

the confluence with Grave Creek. The dam creates Harmer Pond and is a barrier to upstream fish movement (Lotic Environmental, 2015). This section of the Aquatic LSA was not applicable to the assessment of fish and fish habitat as it is an isolated region not anticipated to be impacted by the Project. The Fish and Fish Habitat LSA also considers other land users within these watersheds. The Fish and Fish Habitat LSA includes the Alexander Creek and Grave Creek watersheds and has an approximate area of 235 km² (Figure 12.2-1). The Alexander Creek watershed captures flow leaving the Project footprint to the south and east, while the northern and western limits of the Fish and Fish Habitat LSA are defined by the Grave Creek watershed. Teck’s Elkview Operations is located immediately west of the Fish and Fish Habitat LSA and contributes surface water flow into the lower reaches of Grave Creek. The Fish and Fish Habitat LSA is therefore limited to the area the Project is anticipated to interact with fish and fish habitat.

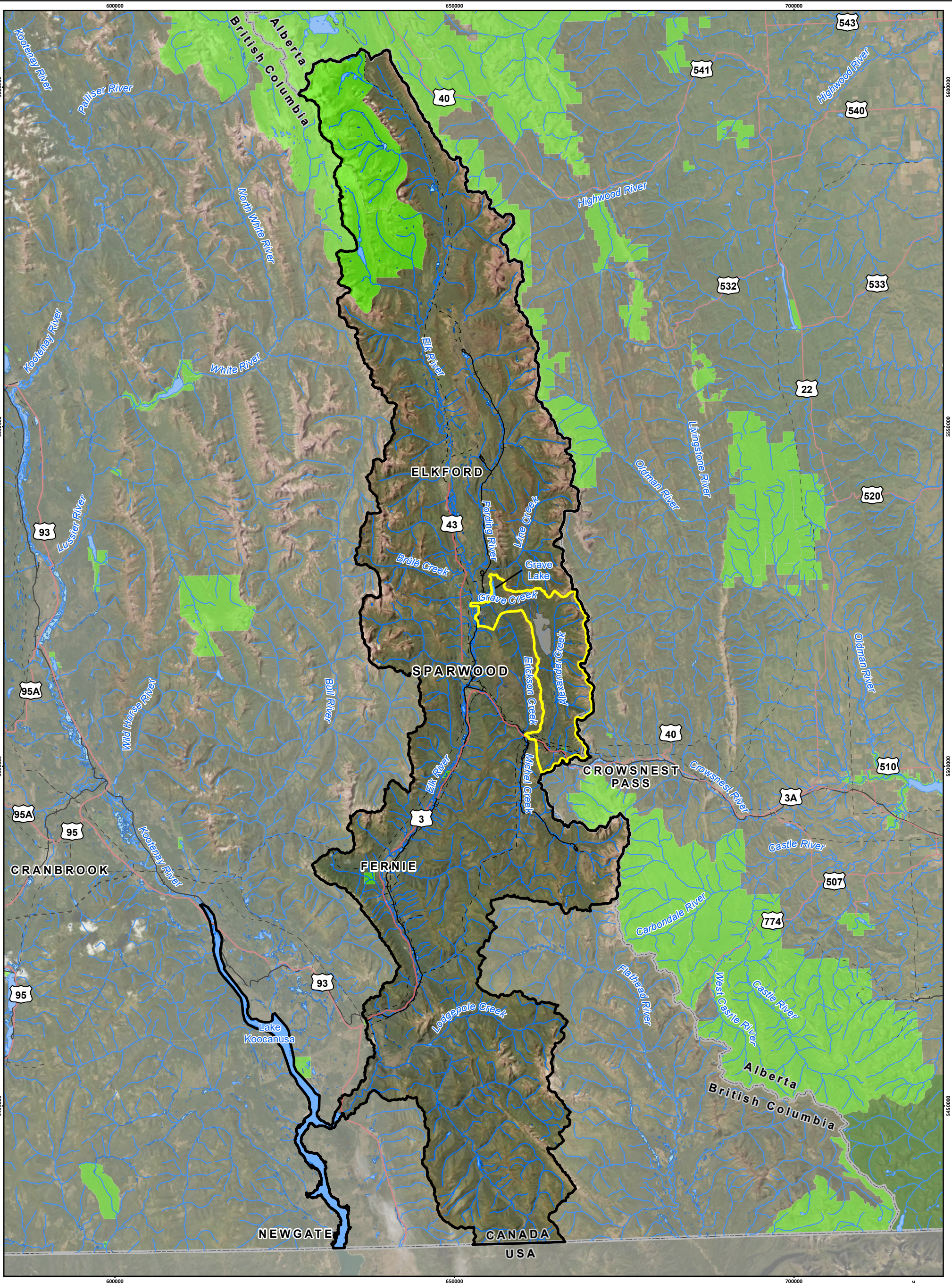
The Aquatic RSA generally encompasses the full extent of the Elk River watershed and the portion of Lake Koochanusa between the outlet of the Elk River, approximately 80 km southwest of the Project, and the Canada-United States of America (U.S.A.) border (Figure 12.2-2). The Aquatic RSA referred to in this chapter has the same spatial extent as the RSA used for the surface water quality and surface water quantity assessments. The Aquatic RSA extends beyond the Fish and Fish Habitat LSA and covers a total geographic area of approximately 4,380 km². The Aquatic RSA comprises the regional area in which the aquatic environment could potentially be directly or indirectly impacted by the Project and is the area within which cumulative effects of the Project will be assessed. The headwaters of the Elk River watershed originate within Elk Lakes Provincial Park and the Elk River flows in a southerly direction to its outlet into Lake Koochanusa. Streamflows in the lower reaches of the Elk River are regulated by a hydroelectric dam near Elko (Elko Dam), which is operated by B.C. Hydro.

12.2.3.2 Temporal Boundaries

Temporal boundaries include the time periods during which the Project is anticipated to result in potential effects on VCs (EAO, 2013). The temporal boundaries considered in the assessment include the temporal limits of the Project in terms of its Construction and Pre-Production, Operations, Reclamation and Closure, and Post-Closure phases. The temporal boundaries of the Project used in the effects assessment include the timing of Project phases and activities as outlined in Table 12.2-3. Additional details on the Project phases and activities are provided in Chapter 3.

Table 12.2-3: Temporal Boundaries for the Project Effects Assessment for Fish and Fish Habitat

Phase	Project Year	Length of Phase (Years)
Construction and Pre-Production	1 – 2	2
Operations	3 – 17	15
Reclamation and Closure	18 – 19	2
Post-Closure	20 – 34	15

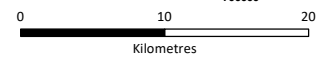


Crown Mountain Coking Coal Project

Figure 12.2-2
Aquatic Regional Study Area (RSA)

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



Scale 1:525,000

Map Drawing Information:
 Data Provided by NWP Coal Canada Ltd, Dillon Consulting Limited, Province of British Columbia GeBC Open Data, Government of Alberta Open Data, Natural Resource Canada, Elk Valley Water Quality Plan.
 Imagery Provided by ESRI.
 Map Created By: RB
 Map Checked By: HEB
 Map Coordinate System: NAD 1983 UTM Zone 11N



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12.2.3.3 Administrative Boundaries

Administrative boundaries refer to the limitations imposed on the assessment by political, economic, or social constraints and consider the jurisdiction in which the Project is located. In addition to the applicable regulatory and policy framework as outlined in Table 12.1-1, the Project falls within the resource management area boundaries of Fisheries and Oceans Canada (DFO's) Pacific Region and the B.C. Ministry of Forests, Lands, Natural Resources Operations and Rural Development (FLNRORD) Rocky Mountain District in Kootenay Region 4.

Pathways in which the Project may result in death of fish or changes to fish habitat are outlined by DFO's Fish and Fish Habitat Protection Program, as well as the regulatory process for compliance with the amended *Fisheries Act* (DFO, 2019a and DFO, 2019b).

The *Fisheries Act* provides a framework for the conservation and protection of fish and fish habitat. Specifically, the fish and fish habitat protection provisions include:

- A prohibition against works, undertakings or activities resulting in the death of fish by means other than fishing;
- A prohibition against works, undertakings or activities resulting in HADD of fish habitat without an authorization;
- A prohibition regarding the unauthorized release of deleterious substances to waters frequented by fish;
- Factors to consider to guide the Minister's regulatory decision making; and
- Ministerial powers to ensure free fish passage, sufficient water flows, and to manage or control obstructions for the protection of fish or fish habitat, among other requirements.

Canadian Environmental Quality Guidelines (CEQGs) provide science-based goals for the quality of aquatic and terrestrial ecosystems. The CCME guidelines include water quality guidelines for the protection of aquatic life for: five neonicotinoid insecticides; nickel; and polycyclic aromatic hydrocarbons (PAHs). There are well developed guidelines for the Protection of Aquatic Life; these guidelines are intended to protect all forms of aquatic life and all aspects of aquatic life cycles, including the most sensitive life stage of the most sensitive species over the long term from anthropogenic stressors such as chemical inputs or changes to physical components. They provide the science-based benchmark for a nationally consistent level of protection for aquatic life in Canada.

Water Quality Objectives (WQOs) provide approved policy direction to guide the balance between human use, values, and healthy aquatic environments by guiding statutory decisions that may impact the quality of a specific waterbody. WQOs are established on a priority basis for freshwater, estuarine, and marine waterbodies of regional, provincial, inter-provincial, and international significance. They are used to inform resource management decisions, identify which values should be addressed based on local concerns, promote water stewardship, and support long-term planning in communities across B.C. WQOs are numbers or statements representing low-risk conditions to provide protection for a specific waterbody and its associated water values and uses. These include:

- Drinking water sources;
- Aquatic life and its habitat;
- Wildlife and its habitat;
- Agriculture (livestock watering and irrigation);

- Recreational use and aesthetics; and
- Traditional, cultural, and social uses.

The EV-CEMF is part of the Provincial Cumulative Effects Framework, which provides policy and strategic directions. Five provincial values – aquatic ecosystems, forest biodiversity, old growth, grizzly bear, and moose have been assessed at a broader scale. A Cumulative Effects Framework Interim Policy was approved by the Natural Resources Sector Board in October 2016 (Province of British Columbia, 2016). The policy provides directions on cumulative effects assessment, engagement and decision support.

12.2.3.4 Technical Boundaries

Technical boundaries represent constraints imposed on the assessment due to limitations in the ability to predict the effects of the Project (EAO, 2013). Technical boundaries for the assessment of potential effects to fish and fish habitat include:

- Limitations imposed by the constraints of the baseline data collection, data coverage, and lack of historically available data for Alexander Creek;
- Assumptions required in the predictive models, specifically the water and load balance model; and
- Uncertainties related to other assessment disciplines such as sediment and toxicological benchmark assessments, which are closely linked to outputs from the water quality model.

12.3 Regional and Local Overview

Key watercourses in the Project footprint, Fish and Fish Habitat LSA, and Aquatic RSA include the Elk River, Michel Creek, Alexander Creek, West Alexander Creek, Harmer Creek, and Grave Creek (Figure 12.2-1; Figure 12.2-2). Waterbodies in the immediate vicinity of the Project include Grave Lake, Harriet Lake, Mite Lake, and Barren Lake. For more details on the watersheds in the Fish and Fish Habitat LSA and Aquatic RSA, refer to Chapter 10.

Current land uses within the Fish and Fish Habitat LSA and Aquatic RSA include: residential, recreational (e.g., hunting, ATV trails, fishing, hiking, etc.), exploration, resource, industrial, rangeland, agriculture, and forestry. Mining in the East Kootenay has been ongoing for well over a century, with coal being the dominant resource extracted in the area. Additional information on past and present land uses is provided in Chapter 1, Section 1.3.2.

The Elk River Valley is extensively used as a recreational fishery, particularly the section of the Elk River between Sparwood and Elkford. Lakes located within the vicinity of the Project are used for recreational fishing and some are stocked with sportfish, according to the Freshwater Fisheries Society of B.C. (2020). Given the high recreational fishing pressure in the area, the Elk River and its tributaries are designated as Classified Waters (FLNRORD, 2019), including Alexander Creek which occurs east of the Project and within the coal licence areas. Classified Waters require a special angling license to fish the waters and were created to preserve the unique fishing opportunities provided by highly productive trout streams in B.C. (FLNRORD, 2019). Fishing is prohibited in Grave Creek and its tributaries (FLNRORD, 2019). Trout or qustit' (including WCT) from the Elk River and tributaries are also important to the Ktunaxa Nation as they provide an important food source and hold cultural significance (Davidson et al., 2018)

The management of cumulative effects to aquatic ecosystems is an ongoing concern in the Elk Valley due to historic, current, and ongoing mining, timber harvesting, recreation, and municipal development pressures in the area (Davidson et al., 2018; Province of B.C., 2020). WCT and riparian habitat (primarily discussed in Chapter 13) were selected as VCs for EV-CEMF, as discussed in Section 12.1.1. Although many healthy WCT populations persist in the East Kootenay, the species faces severe reductions to distribution and abundance throughout its range due to over-harvest, habitat fragmentation and degradation, water quality impacts, hybridization and competition with non-native salmonids, and climate change impacts to streamflows and thermal regimes (Davidson et al., 2018). In addition, high-quality WCT habitat is primarily controlled by riparian areas, which have been extensively impacted by anthropogenic disturbance in the Elk Valley (Davidson et al., 2018). Although EV-CEMF focuses on WCT, many of these impacts negatively impact all fish species in the Elk Valley. Mitigation efforts and management responses to WCT and riparian habitat impacts in the Elk Valley are ongoing to ensure the long-term sustainability of aquatic ecosystems in the region.

12.4 Existing Conditions

This section describes the existing conditions in the Project footprint, Fish and Fish Habitat LSA, and Aquatic RSA in sufficient detail to enable potential effects of the Project on fish and fish habitat and aquatic health to be identified, understood, and assessed.

12.4.1 Existing Regional and Local Information

Existing regional and local fish and fish habitat information was compiled by conducting a desktop assessment of background information in the Project study areas (i.e., the Project footprint, the Fish and Fish Habitat LSA, and the Aquatic RSA). Information sources included:

- Canadian Species at Risk Public Registry (Government of Canada, 2019);
- British Columbia Conservation Data Centre iMap and Species and Ecosystems Explorer (B.C. CDC, 2020);
- Scientific literature and government reports;
- Research from local non-governmental organizations (NGOs); and
- Other baseline studies completed for projects in the region.

12.4.1.1 Regional and Local Environment

Field studies were completed in 2014, 2017, 2019, and 2020 and included sampling in winter, spring, summer, and fall. A total of 60.1 km of stream length was assessed. Of this, 49.1 km (82%) was determined to be fish bearing, and the remaining 11.0 km (18%) was non-fish bearing. Fish species previously observed within the Fish and Fish Habitat LSA include Westslope Cutthroat Trout, Bull Trout, Eastern Brook Trout, Mountain Whitefish, and Rainbow Trout (*Oncorhynchus mykiss*; Lotic Environmental, 2020a). Additional species found in the Aquatic RSA include Longnose Sucker, Longnose Dace (*Rhinichthys cataractae*), Torrent Sculpin (*Cottus rhotheus*), Burbot, Kokanee, Peamouth Chub (*Mylocheilus caurinus*), and Northern Pikeminnow (*Ptychocheilus oregonensis*). Distribution of Rainbow Trout, Burbot, Kokanee, Peamouth Chub, and Northern Pike Minnow is limited to downstream of Elko Dam on the Elk River and in Lake Koochanusa (Lotic Environmental, 2020a).

Fish and fish habitat baseline studies were completed by Lotic Environmental (2015) in the vicinity of Teck's Elkview Operations. Seven fish species were documented during Lotic's studies: Westslope

Cutthroat Trout, Bull Trout, Eastern Brook Trout, Mountain Whitefish, Longnose Sucker, Longnose Dace, and Redside Shiner (*Richardsonius balteatus*). Westslope Cutthroat Trout were the most widely distributed species observed, and Longnose Suckers were the most abundant (Lotic Environmental, 2015). Golder Associates (2015) conducted selenium baseline studies in the vicinity of Elkview Operations and found the muscle selenium concentrations in Westslope Cutthroat Trout collected from lotic reference sites in 2013 ranged from 2.16 mg/kg (milligram/kilogram) dry weight (dw) in Grave Creek upstream of Harmer Creek to 6.15 mg/kg dw in Upper Harmer Creek (B.C. WQG for the protection of aquatic life is 4 mg/kg (dw)). Muscle concentrations in lotic exposed sites ranged from 4.87 mg/kg dw in Gate Creek to 34 mg/kg dw in Dry Creek (Golder Associates, 2015).

Benthic invertebrate baseline studies were completed by Lotic Environmental (2015) in the vicinity of Teck's Elkview Operations. The lotic project sampling sites had community structures that ranged from being in reference (i.e., undisturbed) condition to being highly divergent from reference condition, according to CABIN analysis. Lotic sites upstream of Elkview Operations were found to be in reference condition at all the locations sampled in 2013, but only one site in Alexander Creek was confirmed to be in reference condition in 2014. It is unclear what drove the decline in benthic invertebrate community condition at the reference sites in 2014, as the majority of invertebrate metrics were similar to 2013 (Lotic Environmental, 2015). Golder Associates (2015) conducted selenium baseline studies in the vicinity of Elkview Operations and found that tissue selenium concentrations in benthic invertebrates collected from lotic reference sites in 2013 ranged from 4.25 mg/kg dw in Grave Creek upstream of Harmer Creek, to 4.76 mg/kg dw in Upper Harmer Creek. Selenium concentrations in benthic invertebrates collected from exposed lotic sites ranged from 2.47 mg/kg dw in Fennelon Creek to 47.5 mg/kg dw in Dry Creek (Golder Associates, 2015).

Baseline studies conducted by Teck in 2009 and 2010 and by Golder Associates in 2010, 2011, and 2013 in the vicinity of Teck's Line Creek and Fording River Operations identified Bull Trout, Brook Trout, Mountain Whitefish, Westslope Cutthroat Trout, Largescale Sucker (*Catostomus macrocheilus*), Longnose Sucker, and Redside Shiner in the lower sections of the Fording River between the confluence with the Elk River and Josephine Falls (Teck Coal Limited, 2011; Golder Associates, 2014). Westslope Cutthroat Trout were the only fish species found in the Fording River upstream of Josephine Falls during both studies.

Cope (2020) conducted a recent study on the Upper Fording River between 2012 and 2019. Results showed that adult counts of Westslope Cutthroat Trout declined by 93% between 2017 and 2019, representing a population viability and sustainability concern. In addition, fry and juvenile densities in the Upper Fording River decreased by 74% between 2017 and 2019 (Cope, 2020). The decrease in fry and juvenile densities was attributed to substantial and significant decreases in both mainstem spawning and fry rearing area and tributary juvenile rearing habitats. Decreases occurred within both mine-influenced reaches and reference reaches, and were also noted in areas that had previously high-density spawning and fry rearing noted, including mine-influenced tributaries (Cope, 2020).

Figure 12.4-1 presents the distribution of the six fish VCs in the Aquatic RSA, while Figure 12.4-2 shows the distribution of the VCs within the Fish and Fish Habitat LSA. Data in the figures are based on B.C. provincial database, existing data, and from baseline sampling conducted as part of the Project's assessment. There is a gradient of distribution present, with Burbot only occurring downstream of Elko and WCT being the most prominent species found in the upper tributaries of the Fish and Fish Habitat LSA. Figure 12.4-3 presents an inventory of existing stream crossings for the Fish and Fish Habitat LSA.