unique project which could allow for research opportunities
Elk River Side Channel (Garrett Ready Mix Site)	Removal of debris from the banks of the existing side channel, restoration of banks and enhancement of side channel habitats	RSA	Not similar	Yes: Restoration and enhancement of off-channel habitat in the Elk River	High: Restoration and enhancement of off-channel habitat is a common approach to offsetting with many successful examples, and with proper engineering would be expected to be durable.	High: Monitoring of restored habitats is simple, routine and standard with well-defined best practices, and is measurable and verifiable.	Moderate	Moderate	Good potential; technique would enhance degraded rearing habitat
Elk River Side Channel Creation (Garrett Ready Mix Quarry)	Establishment of surficial connection to old quarry site, enhancement of quarry site to create new off-channel habitat	RSA	Not similar	Yes: Creation of off-channel habitat in the Elk River	Moderate: Creation of off-channel habitat is a known approach to offsetting with successful examples. With proper engineering, the newly established habitat would be expected to be durable.	High: Monitoring of the established habitat would follow similar methods to monitoring restored habitats, which are routine and standard with well-defined best practices, and is measurable and verifiable.	Moderate	High	Good potential; technique would create new rearing habitat
Ingham/Olsen Rest Area	Establishment of defined channel to connect watercourse to the downstream enhanced wetland	RSA	Not similar	Yes: Creation of off-channel habitat	Moderate: Creation of off-channel habitat is a known approach to offsetting with successful examples. With proper engineering, the newly established habitat would be expected to be durable.	High: Monitoring of the newly established habitat would follow similar methods to monitoring restored habitats, which are routine and standard with well-defined best practices, and is measurable and verifiable.	Moderate	High	Good potential, could be completed in connection with further restoration work being completed on the wetland by the Canadian Wildlife Federation

Habitat Offsetting Concepts	Description	Evaluation Criteria							Comments
		Location	Habitat Function	Alignment with Local Priorities	Technical Feasibility and Long-Term Success	Feasibility of Monitoring Measures	Land Tenure Certainty	Capital/ Maintenance Costs	
Alexander Creek	Potential for ford decommissioning, riparian restoration and large woody debris installation, and spawning habitat enhancement	LSA	Similar: Adjacent habitat located downstream of West Alexander	Yes: Restoration of similar habitat	Moderate: While riparian restoration and installation of large woody debris are common techniques with many successful examples and would be expected to be durable, the areas where restoration could be completed are limited by access.	High: Monitoring of restored habitats is simple, routine and standard with well-defined best practices, and is measurable and verifiable.	High	Low	Good potential, but limited areas where restoration could be completed due to limited access
Hosmer Creek	Twin culverts with beaver baffles at crossing in town near confluence with Elk River	RSA	Not similar	Yes: Restoration of connectivity is one of DFO's key guiding offsetting strategies, and road culvert crossings are identified as priority barriers for local special interest groups.	High: Replacement of road culverts with structures passable by fish is a common practice, and materials could be sourced locally.	High: Monitoring (i.e., confirming structural integrity, fish mark-recapture, and eDNA studies) is routine and standard with well-defined best practices, and is measurable and verifiable.	Moderate	Low	Unknown if crossing impedes fish passage; small area for restoration and enhancement available; sediment sources noted near confluence; evidence of beavers present in area
Morrissey Meadows Conservation Area	Channelizing Elk River tributary to improve connectivity	RSA	Not similar (connectivity of tributary)	Yes: Improve connectivity between habitats; however, this location lacks a defined channel.	Low: Poorly defined and dry channels were observed in area. Some areas contained water and depth but no connection to Elk River.	Moderate: Monitoring connected fish habitat (i.e., confirming structural integrity, fish mark-recapture, and eDNA studies) is routine and standard with well-defined best practices, and is measurable and verifiable.	Moderate	High	Partial wetland in some areas, poorly defined channel with overall lack of flow towards Elk River; water quality concerns for fish due to strong sulfur odour and is not recommended for offsetting
Elk River Oxbow	Reconnection of oxbow to provide habitat enhancement including off channel and rearing habitat	RSA	Not similar	Yes: Creation of off-channel habitat opportunity exists; however, location is currently a large wetland.	Low: Reconnection of oxbows requires significant engineering in order to ensure long-term connectivity and success. While technically feasible, the engineering required is challenging and anticipated to be expensive, particularly as the Elk River is a dynamic watercourse.	High: Monitoring of restored habitats is simple, routine and standard with well-defined best practices, and is measurable and verifiable.	High	High	Site is currently a large functional wetland with aquatic, riparian, and terrestrial habitat in abundance and is not recommended for fish habitat offsetting
Coal Creek	Previous flood event led to expanded floodplain, large alluvium deposits, and lack of surface connection	RSA	Similar: Similar size creek, same species, within Elk River watershed	Yes: Restoration of degraded habitat following extreme flow event.	Low: The heavily modified and channelized nature of Coal Creek likely means it is susceptible to extreme variation in flows and has high potential for mobilization of substrates. While technically feasible, the engineering required is challenging and anticipated to be expensive.	High: Monitoring of restored habitats is simple, routine and standard with well-defined best practices, and is measurable and verifiable.	Low	High	Large scale project requiring substantial hydrological assessment to evaluate current watercourse and flows to sustain fish populations. Additional information required regarding other potential parties interested in restoration

3.4 Selected Conceptual Offsetting Measures

Based on the criteria described in Section 3.2 and Section 3.3.3, six habitat offsetting concepts and sites were selected to offset the HADD due to the loss of habitat associated with West Alexander Creek. The geographic coordinates for each site are provided in Table 6.

Table 6: **Geographic Coordinates (Universal Transverse Mercator; NAD 83) of Selected Offsetting Measures**

Offsetting Measure	Zone	Easting	Northing
Weigert Creek North	11	647180	5534584
Weigert Creek South	11	649103	5531749
Grace Creek	11	653796	5539841
Brûlé Creek	11	647271	5528011
Elk River Channel Enhancement	11	651368	5504007
Elk River Side Channel Creation	11	651378	5503527
Ingham Channel	11	650741	5500667

3.4.1 Weigert Creek Crossing Replacements

Weigert Creek is a fourth order fish-bearing watercourse and tributary to the Elk River, with a watershed catchment area of approximately 43 km^2 upstream of the Highway 43 crossing. The channel has an average bankfull width of 6.6 m, and an average wetted width of 4.6 m (New Graph Environment [NGE], 2021). Fish within Weigert Creek include BT and WCT (NWP, 2023). A forest service road runs alongside Weigert Creek, used by hunters and trappers. Two fording crossings were identified through Weigert Creek, which impacts fish habitat through rutting and compaction of the bed and banks from vehicle use, loss of riparian habitat at the crossing due to vegetation removal, and sedimentation of downstream habitat when in use. The upstream fording location has also caused the redirection flows onto the current vehicle trail during high water events and into the terrestrial environment. Abutments were noted where historical temporary bridges were once used to cross the creek, though these bridges were likely decommissioned following the completion of forestry activities. Additionally, historic logging has left Weigert Creek exposed and with limited riparian vegetation in locations upstream of the ford crossing.

Fording crossings may contribute to sedimentation of downstream fish habitat through five main processes: creation of wheel ruts and concentration of surface runoff; existence of tracks and exposed surfaces; compaction of soils and subsequent reduction in infiltration rate leading to increased surface runoff; backwash from vehicles and undercutting of banks by bow wave action (Brown, 2007). Brown (1994), as cited in Marion et al. (2014) found that most coarse size sediment that deposited on stream beds as a result of off-highway vehicle (OHV) fords in Victoria, Australia occurred within the first 10 m, while fine size sediment was transported several kilometres downstream. Marion et al. (2014) studied stream channel responses to OHV crossings in Arkansas and found that mud coatings, sediment

deposition, and/or bank erosion occurred at 80% of sites, and downstream changes were observed at least 100 to 200 m from the crossings.

To improve habitat conditions within the creek, NWP is proposing to decommission the two existing ford crossings, enhance instream and riparian habitats, including planting in historically logged areas upstream of the ford areas, and re-establish bridge crossings as permanent crossings to keep future vehicles from entering the watercourse at both locations.

3.4.1.1 Location

The conceptual fish habitat offsetting plans for Weigert Creek are outlined in Figure 3 and Figure 4.

3.4.1.2 Anticipated Habitat Function

The proposed offsetting measures of the Weigert Creek provide a number of benefits to fisheries within the Elk River watershed. The intended function of the proposed offsetting project is to remove the fords, restore habitat, improve connectivity, lower water temperature, and reduce sedimentation within Weigert Creek. Habitats intended to benefit from the proposed Weigert Creek offsetting measures are provided below:

- Instream Habitat
- Remove fords to reduce potential for direct mortality of fish from vehicles crossing the creek;
- Indirect enhancement of spawning and rearing habitat by reducing sedimentation downstream of the fords;
- Indirect enhancement of instream habitat by introducing shade (i.e., reducing water temperature) and bank stability (i.e., reducing sedimentation through runoff) through riparian planting; and
- Indirect enhancement of instream migration habitat and connectivity by increasing potential for fish passage upstream of the fords.
- Riparian Habitat
- Improve riparian habitat with native plant species;
- Provide shade and cover habitat; and
- Reduce erosion and sedimentation by reconstructing banks and confining the channel, as well as increased bank stability from the addition of native vegetation.

649000 649050 649100 649150 649200 649250

5531800 5531750 5531700 5531650

New access road

Road to be decommissioned

Weigert Creek

Photo 1 Left bank of truck ford.

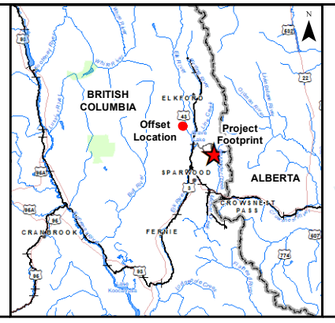
Photo 2 Erosion on right bank of truck ford.

Crown Mountain Fish Habitat Conceptual Offsetting Plan

Figure 3
Weigert Creek Crossing Replacement (South)

LEGEND

- Riparian Offset
- Watercourse Offset
- Watercourse
- Decommissioned Road
- New Access Road
- Permanent Bridge Crossing



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Imagery Provided By Landsat 8 (Aug 2018), and GeoBC Ortho Imagery (Aug 2016).

Map Created By: JFC, RBB
Map Checked By: HEB
Map Coordinate System: NAD 1983 UTM Zone 11N

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Project: 224558

Status: FINAL

Date: 2023-07-20

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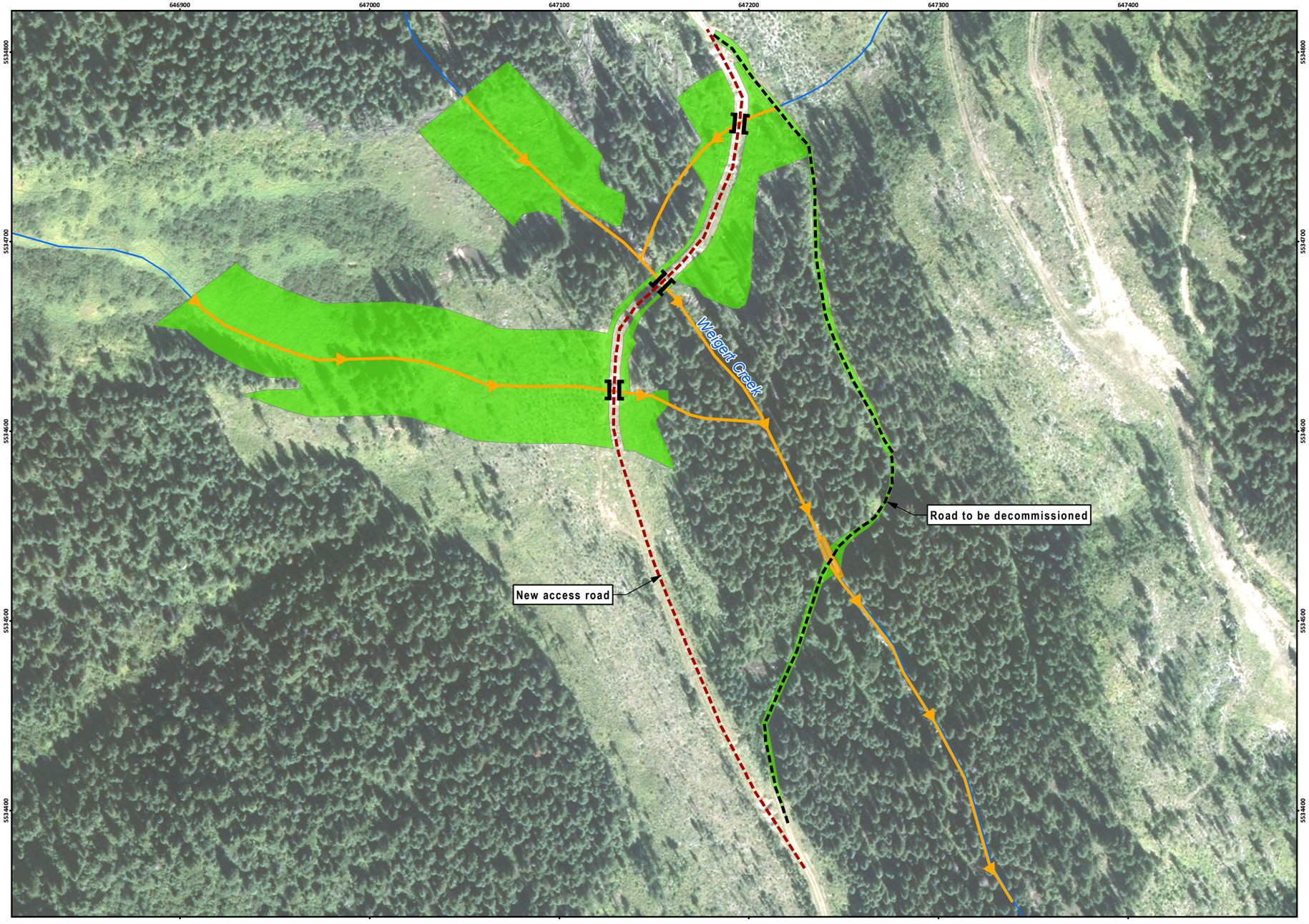


Photo 1 Left bank of truck ford showing erosion and sedimentation.

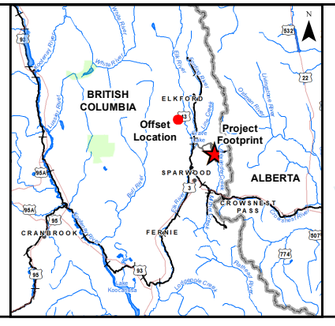
Photo 2 Right bank of truck ford and road prone to flooding during high water events.

Crown Mountain Fish Habitat Conceptual Offsetting Plan

Figure 4
Weigert Creek Crossing Replacement (North)

LEGEND

- Riparian and Upland Offset
- Watercourse Offset
- Watercourse Offset
- Watercourse
- Decommissioned Road
- New Access Road
- New Permanent Bridge Crossing



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3.4.1.3 Feasibility

Bailey bridges or prefabricated bridges are a common crossing method in the local region and could be easily sourced. Footings are already present and could be recommissioned with minor updates. Channel and bank restoration and stabilization will utilize common techniques with many successful examples and would be expected to be durable.

Land Tenure

The proposed Weigert Creek crossing replacements are located within provincial Crown land classified as "Forest Management Unit". Construction of the bridges and accompanying riparian habitat enhancement is anticipated to require a Special Use Permit, an authorization under the *Forest Practices Code of British Columbia Act* (RSBC, 1996) that allows the holder the non-exclusive rights to use and occupy Crown land within the provincial forest to facilitate a resource use. NWP will submit an Application Form for Special Use Permit to the Ministry of Forest's Rocky Mountain Natural Resource District during Project permitting to obtain authorization to construct the offsetting measures on the Weigert Creek Forest Service Road and surrounding Weigert Creek.

3.4.1.4 Monitoring Measures

Effectiveness monitoring will be undertaken to confirm the offsetting habitats are functioning as intended following construction. Specific habitat performance criteria, monitoring methods, and measureable parameters will be defined in the Request for *Fisheries Act* authorization following specific requirements outlined in the *Fisheries Act*'s Authorizations Concerning Fish and Fish Habitat Protection Regulations (SOR/2019-286). Effectiveness monitoring measures may include:

- Installation of traffic counters prior to construction at each crossing location to determine the number of vehicles typically fording Weigert Creek, and the number of vehicles utilizing the bridge crossings once installed;
- Monitoring of riparian vegetation establishment surroundings the crossings; and
- Monitoring water temperature as vegetation establishes.

3.4.2 Grace Creek Crossing Replacements

Grace Creek is a third order, fish-bearing watercourse and tributary to the Fording River (Masse Environmental Consultants [Masse], 2015). The watercourse has an average bankfull width of 3.2 m, and Cutthroat Trout were captured downstream of the culvert that runs under Line Road (Masse, 2015). Several culvert crossings are located throughout Grace Creek (Masse, 2015).

To improve habitat connectivity within Grace Creek, NWP is proposing to replace current road crossing structures downstream of the railway to restore habitat connectivity to Grace Creek. This will restore approximately 1,900 m of channel as potential fish habitat for fish within Grace Creek. This project was identified by the Canadian Wildlife Federation as a high priority site due to the population of WCT. Current crossings are proposed to be replaced with bridges or alternatively, new culverts (of appropriate

diameter, slope equal to or similar to watercourse, inlets and outlets positioned below bed) in order to restore the streambed, and offsetting measures will include the enhancement of surrounding riparian habitat at each of the improved crossings.

3.4.2.1 Location

The conceptual fish habitat offsetting plan for Grace Creek is outlined in Figure 5.

3.4.2.2 Anticipated Habitat Function

The proposed offsetting measures of the Grace Creek provide a number of benefits to fisheries within the Elk and Fording River watersheds. The intended function of the proposed offsetting project is to restore habitat connectivity within Grace Creek. Habitats intended to benefit from the proposed Grace Creek offsetting measures are outlined below:

- Instream Habitat
- Restore instream rearing, migration and spawning habitat for salmonids by restoring habitat connectivity within Grace Creek.
- Riparian Habitat
- Provides shade and cover habitat.

3.4.2.3 Feasibility

Replacement of road culverts with structures passable by fish (e.g., bridges or baffled culverts designed with appropriate diameter, slope equal to or similar to watercourse, inlets and outlets positioned below bed) is a common practice, and materials could be sourced locally.

Land Tenure

The proposed Grace Creek crossing replacements are located within CanWel's land tenure. NWP has an ongoing relationship with CanWel, has permission from CanWel for land access and land use, and expects to be able to get an agreement in place for the proposed offsets.

3.4.2.4 Monitoring Measures

Effectiveness monitoring will be undertaken to confirm the offsetting habitats are functioning as intended following construction. Effectiveness monitoring measures may include:

- Riparian planting success monitoring; and
- Fish community survey (including fish relative abundance and distribution) to evaluate fish use upstream when culverts removed.

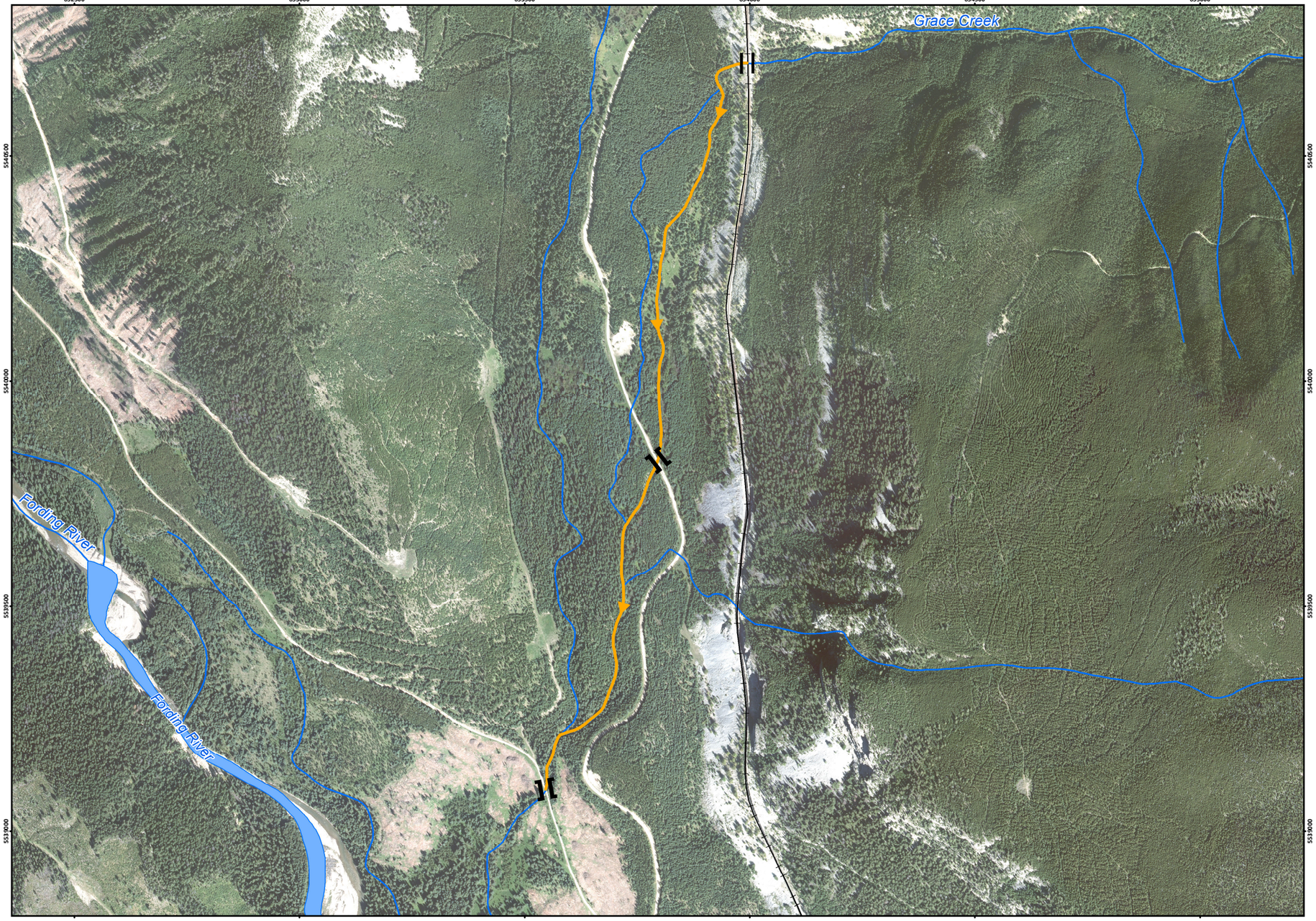


Photo 1 Representative riffle habitat in Grace Creek.

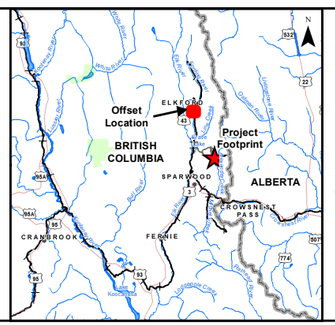
Photo 2 Hanging culvert outlet at Grace Creek Crossing 1.

Crown Mountain Fish Habitat Conceptual Offsetting Plan

Figure 5
Grace Creek Crossing Replacements

LEGEND

- Railway Culvert
- Permanent Bridge Crossing
- Watercourse Offset
- Railway
- Waterbody
- Watercourse



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3.4.3 Brûlé Creek Fish Introduction

Brûlé Creek is a fifth order watercourse with a watershed area upstream of Highway 43 of approximately 87 km^2 (NGE, 2021). The channel has an average bankfull width of 5.5 m, and an average wetted width of 2.3 m (NGE, 2021). Brûlé Creek contains WCT, BT, and rainbow trout (*Oncorhynchus mykiss*) downstream of Highway 43 culverts, and WCT and rainbow trout upstream of the culverts (NGE, 2021). Investigations of Brûlé Creek have identified a permanent barrier to fish passage (i.e., a large waterfall) on Brûlé Creek approximately 3.7 km upstream of the Highway 43 culverts. Upstream of the waterfall, no fish are present (NWP, 2023). However, suitable habitat for salmonids (including WCT) is evident upstream of the falls. Suitable substrates for potential spawning are available, and high amounts of complex, varied habitat providing cover are located throughout the creek. Additionally, several benthic invertebrate taxa were noted during the September 2022 site visit, including Plectoptera, Trichoptera, and Ephemeroptera, which would provide a food source for a potential WCT population. Based on on-site assessments, habitat value in the upstream portion of Brûlé Creek is rated as high for fry and juvenile WCT rearing (NGE, 2021).

NWP is proposing to introduce WCT to the area upstream of the waterfall, to create an isolated population of the genetically pure species.

It was noted in a previous survey (D. Baines, personal communication, 2022) that water is present in a roughly 4 km section of channel upstream of the Brûlé Creek falls. Further upstream, flows appear to go subsurface for some parts of the year. Because of this, only the 4 km section of channel has been included in the initial quantification of offsetting.

3.4.3.1 Location

The conceptual fish habitat offsetting plan for Brûlé Creek is outlined in Figure 6.

3.4.3.2 Anticipated Habitat Function

Should the detailed feasibility studies indicate that a self-sustaining population of genetically pure WCT is likely to be maintained long-term, the introduction of WCT is anticipated to have multiple benefits towards conservation of the species. Cutthroat trout in the Elk River watershed are susceptible to threats such as competition for food with other trout, as well as hybridization with introduced rainbow trout. However, the permanent barrier (i.e., the waterfall) would prevent other fish species from accessing the habitat upstream. This would allow for a genetically pure, isolated population of WCT to be maintained, which in the Elk Valley is limited to a few isolated watercourses.

Photo 1 Representative riffle habitat in the middle reaches of Brûlé Creek (Photo from July 2021).

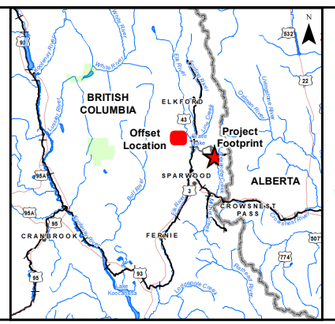
Photo 2 Representative riffle habitat near the Brûlé Creek FSR bridge.

Crown Mountain Fish Habitat Conceptual Offsetting Plan

Figure 6
Brûlé Creek Fish Introduction

LEGEND

- Watercourse Offset
- Watercourse



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Map Coordinate System:

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Project: 224558
Status: DRAFT
Date: 2022-12-20

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The creation of a WCT population in upstream Brûlé Creek is proposed to partially offset the HADD proposed by the loss of portions of West Alexander Creek, specifically for the loss of WCT habitat. This will be achieved by introducing WCT to suitable habitat, making the following habitat types available:

- Instream Habitat:
- Rearing, spawning, and overwintering (once confirmed during detailed plans) habitat will be available to WCT.
- Riparian Habitat:
- Established riparian community offering shade and cover habitat.

3.4.3.3 Feasibility

Prior to the introduction of any WCT to Brûlé Creek, a detailed feasibility study will be conducted pending Project approval to determine whether a population of WCT can be sustained long-term within the watercourse. NWP will aim to set up partnerships with the appropriate agencies and/or institutions (e.g., researchers, academia) during the design and detailed feasibility study of this proposed offsetting measure. Studies into the flow levels of Brûlé Creek will be required to confirm whether sufficient water is present to sustain critical life stages for WCT year-round. This study would also be used to quantify the upstream extent of habitat suitable to WCT including overwintering and spawning habitat availability.

Remote site incubation (RSI) is one method of recovery stocking where fish are introduced into a new habitat from the nearest neighbouring population and could be used for introducing WCT to the upstream reaches of Brûlé Creek. Eggs and milt are collected from wild mature fish during their spawning season. Fertilized eggs are moved to a quarantine facility at the hatchery until the eyed stage, where they are then placed into an RSI unit, improving the rate of survival. As such, the introduction stage is considered to be technically feasible.

Examples of introduction and reintroduction of WCT have been conducted by Parks Canada, with several recent and ongoing examples of WCT introduction in the eastern slopes of the Rocky Mountains.

- Hidden Lake, Banff National Park
  - Parks Canada is undergoing a multi-year WCT reintroduction effort in Hidden Lake, located in Banff National Park. Hidden Lake functions as a headwater refugia as it is separated from downstream reaches of Hidden Creek via a barrier. As such, an established population of WCT would be sheltered from the upstream migration of non-native competitors (e.g., brook trout, rainbow trout). Per Parks Canada's criteria, "The ideal restoration area for [WCT] has cold, clean water with suitable spawning grounds and a barrier downstream to stop non-native fish from swimming upstream into the restored habitat. Hidden Lake, in the Skoki area, meets these criteria and once had a thriving population of [WCT]".
  - Parks Canada's efforts required the removal of all non-native fish using rotenone, a fish toxicant.
  - Fish were introduced using collected eggs and milt from a genetically pure population of WCT. Partially matured hatchery eggs were placed into streamside incubators, and directly released into Hidden Creek upon hatching.

  - Parks Canada plans to continue streamside incubation and introduction until the lake supports a self-sustaining population of WCT.
  - The upstream reaches of Brûlé Creek fit the criteria of a headwater refugia, with the added benefit that no initial removal of non-native fish would be required as the upstream reaches do not currently support fish populations.
- Margaret Creek Fish Barrier Creation, Banff National Park
  - Parks Canada is completing a similar reintroduction in Margaret Lake in Banff National Park. Margaret Creek previously had a stepped cascade that allowed for upstream migration of fish into Margaret Lake. In order to create a headwater refugia, Parks Canada completed controlled detonations to create a 2.5-3 m tall barrier.
  - One rotenone treatment was conducted in summer 2022, with another planned for summer 2023.
  - Once the rotenone treatments have been completed and the invertebrate population has been established WCT will be introduced, likely using techniques similar to the Hidden Lake introduction.

The upstream reaches of Brûlé Creek already have a natural barrier separating them from non-native fish, and as such a barrier would not need to be established. Additionally, as rotenone treatments are not required there would be no need to wait for the establishment of aquatic invertebrates, as benthic invertebrates were observed in Brûlé Creek during the field assessment. However, a study is proposed in order to characterize the benthic invertebrate community of Brûlé Creek during the detailed design stages. Provided that overwintering and spawning habitat in Brûlé Creek can be confirmed by the detailed feasibility study, it is anticipated that this candidate is technically feasible.

Land Tenure

The proposed Brûlé Creek fish introduction will occur within provincial Crown land classified as “Forest Management Unit” and “Misc. Reserves”. The fish introduction is anticipated to require a Special Use Permit under the *Forest Practices Code of British Columbia Act*. NWP will submit an Application Form for Special Use Permit to the Ministry of Forest’s Rocky Mountain Natural Resource District during Project permitting to obtain authorization to conduct the offsetting measures in Brûlé Creek. The fish introduction will also require a permit from DFO for introduction or transfer of fish under Section 56 of the *Fishery (General) Regulations*. NWP will also submit an application to DFO’s B.C. Introductions and Transfers Committee during Project permitting to obtain permission for the fish introduction.

3.4.3.4 Monitoring Measures

Effectiveness monitoring will be undertaken to confirm the established population is functioning and self-sustaining following introduction. Effectiveness monitoring measures may include:

- eDNA monitoring;
- Multi-year mark-recapture studies;
- Spring redd/spawning surveys.

3.4.4 Elk River Channel Enhancement

The Garrett Ready Mix site was assessed for potential offsetting projects and following approval of the project is planning to engage the Nature Conservancy Canada to discuss fish habitat enhancement and restoration. A side channel to the Elk River that flows adjacent to the site was identified for potential restoration. A review of historical aerial imagery showed that the side channel was previously the main channel of the Elk River; however, it underwent lateral migration likely due to a flood event and has been partially infilled with bed load. Scour leading to bank collapse at the Garrett Ready Mix operation site on the left downstream bank caused deposition of concrete and asphalt and other deleterious materials on the slope of the bank, further confining the Elk River. The banks of the side channel consist of silty deposition material (downstream right bank) and the heavily scoured, debris covered bank lacking riparian vegetation.

NWP is proposing to restore the site and enhance the side channel to create off-channel habitat on the Elk River which is limiting habitat and therefore valuable to a number of fish populations within the Elk River watershed. This will be completed by:

- Breaking up and removing concrete, asphalt, and other anthropogenic debris from the banks;
- Restoration of banks, including building up and stabilization of the banks and gravel bar;
- Planting native riparian vegetation; and
- Addition of habitat features to the side channel (e.g., root wads).

3.4.4.1 Location

The conceptual fish habitat offsetting plan for the Elk River channel is outlined in Figure 7.

3.4.4.2 Anticipated Habitat Function

The cleanup of debris, restoration of the banks, and enhancement of side channel habitat will restore and enhance the habitat of the side channel, providing habitat benefits for fish species within the Elk River. In particular, the offsetting measures will enhance side-channel rearing habitat for salmonids. Habitats intended to benefit from the offsetting measures include:

- Instream Habitat
- Direct enhancement of off-channel rearing habitat through the addition of instream habitat features (e.g., root wads).
- Riparian Habitat
- Restoration of currently non-functional riparian zone (i.e., due to presence of concrete and asphalt debris);
- Improves rearing habitats by providing shade and cover habitat;
- Reduce erosion and sedimentation by removing concrete debris and restoration of riparian vegetation and soil to capture runoff; and
- Anticipated to provide additional benefits through supporting nutrient input into the Elk River.

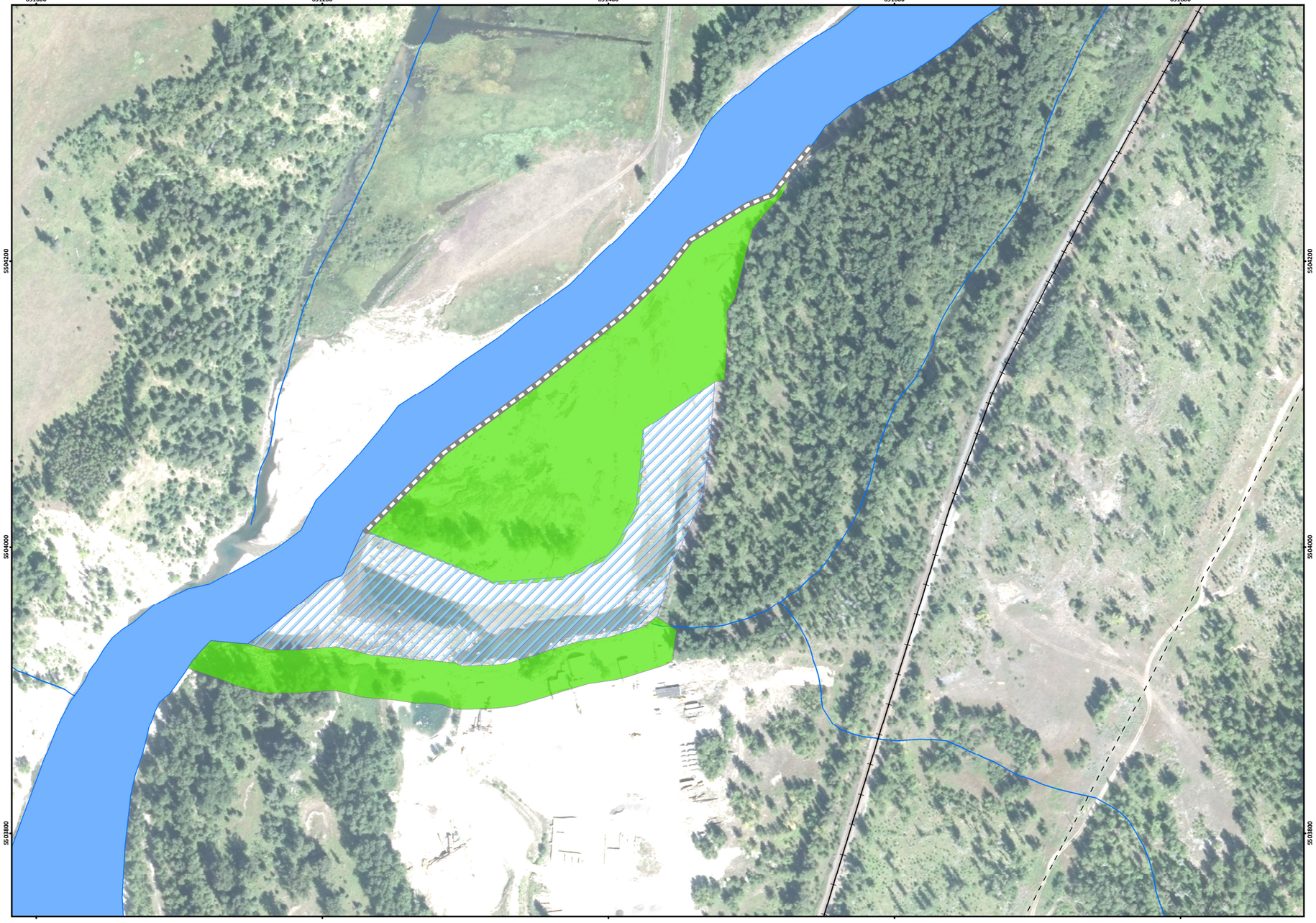


Photo 1 Elk River backwater channel looking downstream showing debris on bank and lack of riparian vegetation.

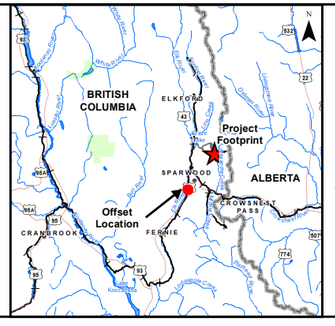
Photo 2 Elk River backwater channel looking upstream showing lack of riparian vegetation on mid-channel bar.

Crown Mountain Fish Habitat Conceptual Offsetting Plan

Figure 7
Elk River Channel Enhancement

LEGEND

- Riparian Offset
- Waterbody (Enhancement)
- Riprap Armouring / Slope Protection
- Railway
- Transmission Line
- Waterbody
- Watercourse



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Map Created By: JFC, RBB
Map Checked By: HEB
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3.4.4.3 Feasibility

Restoration and enhancement of off-channel habitat is a common approach to offsetting with many successful examples. However, the Elk River is a large watercourse, with the potential to change due to changes in elevation or water volume (e.g., through floods). The final off-channel habitat design will be engineered to withstand flood events using river flow analysis, and with appropriate analysis and engineering the detailed design is expected to be durable.

Land Tenure

The Garrett Ready Mix operations site is located on NCC lands within the Elk Valley. NWP will continue their ongoing discussions with NCC, and following project approval will discuss the opportunity to conduct fish habitat enhancement works on this land. NWP is prepared to explore purchasing lands to complete the offsetting works.

3.4.4.4 Monitoring Measures

Effectiveness monitoring will be undertaken to confirm that the restored habitat is functioning and stable following construction. Effectiveness monitoring measures may include:

- Riparian planting success monitoring (e.g., species composition, growth and density of riparian vegetation); and
- Monitoring of the stability of restored or enhanced features (e.g., root wads) to determine the stability of the structures.

3.4.5 Elk River Side Channel Creation

In addition to the impacted side channel, the Garrett Ready-Mix Site contains a large quarry, separated by the Elk River by a relatively thin earthen berm, located at the south end of the property. The quarry is variable in elevation and maintains water depth likely due to subsurface connection with the Elk River. NWP is proposing to create new side channel and rearing habitats within the quarry and connect the quarry to the Elk River to create new off-channel rearing habitats. This will be completed by:

- Designing and enhancing off-channel habitat through grading banks and placement/ removal of fill;
- Establishing instream habitat by constructing habitat features (e.g., root wads, boulders);
- Removal of anthropogenic debris from the quarry in the area of restoration and enhancement;
- Creating functional riparian habitat through riparian planting (including potential wetland creation); and
- Establishing connectivity between the new off-channel habitat and the Elk River by opening a section of the existing berm and constructing a side channel, complete with additional instream and riparian habitat features.

3.4.5.1 Location

The conceptual fish habitat offsetting plan for the Elk River side channel is outlined in Figure 8.

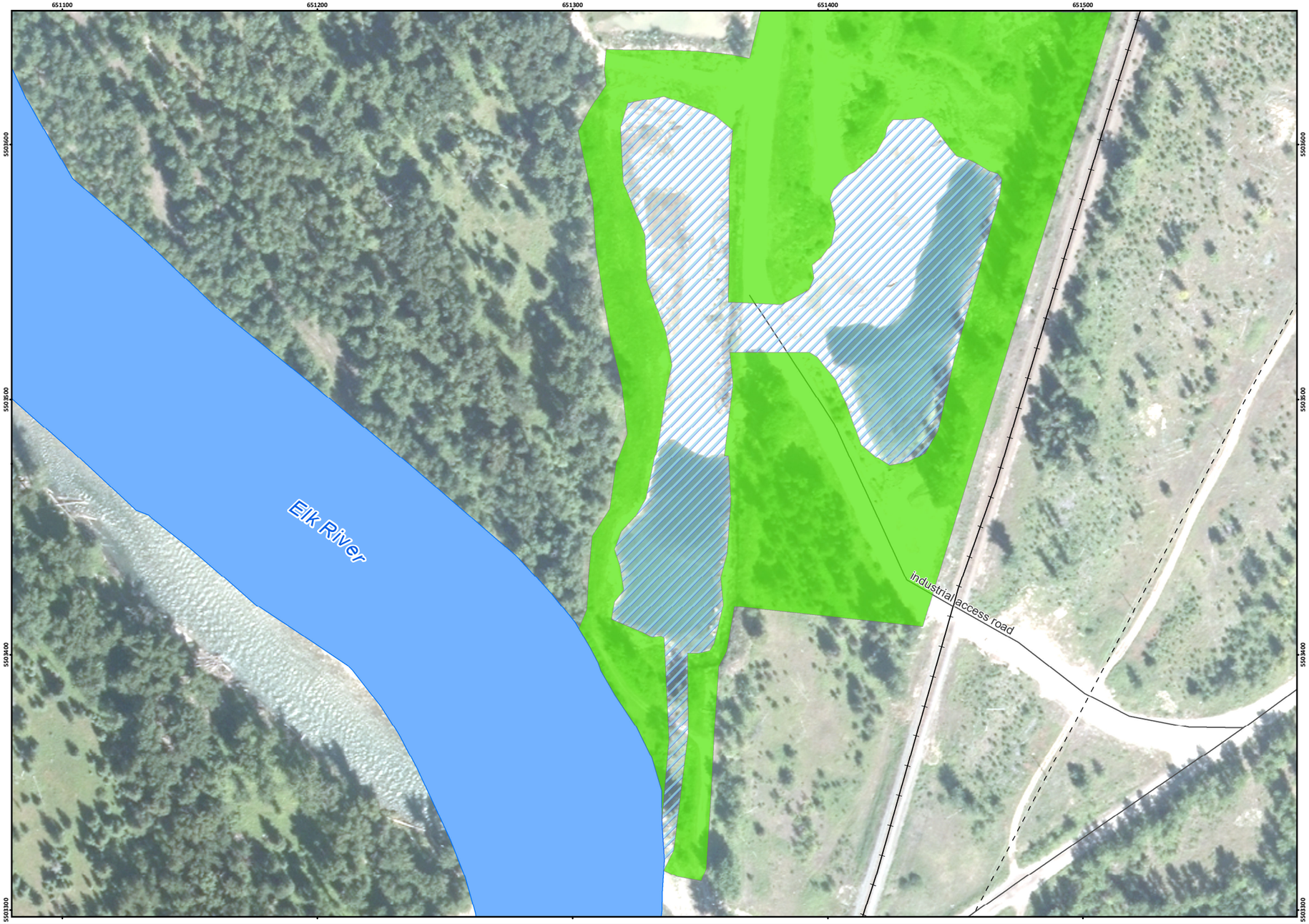


Photo 1 Northern end of quarry.

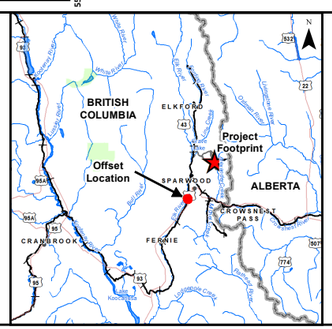
Photo 2 Southern end of old quarry separated from the Elk River by an earthen berm.

Crown Mountain Fish Habitat Conceptual Offsetting Plan

Figure 8
Elk River Side Channel Creation

LEGEND

- Riparian Offset
- Waterbody (New)
- Local/Resource Road
- Railway
- Transmission Line
- Waterbody



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3.4.5.2 Anticipated Habitat Function

The construction of new habitat and subsequent connection to the Elk River will create new, previously unavailable off-channel habitat for a variety of fish within the Elk River. In particular, the offsetting measures will create side-channel rearing habitat for salmonids and forage fish. Habitats intended to benefit from the offsetting measures include:

- Instream Habitat
- Direct creation of off-channel rearing habitat, including habitat features (e.g., root wads, boulders), increasing availability of a habitat type that is relatively uncommon within the Elk River (off channel rearing habitat); and
- Potential to create deep overwintering habitat off the main channel of the Elk River.
- Riparian Habitat
- Creation of new riparian zone, enhancing rearing habitat by creating cover and shade; and
- Anticipated to provide additional benefits through increased nutrient input into the Elk River.

3.4.5.3 Feasibility

Creation of off-channel habitat is a known approach to offsetting with successful examples. With proper engineering, the newly established habitat would be expected to be durable.

Land Tenure

The Garrett Ready Mix operations site is located on NCC lands within the Elk Valley. NWP will continue their ongoing discussions with NCC, and following project approval will discuss the opportunity to conduct fish habitat restoration and enhancement works on this land. NWP is prepared to explore purchasing lands to complete the offsetting works.

3.4.5.4 Monitoring Measures

Effectiveness monitoring will be undertaken to confirm that the new habitat is functioning and stable following construction. Effectiveness monitoring measures may include:

- Riparian planting success monitoring (e.g., species composition, growth and density of riparian vegetation);
- Monitoring of the stability of instream features (e.g., root wads) to determine the stability of the structures;
- Conduct active and passive sampling of fish to determine use of the new habitat by fish; and
- Monitoring of the channel connecting the quarry to the Elk River in effort to maintain connectivity so that fish cannot be stranded.

3.4.6 Ingham Channel

The existing unnamed watercourse adjacent to the "Ingham Rest Station" has a defined channel within the upstream reaches. Located east of Highway 3 and approximately 10 km south of Sparwood, this channel crosses and flows along and across the TransCanada hiking trail in several locations, before going subsurface downstream of the Ingham site. Some channel engineering and armouring has occurred where the channel flows adjacent to the trail and the BC Hydro right of way. Eventually, it is believed that water from the watercourse flows subsurface through a forested stand and into an open-water wetland recently restored by the Elk River Alliance (ERA) in partnership with the NCC. Based on historical results from the B.C. Habitat Wizard (Province of B.C., 2022), historically the channel held cutthroat trout and brook trout, indicating that base flows are likely sufficient to support trout populations. However, with no connectivity to larger downstream waterbodies or watercourses, fish passage is restricted.

NWP is proposing to channelize the watercourse to create surficial flow from the upstream reaches of the watercourse to the downstream wetland. This would create flowing-water habitat for potential fish species present in adjacent waterbodies adjacent to the wetland and highway and create additional habitat for fish potentially present upstream of the wetland. There is also potential at this site for additional channelization to occur downstream of the wetland which would restore connectivity to the Elk River.

3.4.6.1 Location

The conceptual fish habitat offsetting plan for the Ingham channel is outlined in Figure 9.

3.4.6.2 Anticipated Habitat Function

The construction of new fish habitat and subsequent connection to the downstream wetland will create new, previously unavailable habitat for fish within the wetland. Habitats intended to benefit by the offsetting measures include:

- Instream Habitat
- Direct creation of upstream habitat through creation of a channel; and
- Provide access to upstream habitats within the unnamed watercourse.
- Riparian Habitat
- Creation of new riparian zone, enhancing rearing habitat by creating cover and shade for fish.

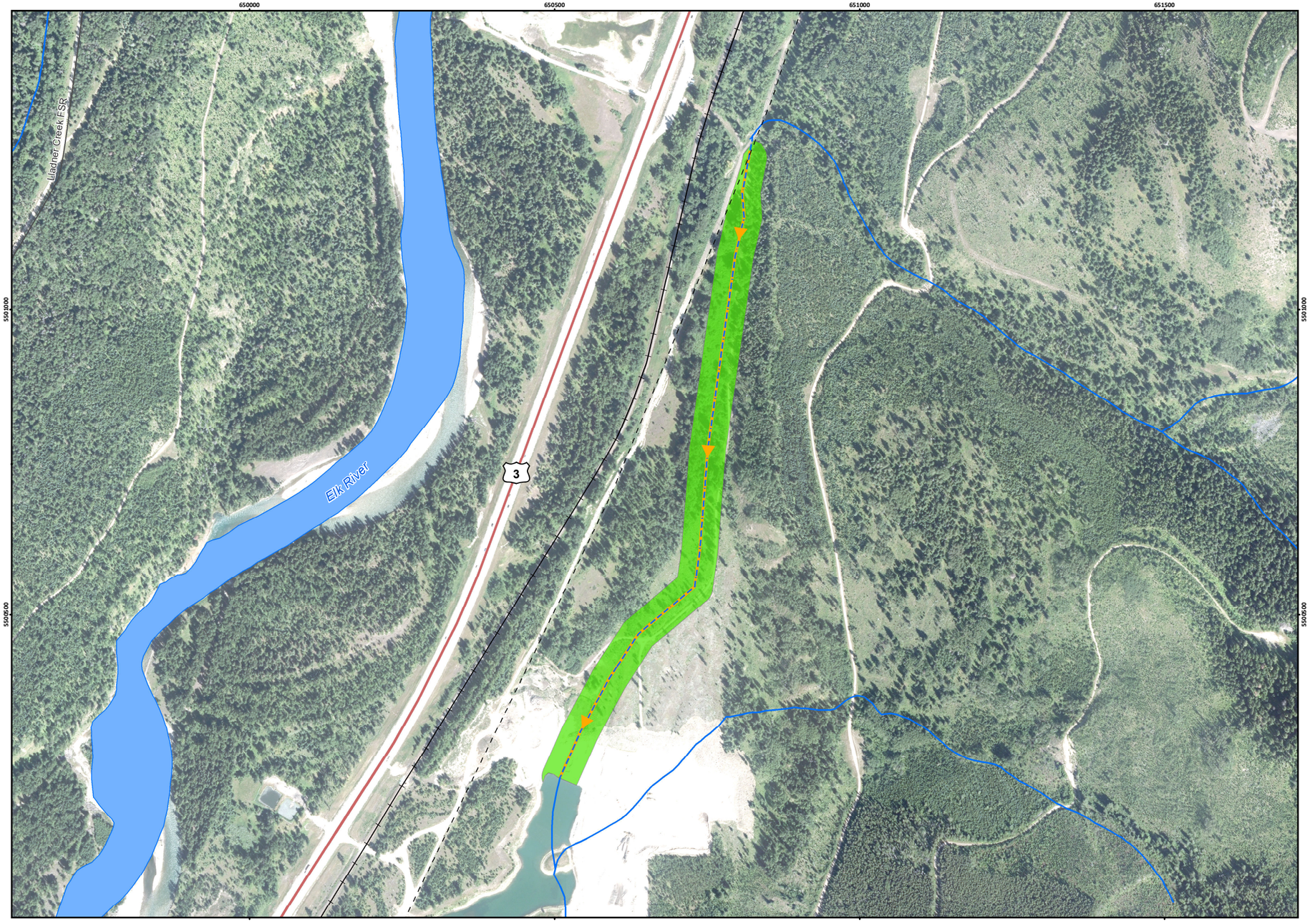


Photo 1 Decreased flows downstream of engineered channel.

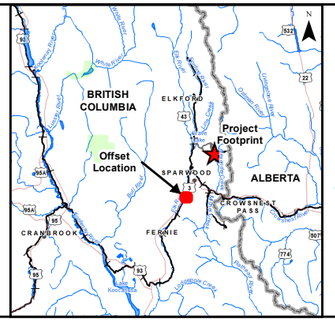
Photo 2 Loss of defined channel into treed area.

Crown Mountain Fish Habitat Conceptual Offsetting Plan

Figure 9
Ingham Channel Connection

LEGEND

- Riparian Offset
- Watercourse Offset
- Highway
- Local/Resource Road
- Railway
- Transmission Line
- Waterbody
- Watercourse
- Watercourse (Subsurface)



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3.4.6.3 Feasibility

Creation of a permanent bed and banks of the channel of the watercourse will require analysis of substrate and underlying geology, a review of the anticipated hydroperiod to accommodate snow-melt runoff and dry periods in the fall, and the quantification of available habitat upstream and downstream of the proposed channel restoration area. With proper analysis and engineering it is anticipated that the restoration of the wetted channel and associated habitat will be feasible and long-lasting.

Land Tenure

The Ingham channel site is located on NCC land. NWP will continue their ongoing discussions with NCC, and following project approval will discuss the opportunity to conduct fish habitat restoration and enhancement works on this land. NWP is prepared to explore purchasing lands to complete the offsetting works.

3.4.6.4 Monitoring Measures

Effectiveness monitoring will be undertaken to confirm that the new habitat is functioning and stable following construction. Effectiveness monitoring measures may include:

- Riparian planting success monitoring;
- Monitoring of the stability of instream features (e.g., root wads) to determine the stability of the structures;
- Conduct active and passive sampling of fish to determine use of the new habitat by fish;
- Monitoring of the stability and water levels of the new channel to monitor ongoing availability and connectivity of the habitat.

4.0 Characterization of Offsetting Value

The amount of offsetting required to balance the predicted residual effects requires that offsetting measures are proportional to predicted project impacts and account for uncertainty and time lag to intended functionality. To determine the amount of offsetting required to counterbalance the predicted residual effects of the Project, a "relative productivity" approach is being proposed to assess the value of habitats permanently lost or altered as a result of the Project and those habitats gained and enhanced through the proposed offsetting measures. This evaluation includes an evaluation and comparison of the following:

- Habitat(s) permanently lost or altered from the proposed project-related activities;
- Habitat(s) permanently lost or altered from the creation of proposed offsetting measures; and
- Habitat(s) created from the proposed offsetting measures.

Bradford et al., (2016) indicates that "in the context of offsets, 'equivalency' refers to the process to determine the amount and nature of offsets required to achieve a fair exchange between project impacts and gains" (Bradford et al., 2016). The proposed relative productivity approach involves the determination of Relative Habitat Values (RHV) for the existing habitat types, as well as those habitat types that are proposed through the offsetting measures. The RHVs were developed through a review of existing RHV literature including Williams and Associates Ltd. (2005) and Short et al., (2000), as well as professional opinion and guidance.

Bradford (2017) was reviewed to consider accounting for time lags and uncertainty associated with the proposed offsetting measures. Through our review, the following RHVs were developed for habitat associated with the Project and offsetting measures; summarized below in Table 7 and Table 8. The relative productivity calculations are completed by multiplying the RHVs by the areas (m^2) of the habitat(s) that are lost, altered, and/or created to produce a value termed "Productivity-Adjusted Area" that serves as a standardized productivity measurement to assess impacts and develop offsetting. The relative productivity calculations are summarized in Section 5.0 (Table 9).

Table 7: **Summary of Potentially Impacted Habitat Types and Associated Relative Habitat Values**

Project Component	Habitat Type	Relative Productivity	Habitat Description	Impact Type	RHV Rationale	RHV
Crown Mountain Coking Coal Project	Instream Habitat (Fish Bearing)	Moderate	Cascade-pool morphology instream habitat.	Habitat Loss	Fish bearing instream habitat within Reach 1 and Reach 2 of West Alexander Creek was chosen to represent the baseline RHV of 1.0	1.0
	Instream Habitat (Non Fish Bearing)	Moderate	Non-fish bearing habitat, due to one or more factors making habitat unsuitable to directly support fish (steep gradients, barriers, or frequent dewatering)	Habitat Loss	Assuming the RHV standard of 0.5, habitat is considered to be of lower comparative value. Provides nutrient input and stream maintenance but does not support critical fish lifestage habitat.	0.5
	Riparian Habitat	Moderate	Mature forest adjacent to Instream Habitat (Fish Bearing)	Habitat Loss	Assuming the RHV standard of 0.5, riparian habitat is considered to be of lower comparative value. Provides cover, nutrient input and shading.	0.5

Table 8: **Summary of Candidate Sites for Application of Conceptual Offsetting Measures and Associated Relative Habitat Values**

Project Component	Habitat Type	Relative Productivity	Habitat Description	Impact Type	RHV Rationale	RHV
Weigert Creek Crossing Replacements	Instream Habitat	High	Instream fish-bearing habitat resulting from the restoration of fords, increased connectivity, and riparian planting in exposed areas to create shade	Habitat Enhancement	Removal of the fords will directly enhance habitats previously within the ford, making habitat of comparable productivity to the RHV standard of 1.0 available for fish. Increased connectivity from removal of the fords will allow for increased upstream migration and reduced downstream sedimentation.	1.0
	Riparian Habitat	Moderate	Restored and enhanced riparian vegetation adjacent to decommissioned fords and exposed areas	Habitat Enhancement	Restored and enhanced riparian habitat will be of comparable productivity to the riparian habitat of RHV 0.5 lost as a result of the Project	0.5
Grace Creek Crossing Replacements	Instream Habitat	High	Restored connectivity to instream habitat	Habitat Gain	Increased connectivity from the crossing replacements will make instream habitat of comparable productivity to the RHV standard of 1.0 available for fish	1.0

Project Component	Habitat Type	Relative Productivity	Habitat Description	Impact Type	RHV Rationale	RHV
Brûlé Creek Fish Introduction	Instream Habitat	High	Newly available instream habitat directly available for fish	Habitat Gain	Introduction of WCT will make instream habitat of comparable productivity to the RHV standard of 1.0 available for fish. However, as the population will be physically isolated from other fish species with the intent of preserving a genetically pure WCT population, a unique characteristic for the region, this habitat is considered to be of higher value	3.0
	Riparian Habitat	High	Habitat Gain	Not applicable	Riparian habitat is not currently in need of restoration or enhancement	-
Elk River Side Channel Improvements	Instream Habitat	High	Enhanced side-channel rearing habitat	Habitat Enhancement	Instream habitat will be enhanced through the addition of habitat features. Off-channel habitat is less common in the Elk River watershed, increasing its relative value. As such, the improved off-channel habitat has been given an RHV of 2.0.	2.0
	Riparian Habitat	Moderate	Removal of anthropogenic debris, restored and enhanced riparian vegetation, and improvement of flood, and erosion and protection measures	Habitat Enhancement	Restored and enhanced riparian habitat, with the addition of flood and erosion and sediment protection measures, as well as site cleanup and removal of debris will restore riparian habitats in rare off-channel habitat. As such, the riparian habitat has been given an RHV of 1.0.	1.0

Project Component	Habitat Type	Relative Productivity	Habitat Description	Impact Type	RHV Rationale	RHV
Elk River Side Channel Creation	Instream Habitat	High	Newly created side channel rearing habitat	Habitat Gain	Instream habitat will be gained through the addition of newly available habitat with habitat features, comparable in productivity to the RHV standard of 1.0	2.0
	Riparian Habitat	Moderate	Newly created riparian habitat, removal of anthropogenic debris, and improved flood, and erosion and protection measures	Habitat Gain	New riparian habitat with the addition of flood and erosion and sediment protection measures will create new riparian habitat in rare off-channel habitat. As such, the riparian habitat has been given an RHV of 1.0.	1.0
Ingham Channel	Instream Habitat	High	Newly created and connected instream habitat	Habitat Gain	Instream habitat will be gained through the addition of newly available habitat and restored access. Habitat will be comparable in productivity to the RHV standard of 1.0	1.0
	Riparian Habitat	Moderate	Newly created riparian habitat	Habitat Gain	New riparian habitat will be of comparable productivity to the riparian habitat of RHV 0.5 lost as a result of the Project	0.5

5.0 Summary of Conceptual Offsetting Plan

Five candidate locations within the RSA have been selected to offset the loss of fish habitat in West Alexander Creek resulting from the Project design. The five candidate locations selected at the conceptual planning stage consist of Weigert Creek, Grace Creek, Brûlé Creek, the Elk River, and Ingham Channel. Each site has been evaluated against several criteria to assess the function of the habitat present to support local fish populations including WCT and BT populations, add value by providing limiting habitat within the region, alignment with local priorities, and overall feasibility of construction, durability/resiliency, and implementation certainty/success (Section 3.2 and Section 3.3.3). Candidate sites were also discussed with stakeholders exploring opportunities for partnerships including the Elk River Alliance, the Nature Conservancy of Canada, and the Canadian Wildlife Federation.

In consideration of the restoration and enhancement measures to offset fish habitat loss as described above, and the calculated RHVs associated with each location's conceptual plan, a combined area of approximately 227,428 m^2 of (productivity-adjusted) habitat to restore and enhance has been identified (Table 9). This total area includes approximately 109,815 m^2 of riparian habitat and 117,614 m^2 of instream habitat in order to offset the loss that is anticipated to result from the Project. As a result, this conceptual plan provides a net gain of approximately 6,022 m^2 of fish habitat offset. NWP is committed to providing viable measures to offset fish habitat and continuing discussions with stakeholders and engaging Indigenous communities to compensate for the residual HADD resulting from the proposed Project per the requirements outlined under the *Fisheries Act*.

Table 9: **Summary of Conceptual Fish Habitat Offsetting Plan for Total Area Enhanced (m^2) and Productivity-Adjusted Area (m^2).**

Project	Habitat Type	Area Lost (m^2)	Area Enhanced (m^2)	Area Gained (m^2)	Relative Habitat Value	Total Area (m^2)	Productivity-Adjusted Total Area (m^2)
Crown Mountain Coking Coal Project	Instream Habitat (Fish Bearing)	35,165	0	0	1.0	-35,165	-35,165
	Instream Habitat (Non-Fish Bearing)	11,182	0	0	0.5	-11,182	-5,591
	Riparian Habitat	361,300	0	0	0.5	-361,300	-180,650
					Total (Crown Mountain Coking Coal Project; m^2):	-407,647	-221,406
Weigert Creek Crossing Replacements	Instream Habitat	0	5,320	0	1.0	+5,320	+5,320
	Riparian Habitat	0	26,097	0	0.5	+26,097	+13,049
Grace Creek Crossing Replacements	Instream Habitat	0	0	5,738	1.0	+5,738	+5,738
Brûlé Creek Fish Introduction	Instream Habitat	0	0	11,345	3.0	+11,345	+34,035
Elk River Side Channel Improvements	Instream Habitat	0	20,702	0	2.0	+20,702	+41,404
	Riparian Habitat	0	37,958	0	1.0	+37,958	+37,958
Elk River Side Channel Creation	Instream Habitat	0	0	15,005	2.0	+15,005	+30,009
	Riparian Habitat	0	0	26,023	1.0	+26,023	+26,023
Ingham Channel	Instream Habitat	0	0	1,108	1.0	+1,108	+1,108
	Riparian Habitat	0	0	65,570	0.5	+65,570	+32,785
						Total Riparian Gain (m^2):	+109,814
						Total Instream Gain (m^2):	+117,614
						Total Net Gain (m^2):	+6,022

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