REPORT

2019 Implementation Plan Adjustment

Integrated Effects Assessment

Submitted to:

Teck Coal Limited

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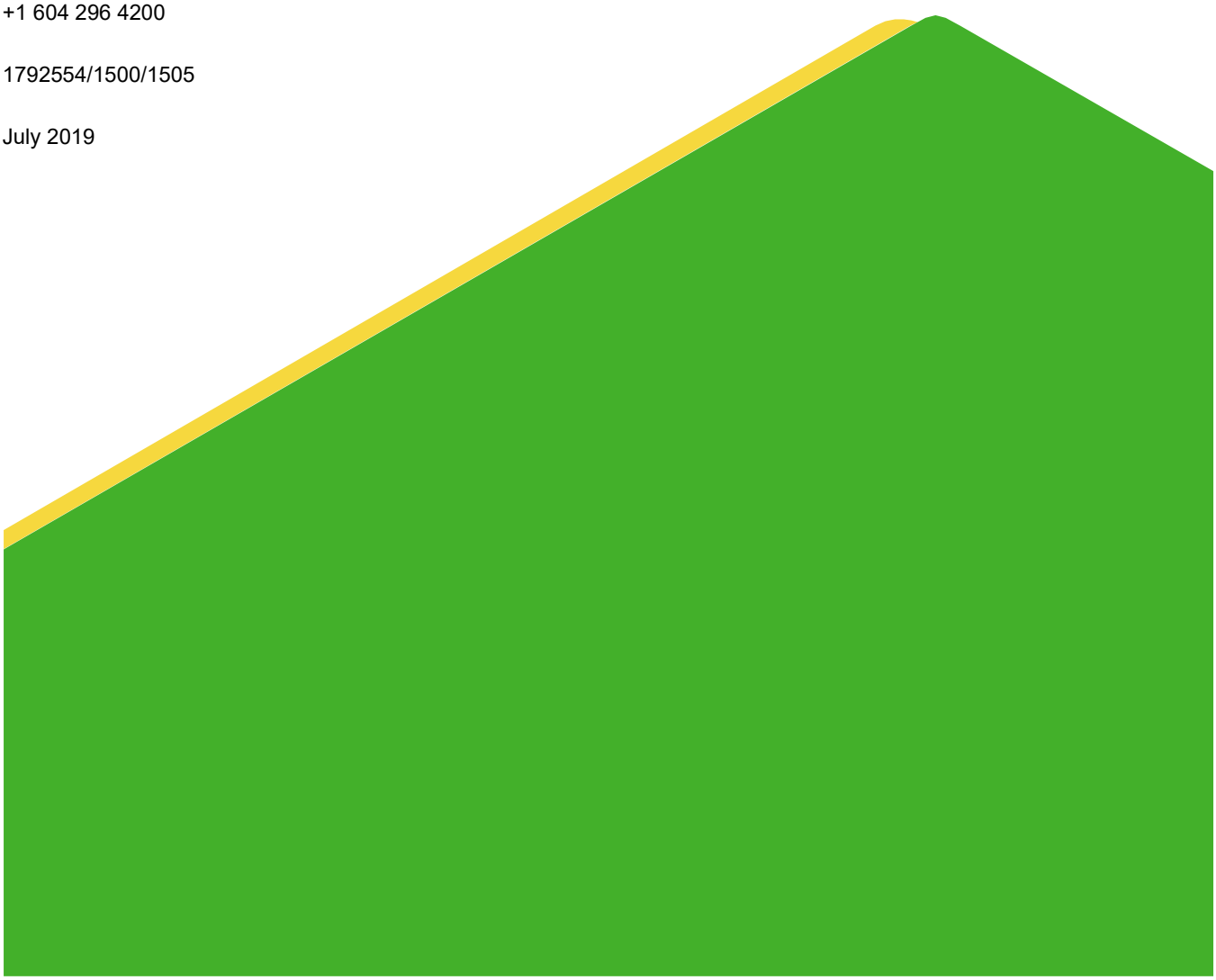

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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) is pleased to provide Teck Coal Limited (Teck) with the following report that summarizes the methods and results of an integrated effects assessment for the 2019 Implementation Plan Adjustment (2019 IPA). The assessment presented herein was conducted to evaluate potential effects to aquatic species related to projected water quality concentrations in excess of the Compliance Limits and Site Performance Objectives (SPOs) outlined in Environmental Management Act Permit 107517.

Integrated effects tables from Annex H (Integrated Assessment Report) of the Elk Valley Water Quality Plan (EVWQP) were used to conduct the assessment. These tables provide a transparent basis for aggregating model output and ecological effects data in a format used and approved as part of the EVWQP.

The spatial resolution of the integrated assessment was at a Management Unit (MU) level, calculating spatially integrated results within each MU using an area-weighted approach. This approach is similar to what was done in the EVWQP (Figure 1). Water quality scenarios considered in the assessment consisted of:

- Conditions in 2016, represented by predicted water quality concentrations for 2016.
- The time period of 2017 to 2022 prior to commissioning of Fording River Operations South (FRO-S) and Elkview Operations (EVO) Phase I Active Water Treatment Facilities (AWTFs).
- The time period of 2023 to 2037, the end of the planning period outlined in the 2019 IPA.

In each scenario, the highest projected monthly average constituent concentrations occurring across the time period of interest were identified and carried forth into the integrated effects assessment. Peak projected concentrations were used because they would represent the highest level of exposure aquatic organisms are likely to experience; hence, they are effective for use in assessing potential effects to aquatic species related to projected concentrations in excess of the Compliance Limits and SPOs.

Conditions in 2016 were defined using modelled data, rather than monitored information, to provide a consistent base of comparison among the three scenarios (i.e., changes to projected levels of effect among the three scenarios related to mine activity, rather than a combination of mine activity and differences between modelled and monitored data). As outlined in Teck (2017), the Regional Water Quality Model (RWQM) accurately simulates concentrations of selenium, nitrate, and sulphate in the Fording and Elk rivers and in Line Creek and Michel Creek – watercourses in which Compliance Points and Order stations were established in Permit 107517. Simulated concentrations replicate observed seasonal and longer-term temporal patterns, observed spatial variability across locations in the river mainstems, and observed concentrations ranges. Thus, the use of modelled versus monitored data in these areas is not expected to alter the conclusions of the integrated effects assessment.

Model performance in mine-influenced tributaries is more variable, and it is acknowledged that observed concentrations in some areas, such as LCO Dry Creek and Clode Creek, diverge from model projections. Effort is being expended on understanding the underlying cause for the divergence. Resulting information will be incorporated into the RWQM as part of the 2020 RWQM Update to continue to improve model performance in mine-influenced tributaries. The use of modelled information in place of monitored information for mine-influenced tributaries is not expected to alter the conclusions of the integrated effects assessment for the following reasons:

- Mine-influenced tributaries typically represent a relatively small proportion of the total habitat area present in each MU.
- Both modelled and monitored concentrations in mine-influenced tributaries tend to be high relative to effects benchmarks; thus, use of either set of information in the assessment is likely to yield similar projected levels of effect.

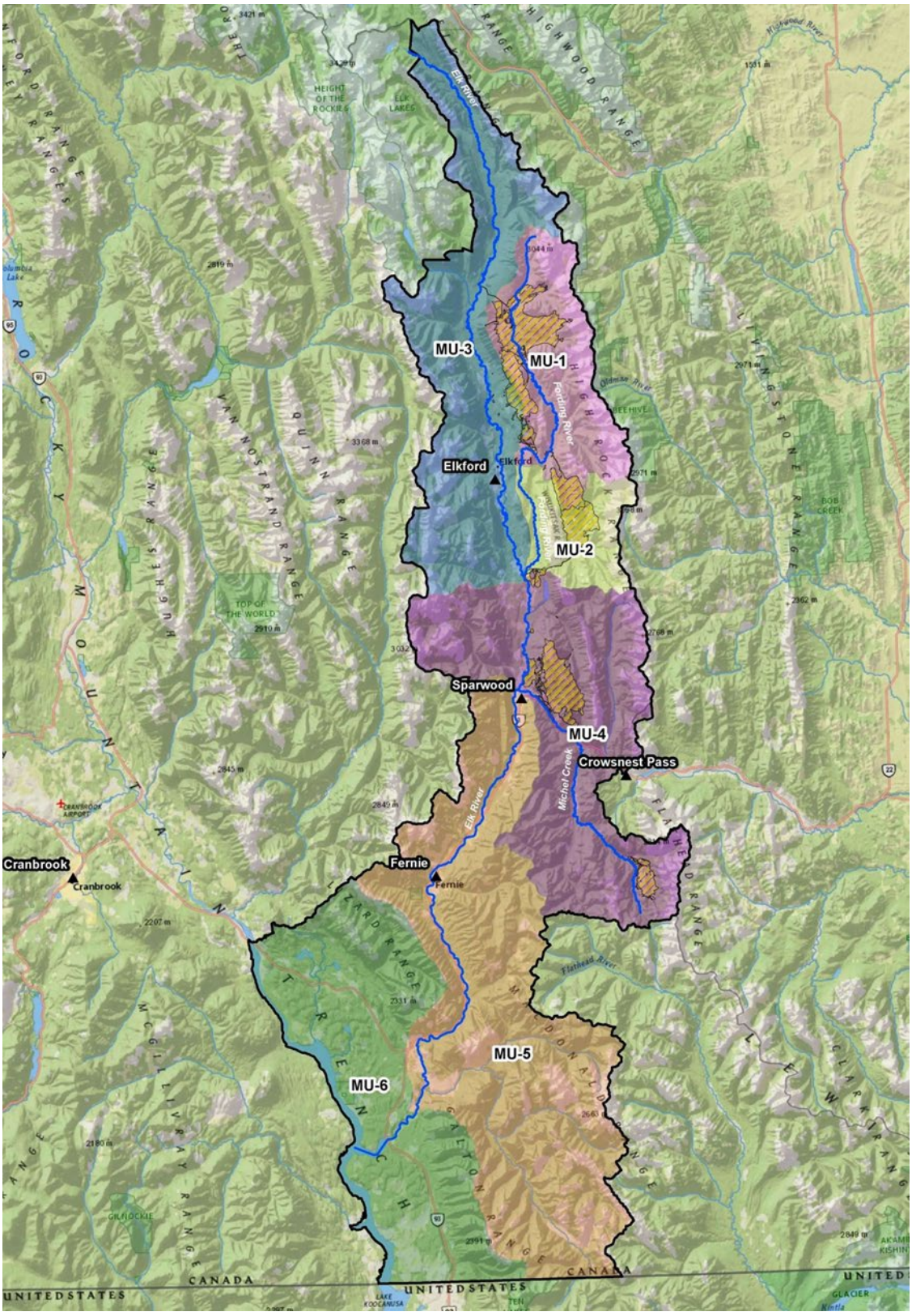
Results of the Conditions in 2016 scenario, in terms of projected effects, are compared herein to observed effects detected through Teck's local and regional aquatic effects monitoring programs (see Section 3). This comparison provides a means of "reality checking" the approach, both in terms of values assigned to effects benchmarks and the use of modelled versus monitoring data in the Conditions in 2016 scenario.

Integrated assessments were conducted for nitrate, sulphate, and selenium using EVWQP benchmarks. An integrated assessment was not conducted for cadmium because projected peak cadmium concentrations are lower than SPOs and Compliance Limits. The approach used to evaluate potential effects from each constituent was consistent with that in the EVWQP, focusing on direct exposure for nitrate and sulphate, and exposure via bioaccumulation for selenium.

The integrated assessments included qualitative and quantitative components to characterize potential effects related to each constituent. The assessments conducted herein followed the same six-step approach used in the EVWQP. The six steps were:

- Step 1: Divide the MU into subunits, including mainstem, tributaries, and off-channel habitats.
- Step 2: Calculate both the total and fish-accessible area of each subunit.
- Step 3: Project water quality in each subunit for each time period of interest.
- Step 4: Calculate potential effects by comparing projected concentrations to water quality guidelines and benchmarks. Potential effects expressed as a percentage were then spatially integrated using an area-weighted approach to identify the percent effect across the entire MU (e.g., a 5% predicted integrated effect to *C. dubia* reproduction across MU1). The area-weighted approach, which relied on the habitat areas defined in Step 2, involved multiplying the percent effect in each subunit by the habitat present in the subunit, adding all of the resulting values, and then dividing by the total habitat available in the MU.
- Step 5: Qualitatively assess the potential interactive effects within each subunit. This step was intended to address the potential for different types of effects to occur together. For example, effects on higher-level receptors such as fish may occur as a result of direct effects from the constituent or indirect effects through changes in food availability that result from the constituents effect on prey organisms.
- Step 6: Assess integrated effects for the MU in question by combining the results of Steps 4 and 5. This evaluation was completed using integrated effects assessment criteria that were developed as part of the EVWQP.

Figure 1: Management Units



2.0 CONSTITUENT-SPECIFIC INTEGRATED ASSESSMENTS

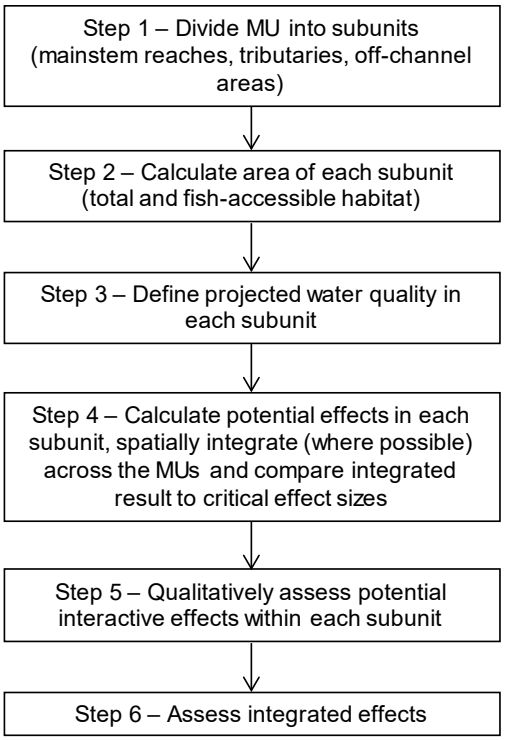
2.1 Overview

Integrated assessments were undertaken on an MU basis to evaluate potential effects related to concentrations of nitrate, sulphate, and selenium. In all cases, the constituent-specific assessments were completed using the same approach as outlined in Annex H of the EVWQP (Figure 2). Assessments were conducted for three time periods (Conditions in 2016, 2017 to 2022, and 2023 to 2037). The evaluation of Conditions in 2016 was included in response to requests from stakeholders. As previously noted, output from the integrated effects assessment conducted for Conditions in 2016 was compared to recent biological monitoring data collected under the 2015 Regional Aquatic Effects Monitoring Program (RAEMP) and 2016 Local Aquatic Effects Monitoring Programs (LAEMPs), providing an opportunity to “reality check” the assessment approach.

The EVWQP did not include an integrated effects table for Koocanusa Reservoir (MU6) because long-term targets for the reservoir were set at BC WQGs. A table was developed as part of this work to evaluate potential effects of selenium at concentrations greater than the BC WQG. Nitrate and sulphate were not evaluated in Koocanusa Reservoir because peak projected concentrations are below BC WQGs. As in other MUs, the effects table for MU6 considered differences in selenium bioaccumulation and potential effects between lentic and lotic habitats. Modelling of lentic and lotic areas in MU6 was done qualitatively because the extent to which lentic conditions are present (from the perspective of selenium bioaccumulation) has not yet been established in the reservoir. Analyses conducted subsequent to the EVWQP indicated that zooplankton, benthic invertebrate, and fish selenium concentrations collected in Koocanusa Reservoir conform to the EVWQP model (i.e., similar to lotic areas; Golder 2018a). However, it has not been ruled out that some portions of the reservoir may exhibit lentic bioaccumulation conditions.

The methods used to complete the constituent-specific evaluations are summarized below in Section 2.2, followed by a discussion of results in Section 2.3. Results are summarized by time period in Section 2.4.

Figure 2: Approach Used to Complete Constituent-Specific Integrated Assessments (Figure 2-1 from Annex H [Teck 2014])



2.2 Methods

The six steps outlined in Figure 2 are described below, referencing Annex H of Teck (2014) where appropriate.

2.2.1 Step 1: Divide MU into Subunits

As per the EVWQP, each MU was divided into subunits to evaluate potential effects in river mainstems, mine-influenced tributaries and associated off-channel habitats. Tributaries not influenced by mining and that are likely to be ephemeral were not included in the integrated assessment because quality of aquatic habitat in these areas is likely to be low and their inclusion would bias the influence of reference tributaries in the assessment. Upstream tributary areas that are isolated from the Fording or Elk River mainstems, such as those in upper Kilmarnock Creek (MU1), were not incorporated into the integrated assessment, because they are not accessible to fish in the river mainstems, nor would they be a source of benthic drift to downstream areas. They were also excluded to avoid a reference area bias (i.e., dilution of effect through the inclusion of unconnected reference areas). The geographic extent of MU6 was constrained to Koocanusa Reservoir; it did not take into account upstream areas, including those in the Bull and Kootenay rivers that may be frequented by fish in the reservoir.

2.2.2 Step 2: Define Available Habitat

The total area of aquatic habitat present in each subunit was quantified, as well as that which is likely to be accessible to fish. These areas remain unchanged from those presented in the EVWQP, although fish accessibility has been updated to incorporate information collected in support of the Tributary Management Plan and the Structured Decision Making process used to identify a long-term Compliance Limit for Harmer Creek. Direct comparisons to the habitat information generated in support of the Tributary Management Plan were not completed, as they have been expressed in different units (length of stream versus habitat area) and generated using slightly different GIS approaches / techniques.

Proposed mine development activities were considered, as were associated water management activities that will result in a loss of habitat following the implementation of mitigation (e.g., Cataract and Swift creeks in MU1 from 2023 onward). The affected habitats, which are expected to be subject to habitat offsetting policies, were not included in the constituent-specific assessment, where relevant.

2.2.3 Step 3: Define Projected Water Quality in Each Subunit

Constituent concentrations in tributaries and other subunits unaffected by mining were set to reference conditions. They were assumed to remain unchanged over time, consistent with the approach used in the EVWQP.

Constituent concentrations in other subunits were defined using the 2017 Regional Water Quality Model configured as per the Planned Scenario in the 2019 IPA, with the clean water diversion at FRO (Kilmarnock Creek) sized at 10,000 m^3/d. The 2017 RWQM was run under 1 in 10 year low, average and 1 in 10 year high flows conditions from 2004 to 2037, which corresponds to the start of the model calibration period to the end of the planning period considered in the 2019 IPA. Model output was compiled and monthly average concentrations under each flow scenario in each mine-influenced subunit were calculated. Peak monthly average concentrations across the three flow conditions were then identified for three time periods or snapshots:

- Conditions in 2016
- 2017 to 2022 prior to commissioning of FRO-S and EVO Phase I AWTFs
- 2023 to the end of the planning period (2037)

As noted above, the evaluation of Conditions in 2016 provided a means of comparing output from the integrated effects tables with recent biological monitoring data to “reality check” the assessment approach. Evaluation of projected peak concentrations from the two future snapshots, 2017 to 2022 and 2023 to 2037, provided a means to evaluate potential effects to aquatic organisms (1) prior to the implementation of most of the mitigation incorporated into the 2019 IPA and EVWQP and (2) through the remainder of the planning period, respectively.

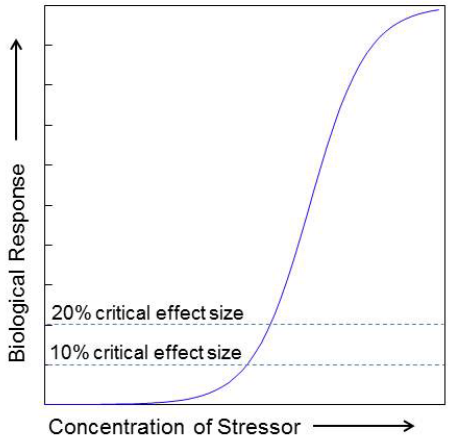
Peak monthly average concentrations were identified independently for each subunit and seasonal period of interest; they were not temporally consistent across the MU within the time period of interest. For example, peak concentrations in one subunit between January and December may be projected to occur in March while those in a different subunit may be projected to occur in August; alternatively, those in one subunit may be projected to occur in April 2019, while those in another subunit may be projected to occur in April 2021. These temporally disconnected results were combined in a single integrated effects assessment table to enable an assessment of integrated effects across the MU in question for the time snapshot of interest. This approach was used to constrain the number of assessment tables considered in the analysis, while at the same time minimizing the risk of under-estimating projected effects of projected concentrations in excess of Compliance Limits and SPOs.

2.2.4 Step 4: Identify Potential Effects to Sensitive Receptors

2.2.4.1 Subunit Evaluation

Toxicological responses of aquatic organisms to increasing constituent concentrations can typically be described using continuous concentration-response curves. The curves illustrate how effects to reproduction, growth, or other life-history endpoints become greater as constituent concentrations increase (see example in Figure 3). Concentration-response curves are typically generated based on laboratory testing and can be used to evaluate potential effects at a given constituent concentration.

Figure 3: Illustration of a Typical Concentration-Response Curve and Critical Effect Sizes



Source: Figure 2-2 from Annex H (Teck 2014)

A critical effect size is a level of effect, defined on the basis of controlled laboratory experiments of sensitive sublethal toxicity, below which changes to populations or communities of sensitive aquatic species in the environment are not expected to occur (i.e., cannot be distinguished from differences that may result from normal background variability). The US EPA identifies 20% as a critical effect size for most cases. It represents an effect on laboratory organisms that is sometimes statistically distinct from reference or control conditions but that is not expected to cause meaningful and measurable changes in a natural population (US EPA 1999, 2013). Suter et al. (1995) also use a critical effect size of 20% but acknowledge that the minimum detectable effect varies by species, habitat and sampling method. For mobile species, they conclude that a difference of less than 20% can seldom be reliably detected and represent a *de minimis* effects level. A USGS study by Mebane (2010) similarly identifies a 20% critical effect size for benthic invertebrates in any environment and for fish when exposed to a single stressor, although they suggest a smaller effect size of 10% for fish when multiple stressors are present.

Based on the above and consistent with the approach used in the EVWQP, potential effects on sensitive aquatic receptors in each subunit were first assessed by comparing constituent concentrations with WQGs. Concentrations of selenium, sulphate and nitrate in excess of WQGs were then either compared to level 1 benchmarks representing a 10% effect size and to level 2 benchmarks representing a 20% effect size or were evaluated using dose-response curves where available. Results of the comparison were expressed either as a categorical result (e.g., < WQG) or as a percentage potential effect on the receptor organism and most sensitive life-history endpoint (e.g., an 8% effect on *C. dubia* reproduction).

Potential effects on sensitive aquatic receptors were evaluated using EVWQP benchmarks for nitrate, selenium, and sulphate (Teck 2014), which allows for a direct comparison to the results in Annex H of Teck (2014). It should be noted that subsequent to approval of the EVWQP, additional chronic toxicity testing studies with nitrate and sulphate were conducted in accordance with Section 9.8.1 of Permit 107517 to assess the sensitivity of invertebrates, fish, and amphibians to nitrate and sulphate using site waters from the Elk Valley (or simulated site waters). The primary goal of the testing was to address residual uncertainties from the EVWQP and help to validate that benchmarks derived therein are protective of aquatic life. Results from the more recent studies confirmed that benchmarks derived in support of the EVWQP, and the associated SPO values, are conservatively protective of aquatic life (Golder 2016, 2018b). However, as discussed in Golder (2018b), many test species and

endpoints exhibited lower sensitivity in subsequent testing relative to previous rounds of testing (e.g., *C. dubia* nitrate sensitivity in the Fall 2016 study was lower than observed in testing prior to the EVWQP). If receptors are less sensitive, then use of EVWQP benchmarks may overestimate effects.

Direct comparison of projected water quality concentrations to benchmarks was undertaken for nitrate and sulphate, because sulphate and nitrate benchmarks are expressed in terms of concentrations in water. In contrast, selenium benchmarks are expressed in terms of concentrations in tissue. The comparison therefore involved first converting projected water quality concentrations into projected tissue concentrations using the bioaccumulation models defined as part of the EVWQP, then comparing the projected tissue concentrations to benchmarks. In both cases, the seasonality of receptor pathways was taken into consideration as outlined below. The rationale for using the EVWQP bioaccumulation models for selenium is also outlined below.

Seasonality of Receptor Pathways

The integrated assessment in the EVWQP was conducted assuming that receptors could be exposed during any month of the year, even though exposure windows vary by constituent, receptor, life stage, and MU. Use of a single maximum monthly concentration has the potential to introduce false positives, in that adverse effects could be predicted because peak water quality occurs when the most sensitive life stage or receptor is not present.

To reduce the potential for false positives, the assessment conducted herein considered the seasonality of the receptor pathway. This approach is consistent with Environment Canada (2012) Ecological Risk Assessment guidance that states that "*[e]valuation of the use of the site should take into account seasonality as some potential receptors may only use the site for a portion of their life cycle*". In alignment with this principle, peak concentrations were assessed for the months during which the receptor or relevant sensitive life stage would be exposed. For example, amphibians have a life cycle in which adults return to lentic areas in the spring to lay eggs in water. Eggs hatch into larvae that then feed, grow, and develop in the water for most of the spring months, until they metamorphose into terrestrial or semiaquatic adults in summer months. In light of this life history, potential effects to amphibians were assessed based on peak concentrations projected to occur during the window that amphibian early life stages use aquatic habitat (May to July). Table 1 contains the rationale for assessment windows used for each receptor and constituent.

Table 1: Assessment Windows Considered in the Integrated Effects Assessment

Receptor	Constituent(s)	Assessment Window	Rationale
Invertebrates	Nitrate, Sulphate, and Selenium	All months	Invertebrates are present year-around.
Fish	Nitrate and Sulphate	MU1: June to August MU2 to MU6: all months	Fish benchmarks are based on effects to embryos and alevins of sensitive fish species. Assessment windows align with when early life stages could be present. In MU1, WCT is the only fish species present. Early life stages of WCT are present from June to August. In other MUs, there are fish species with different spawning windows; early life stages could be present in any month.
	Selenium	All months	Timing of egg provisioning (when selenium is bioaccumulated) has not been sufficiently characterized to define an exposure window for reproductive effects. Growth of juvenile fish was assumed to occur in all months. Therefore, all months were considered potentially relevant to exposure of fish.
Amphibians	Nitrate and Sulphate	May to July	Amphibians in the Elk Valley are spring spawners. Sensitive early life stages are present from spawning until metamorphosis, which occurs in early summer.
	Selenium	n/a	
Birds	Nitrate and Sulphate	n/a	
	Selenium	May to June (reproduction) June to August (juvenile growth)	Birds in the Elk Valley breed in spring. Egg provisioning (when selenium is bioaccumulated) occurs during the breeding season in May and June. Exposure relevant to juvenile growth occurs in the months following hatching.

Notes: n/a = not applicable (amphibians were not assessed for selenium because sufficient information is not available to predict and evaluate tissue selenium concentrations; as discussed in the EVWQP, aquatic-feeding birds were only retained for the selenium assessment); WCT = westslope cutthroat trout.

Selenium Bioaccumulation

The selenium analysis outlined herein was conducted using the selenium bioaccumulation models developed and described in the EVWQP. Although a more recently developed speciation model is available for lotic conditions (as described in Golder 2018a), it was not used based on the following rationale:

- The speciation model was developed primarily to examine how the transformation of selenium species through active water treatment, with and without the use of advanced oxidation process (AOP), could affect projected effects to aquatic biota. The projected peak concentrations defined in Step 3 and used in this effects evaluation are projected to occur primarily prior to the implementation of mitigation; thus, the potential influence of selenium speciation is expected to be limited, and bioaccumulation is expected to continue to conform to the regional patterns described by the EVWQP model.
- Previous work has shown that the speciation model produces comparable results to the EVWQP model both prior to and following implementation of biologically-based active water treatment (examples included in Annex G of the 2019 IPA [Teck 2019]). Therefore, the EVWQP model is expected to provide reasonable predictions of bioaccumulation under the modelled scenarios.

In MU6 (Koocanusa Reservoir), selenium bioaccumulation was evaluated using both the lentic and lotic bioaccumulation models described in the EVWQP. The models were applied, as appropriate, to characterize potential effects in areas designated as lotic and potentially lentic, from the perspective of selenium bioaccumulation.

2.2.4.2 Spatial Integration

Potential effects expressed as a percentage were spatially integrated using an area-weighted approach to identify the percent effect across the entire MU (e.g., a 5% predicted integrated effect to *C. dubia* reproduction across MU1). This value was then compared to the critical effect sizes of 10 and 20% discussed above (Section 2.2.4.1) to assess protection of aquatic life.

The area-weighted approach relied on the habitat areas defined in Step 2 and was implemented assuming that all habitat is of equal value and receives equal use. The calculation involved multiplying the percent effect in each subunit by the habitat present in the subunit, adding all of the resulting values, and then dividing by the total habitat available in the MU.

Work is currently ongoing to update the spatial integration methodology to address Key Uncertainty 2.2 (*How will the integrated assessment methodology used to derive area-based SPOs be validated and updated?*) of Teck's Adaptive Management Plan. These updates will include incorporating fish use information from telemetry studies to refine the approach for weighting predicted effects in each subunit for the calculation of a spatially-integrated effect across MU1. An initial evaluation of how fish use data would be incorporated into the integrated effects calculation is provided in Appendix A.

2.2.5 Step 5: Assess Integrated Effects Qualitatively

Effects on higher-level sensitive receptors such as birds, fish, and amphibians, may occur as a result of direct effects from the constituent or as a result of indirect effects expressed through changes in food availability that result from the constituent's effect on prey organisms. Effects on benthic invertebrates can be expressed as changes to the population of the most sensitive species or more broadly through changes to the community as a whole as a result of effects on multiple species.

In recognition of the potential for different types of effects to occur together, a qualitative integration was completed in each subunit to assess whether potential effects on multiple sensitive endpoints could result in greater effects. For benthic invertebrates, potential population-level responses were assessed based on predicted effects on the most sensitive invertebrate species tested. Potential changes in community structure or function were evaluated with reference to predicted effects on the next most sensitive species. The results of these evaluations were integrated, as shown in Table 2, to generate categorical effect scores 1 through 5, which are defined in Table 3. Rationale for this scoring system is outlined in Annex H of Teck (2014).

Table 2: Integration of Potential Effects to Benthic Invertebrates (Table 2-2 of Annex H)

Endpoint and Level of Predicted Effect		Most Sensitive Species Endpoint[(a)]		
		≤10%	10 to 20%	>20%
Community Endpoint (next most sensitive species)	≤10%	1	2	3
	10 to 20%	n/a	3	4
	>20%	n/a	n/a	5

(a) n/a = non-applicable scenario (i.e., a community level alteration cannot occur without a response to the most sensitive species); colour-coded categorical scores are defined in Table 3.

Table 3: Definition and Interpretation of Categorical Effect Scores (Table 2-3 of Annex H)

Score	Definition	Interpretation
0	Within the WQG	No effect
1	≤10% effect on any endpoint	No population effects
2	10 to 20% effect to sensitive invertebrate species endpoint	Potential effects on populations of sensitive invertebrate species with the effects not expected to be measurable or ecologically meaningful[(a)]
3	*Invertebrates*: >20% effect on sensitive species or 10 to 20% effect on multiple endpoints. *Fish, birds and/or amphibians*: 10 to 20% direct effect or <10% direct effect with 20% effect on food supply	*Invertebrates*: Potential effect on populations of the most sensitive species, or potential effects on multiple species that are not expected to be measurable or ecologically meaningful[(a)] *Fish, birds and/or amphibians*: Potential effects on populations of the most sensitive species that are not expected to be measurable or ecologically meaningful, but that require consideration within the context of other stressors and verification through follow-up monitoring[(a)]
4	*Invertebrates*: >20% effect on sensitive species with 10 to 20% effect on other species *Fish, birds and/or amphibians*: >20% direct effect or 10 to 20% direct effect with >20% effect on food supply	*Invertebrates*: Potential effect on populations of multiple species *Fish, birds and/or amphibians*: Potential effect on populations of one or more sensitive species[(b)]
5	>20% effect on multiple endpoints	Potential effect on populations of multiple species, with potential changes to community structure

(a) Unlikely to be distinguished from changes that occur as a result of natural variation or to affect the maintenance of an ecologically effective and self-sustaining population.
(b) Must be interpreted with caution when applied to local, subunit scale effects to mobile species. For amphibians, must also consider types of habitat present in subunit and whether sensitive amphibian life stages may not be present (e.g., species that breed only in lentic habitats).

Potential effects on fish, birds and/or amphibians were evaluated in a similar fashion, considering direct effects on the most sensitive species and life-history endpoint (e.g., brown trout reproduction), and indirect effects that may occur through reduced food supply (i.e., benthic invertebrate abundance). Categorical effect scores were assigned following the scoring system outlined in Table 4. Rationale for this scoring system is outlined in Annex H of Teck (2014).

Table 4: Integration of Potential Effects on Fish, Birds and Amphibians (Table 2-4 of Annex H)

Endpoint and Level of Predicted Effect		Most Sensitive Species Endpoint[(b)]		
		≤10%	10% to 20%	>20%
Indirect food supply[(a)]	≤20%	1	3	4
	>20%	3	4	5

(a) Indirect effect defined by invertebrate community endpoint.
(b) Colour-coded categorical scores are defined in Table 3.

2.2.6 Step 6: Assess Integrated Effects

The evaluation of integrated effects combines the results of Steps 4 and 5 to assess the integrated effect for the MU in question. This evaluation was completed using the following integrated effects assessment criteria, which are derived from the corresponding critical effect sizes:

For the protection of benthic invertebrate community structure and abundance, as well as food availability for higher level organisms:

- a predicted integrated effect size of <20% across the MU to the benthic invertebrate community endpoint (if concentration-response information is available)
- concentrations less than the Level 2 benthic community benchmark in all mainstem subunits of the Elk and Fording rivers
- benthic invertebrate integrated effect scores of <4 in the mainstem subunits of the Elk and Fording rivers

For the protection of fish, bird or amphibian populations:

- a predicted integrated effect size of <10% across the MU for the most sensitive fish, bird or amphibian life-history endpoint
- concentrations less than the Level 1 benchmark for the most sensitive fish, bird or amphibian[1] life history endpoint in all mainstem subunits of the Elk and Fording rivers
- integrated effect scores of <3 in the mainstem subunits of the Elk and Fording rivers
- for selenium effects to bird and fish reproduction, a predicted integrated effect size of <20% for the most sensitive receptor endpoint across the MU, based on an upper-bound estimate of the dose-response curve

Benthic invertebrate criteria focused on maintaining effect sizes <20% for the most sensitive species and life-history endpoint because Suter et al. 1995, Mebane 2010 and US EPA 1999, 2013 suggest that these will be protective and prevent measurable and ecologically meaningful changes to benthic communities. Lower effect sizes were used for fish in reflection of Mebane 2010, which indicates that effect sizes of 10% are recommended when multiple stressors are present. The same rationale was applied to birds and amphibians, given their longer life spans and lower reproductive output relative to benthic invertebrates.

If all integrated assessment criteria were met, then predicted conditions are expected to be protective of aquatic health in the MU. Exceeding one or more of these integrated assessment criteria for an MU does not necessarily mean that aquatic health would not be protected; however, it does require consideration of any such exceedances to evaluate the level of risk.

[1] Integrated effects calculations for amphibians should be interpreted with caution, noting that amphibian species present in the Elk Valley breed in lentic habitats and as a consequence sensitive early life stages would not be present in mainstem subunits.

2.3 Results

2.3.1 Nitrate

As noted in Annex F of the 2019 IPA, projected nitrate concentrations in excess of SPOs and Compliance Limits under the Planned Development Scenario are infrequent, occur at a limited number of locations and the magnitude of projected exceedance tends to be small (i.e., typically in the range of 1 to 5 mg/L). Integrated assessment results for nitrate are summarized in Table 5 (Conditions in 2016), Table 6 (2017 to 2022), and Table 7 (2023 to 2037), with integrated effects tables provided in Appendix B. Assessment criteria were met for all three time periods across all five MUs. These results are consistent with Annex H of the EVWQP.

Table 5: Results of Integrated Assessments for Nitrate - 2016 Conditions

Assessment Criteria		MU1	MU2	MU3	MU4	MU5
Description	Goal					
Protection of Fish						
Integrated effect size for most sensitive endpoint	Best estimate of <10%	4%	4%	-	-	-
Proportion of MU with concentrations <L1 benchmark for most sensitive endpoint	100% in river mainstem [(b)]	100% (100%)	100% (100%)	100% (100%)	100% (100%)	100% (100%)
Maximum effect score in mainstem	2	1	1	0	1	1
Protection of Amphibians						
Integrated effect size for most sensitive endpoint	<10%	1%	1%	-	-	-
Proportion of MU with concentrations <L1 benchmark for most sensitive endpoint	100% in river mainstem [(b,c)]	100% (100%)	100% (100%)	100% (100%)	100% (100%)	100% (100%)
Maximum effect score in mainstem	2	1	1	0	1	1
Protection of Benthic Invertebrates						
Integrated effect size for community endpoint	<20%	3%	3%	-	-	-
Proportion of MU with concentrations <L2 benchmark for community endpoint	100% in river mainstem [(b)]	100% (99%)	100% (100%)	100% (100%)	100% (100%)	100% (100%)
Maximum effect score in mainstem	3	2	2	0	2	1

- = not applicable, dose-response curve not available for EVWQP benchmarks.
(a) Derived from information contained in Appendix B. See Table 3 for definition of effect scores.
(b) Results shown as % of mainstem subunit area below criterion, with % of area in the MU below criterion shown in parentheses.
(c) Mainstem effects calculations for amphibians should be interpreted with caution, noting that amphibian species present in the Elk Valley breed in lentic habitats and as a consequence sensitive early life stages would not be present in mainstem subunits.

Table 6: Results of Integrated Assessments for Nitrate - 2017 to 2022

Assessment Criteria		MU1	MU2	MU3	MU4	MU5
Description	Goal					
Protection of Fish						
Integrated effect size for most sensitive endpoint	Best estimate of <10%	4%	6%	-	-	-
Proportion of MU with concentrations <L1 benchmark for most sensitive endpoint	100% in river mainstem [(b)]	100% (100%)	100% (100%)	100% (100%)	100% (100%)	100% (100%)
Maximum effect score in mainstem	2	1	1	0	1	1
Protection of Amphibians						
Integrated effect size for most sensitive endpoint	<10%	1%	1%	-	-	-
Proportion of MU with concentrations <L1 benchmark for most sensitive endpoint	100% in river mainstem [(b,c)]	100% (100%)	100% (100%)	100% (100%)	100% (100%)	100% (100%)
Maximum effect score in mainstem	2	1	1	0	1	1
Protection of Benthic Invertebrates						
Integrated effect size for community endpoint	<20%	5%	5%	-	-	-
Proportion of MU with concentrations <L2 benchmark for community endpoint	100% in river mainstem [(b)]	100% (99%)	100% (100%)	100% (100%)	100% (100%)	100% (100%)
Maximum effect score in mainstem	3	3	3	0	2	2

- = not applicable, dose-response curve not available for EVWQP benchmarks. **Bolded** values do not meet the criteria.
(a) Derived from information contained in Appendix B. See Table 3 for definition of effect scores.
(b) Results shown as % of mainstem subunit area below criterion, with % of area in the MU below criterion shown in parentheses.
(c) Mainstem effects calculations for amphibians should be interpreted with caution, noting that amphibian species present in the Elk Valley breed in lentic habitats and as a consequence sensitive early life stages would not be present in mainstem subunits.

Table 7: Results of Integrated Assessments for Nitrate - 2023 to 2037

Assessment Criteria		MU1	MU2	MU3	MU4	MU5
Description	Goal					
Protection of Fish						
Integrated effect size for most sensitive endpoint	Best estimate of <10%	2%	1%	-	-	-
Proportion of MU with concentrations <L1 benchmark for most sensitive endpoint	100% in river mainstem [(b)]	100% (93%)	100% (100%)	100% (100%)	100% (100%)	100% (100%)
Maximum effect score in mainstem	2	1	1	0	1	0
Protection of Amphibians						
Integrated effect size for most sensitive endpoint	<10%	1%	0%	-	-	-
Proportion of MU with concentrations <L1 benchmark for most sensitive endpoint	100% in river mainstem [(b,c)]	100% (100%)	100% (100%)	100% (100%)	100% (100%)	100% (100%)
Maximum effect score in mainstem	2	1	1	0	1	0
Protection of Benthic Invertebrates						
Integrated effect size for community endpoint	<20%	3%	1%	-	-	-
Proportion of MU with concentrations <L2 benchmark for community endpoint	100% in river mainstem [(b)]	100% (94%)	100% (100%)	100% (100%)	100% (100%)	100% (100%)
Maximum effect score in mainstem	3	1	1	0	1	0

- = not applicable, dose-response curve not available for EVWQP benchmarks.
(a) Derived from information contained in Appendix B. See Table 3 for definition of effect scores.
(b) Results shown as % of mainstem subunit area below criterion, with % of area in the MU below criterion shown in parentheses.
(c) Mainstem effects calculations for amphibians should be interpreted with caution, noting that amphibian species present in the Elk Valley breed in lentic habitats and as a consequence sensitive early life stages would not be present in mainstem subunits.

2.3.2 Sulphate

Integrated assessment results for sulphate are provided in Table 8 (Conditions in 2016), Table 9 (2017 to 2022), and Table 10 (2023 to 2037)), with integrated effects tables provided in Appendix C.

Assessment criteria were met for Conditions in 2016 and from 2017 to 2022 for all receptors, and after 2022 for amphibians and invertebrates in all MUs and for fish in all MUs except MU2.

In the lower Fording River (MU2), projected peak sulphate concentrations from 2023 to 2037 resulted in an integrated effect size <10% for fish across the MU. However, the majority of mainstem habitat was predicted to have effect sizes for fish between 10 and 20% (see Appendix C). This calculation indicates that peak projected sulphate concentrations after 2022 could have low-magnitude effects on early life stages of sensitive fish species that spawn in the mainstem lower Fording River. Effects are not expected due to Teck's commitment to implement sulphate treatment where and when required, as outlined in the EVWQP.

Integrated assessment results for conditions after 2022 are consistent with those presented in the EVWQP, with three exceptions:

- In the EVWQP, the sulphate assessment for MU1 predicted low-magnitude effects on the growth of sensitive amphibian species. This result is different from that presented herein, for which all assessment criteria were met. The difference is due to the seasonality of receptor pathways considered herein.
- In the EVWQP, the sulphate assessment for MU1 predicted low-magnitude effects on early life stages of WCT that spawn in the mainstem upper Fording River. This result is different from that presented herein for MU1, for which all assessment criteria were met. As with amphibians, the difference is due to the seasonality of receptor pathways considered herein.
- In the EVWQP, all assessment criteria were for met for sulphate in MU2. This result is different from that presented herein for fish in MU2, for which the assessment predicted low-magnitude effects on sensitive fish species feeding in the mainstem during the period of egg provisioning. However, the results presented herein for MU2 are consistent with results presented in the EVWQP for MU1, in which the integrated effect size for fish was <10% but portions of the mainstem were predicted to have an effect size between 10 to 20%.

Table 8: Results of Integrated Assessments for Sulphate—2016 Conditions

Assessment Criteria		MU1	MU2	MU3	MU4	MU5
Description	Goal					
Protection of Fish						
Integrated effect size for most sensitive endpoint	Best estimate of <10%	1%	1%	0%	0%	0%
Proportion of MU with concentrations <L1 benchmark for most sensitive endpoint	100% in river mainstem (b)	100% (98%)	100% (100%)	100% (100%)	100% (100%)	100% (100%)
Maximum effect score in mainstem	2	0	0	0	0	0
Protection of Amphibians						
Integrated effect size for most sensitive endpoint	<10%	1%	1%	0%	0%	0%
Proportion of MU with concentrations <L1 benchmark for most sensitive endpoint	100% in river mainstem (b,c)	100% (100%)	100% (100%)	100% (99%)	100% (98%)	100% (100%)
Maximum effect score in mainstem	2	0	0	0	0	0
Protection of Benthic Invertebrates						
Integrated effect size for community endpoint	<20%	1%	0%	0%	0%	0%
Proportion of MU with concentrations <L2 benchmark for community endpoint	100% in river mainstem (b)	100% (100%)	100% (100%)	100% (99%)	100% (100%)	100% (100%)
Maximum effect score in mainstem	3	0	0	0	0	0

- = not applicable, dose-response curve not available for EVWQP benchmarks.
(a) Derived from information contained in Appendix C. See Table 3 for definition of effect scores.
(b) Results shown as % of mainstem subunit area below criterion, with % of area in the MU below criterion shown in parentheses.
(c) Mainstem effects calculations for amphibians should be interpreted with caution, noting that amphibian species present in the Elk Valley breed in lentic habitats and as a consequence sensitive early life stages would not be present in mainstem subunits

Table 9: Results of Integrated Assessments for Sulphate—2017 to 2022

Assessment Criteria		MU1	MU2	MU3	MU4	MU5
Description	Goal					
Protection of Fish						
Integrated effect size for most sensitive endpoint	Best estimate of <10%	2%	3%	0%	1%	0%
Proportion of MU with concentrations <L1 benchmark for most sensitive endpoint	100% in river mainstem [(b)]	100% (98%)	100% (100%)	100% (100%)	100% (100%)	100% (100%)
Maximum effect score in mainstem	2	1	0	0	0	0
Protection of Amphibians						
Integrated effect size for most sensitive endpoint	<10%	3%	1%	0%	0%	0%
Proportion of MU with concentrations <L1 benchmark for most sensitive endpoint	100% in river mainstem [(b,c)]	100% (97%)	100% (100%)	100% (99%)	100% (98%)	100% (100%)
Maximum effect score in mainstem	2	1	0	0	0	0
Protection of Benthic Invertebrates						
Integrated effect size for community endpoint	<20%	3%	1%	0%	0%	0%
Proportion of MU with concentrations <L2 benchmark for community endpoint	100% in river mainstem [(b)]	100% (92%)	100% (100%)	100% (99%)	100% (99%)	100% (100%)
Maximum effect score in mainstem	3	1	0	0	0	0

- = not applicable, dose-response curve not available for EVWQP benchmarks.
(a) Derived from information contained in Appendix C. See Table 3 for definition of effect scores.
(b) Results shown as % of mainstem subunit area below criterion, with % of area in the MU below criterion shown in parentheses.
(c) Mainstem effects calculations for amphibians should be interpreted with caution, noting that amphibian species present in the Elk Valley breed in lentic habitats and as a consequence sensitive early life stages would not be present in mainstem subunits

Table 10: Results of Integrated Assessments for Sulphate—2023-2037

Assessment Criteria		MU1	MU2	MU3	MU4	MU5
Description	Goal					
Protection of Fish						
Integrated effect size for most sensitive endpoint	Best estimate of <10%	5%	7%	0%	1%	0%
Proportion of MU with concentrations <L1 benchmark for most sensitive endpoint	100% in river mainstem [b]	100% (91%)	**22%** (52%) [c]	100% (100%)	100% (100%)	100% (100%)
Maximum effect score in mainstem	2	1	**3**	0	0	0
Protection of Amphibians						
Integrated effect size for most sensitive endpoint	<10%	5%	2%	0%	0%	0%
Proportion of MU with concentrations <L1 benchmark for most sensitive endpoint	100% in river mainstem [b,d]	100% (98%)	100% (100%)	100% (99%)	100% (98%)	100% (100%)
Maximum effect score in mainstem	2	1	1	0	0	0
Protection of Benthic Invertebrates						
Integrated effect size for community endpoint	<20%	8%	3%	0%	0%	0%
Proportion of MU with concentrations <L2 benchmark for community endpoint	100% in river mainstem [b]	100% (93%)	100% (100%)	100% (99%)	100% (98%)	100% (100%)
Maximum effect score in mainstem	3	3	1	0	0	0

- = not applicable, dose-response curve not available for EVWQP benchmarks. **Bolded** values do not meet the criteria.
(a) Derived from information contained in Appendix C. See Table 3 for definition of effect scores.
(b) Results shown as % of mainstem subunit area below criterion, with % of area in the MU below criterion shown in parentheses.
(c) Maximum projected aqueous sulphate concentrations are higher in MU1 relative to MU2. However, effects to fish are higher for MU2 relative to MU1 due to different assessment windows. Assessment windows align with when early life stages could be present, which differs for MU1 (May to August) relative to other MUs (all months) (Section 2.2.4).
(d) Mainstem effects calculations for amphibians should be interpreted with caution, noting that amphibian species present in the Elk Valley breed in lentic habitats and as a consequence sensitive early life stages would not be present in mainstem subunits

2.3.3 Selenium

Integrated assessment results for selenium are provided in Table 11 (Conditions in 2016), Table 12 (2017 to 2022), and Table 13 (2023 to 2037), with integrated effects tables provided in Appendix D.

All assessment criteria were met for birds and invertebrates in all MUs for all three time periods. All assessment criteria were also met for fish in MU3. Some but not all assessment criteria were met for fish in other MUs in one or more of the assessed time periods. These results are discussed below.

In the upper Fording River (MU1), the assessment predicted an integrated effect size <10% across the MU for fish for all three time periods. The maximum effect score under Conditions in 2016 and from 2017 to 2022 was 3 and portions of the Fording River mainstem were predicted to have an effect size between 10 to 20%, which indicates that peak projected selenium concentrations prior to 2023 could have low-magnitude effects on reproduction of WCT feeding in the mainstem upper Fording River during the period of egg provisioning. However, the integrated effect across the upper Fording River WCT population remained below 10% during all time periods. After 2022, all assessment criteria are met in MU1.

In the lower Fording River (MU2), the assessment predicted results that were similar for all three time periods. The integrated effect size was between 10 and 20%, the maximum score was 3, and all of the mainstem lower Fording River was predicted to have an effect size between 10 and 20%. This calculation indicates that peak projected selenium concentrations could have low-magnitude effects on reproduction of sensitive fish species that feed in the mainstem lower Fording River during the period of egg provisioning. As discussed in the EVWQP (Annex E), the fish species reported to use the lower Fording River (WCT, mountain whitefish, and bull trout) are expected to be more tolerant of selenium than the species used to derive the benchmarks for sensitive species (brown trout). Therefore, this calculation may over-estimate the actual potential for effects of peak selenium concentrations to fish resident in the area. In addition, fish can move freely between the lower Fording River and the Elk River (MUs 3 to 5), where selenium concentrations and potential effect sizes are lower. As a result, the integrated effect on fish in MU2 is expected to be lower than indicated by this calculation. The results of the assessment for the 2019 IPA are consistent with results presented in the EVWQP for 2034, in which the integrated effect size for fish in MU2 was between 10 to 20%.

In the upper (MU4) and lower (MU5) Elk River, fish criteria are met under Conditions in 2016 and after 2022. From 2017 to 2022, the assessment predicted an integrated effect size <10% across the MU. However, the maximum mainstem score was 3 and some or all of the Elk River mainstem is predicted to have an effect size between 10 to 20% (see Appendix D). This calculation indicates that peak projected selenium concentrations prior to 2023 could result in low-magnitude effects (up to 20% effects on reproductive output in those areas) on the reproduction of sensitive fish species, if any such species feed predominantly in those areas of mainstem habitat during the period of egg provisioning. Overall, however, integrated effects in all Elk River MUs remained below 10% for all three time periods. Effects of this magnitude would not be expected to result in population-level effects even to sensitive fish species. After 2022, all assessment criteria are met for all receptors.

In Koocanusa Reservoir (MU6), fish criteria are met under Conditions in 2016 and after 2022. From 2017 to 2022, the assessment predicted a potential effect to fish reproduction of 4% using the lotic bioaccumulation model, and 11% using the lentic bioaccumulation model. As discussed above, previous analysis have indicated that much or all of Koocanusa Reservoir appears to exhibit selenium bioaccumulation consistent with the EVWQP (lotic) model. Therefore, the calculated effects sizes for MU6 indicate that the integrated potential effect on fish reproduction across the reservoir likely meets the assessment criterion of <10%.

Table 11: Results of Integrated Assessments for Selenium—2016 Conditions

Assessment Criteria		MU1	MU2	MU3	MU4	MU5	MU6 (lotic)	MU6 (lentic)
Description	Goal							
Protection of Fish								
Integrated effect size for most sensitive endpoint	Best estimate of <10% (with upper bound estimate of <20%)	7% (10%)	**13%** (18%)	4% (7%)	6% (9%)	6% (9%)	4% (7%)	6% [(c)]
Proportion of MU with concentrations <L1 benchmark for most sensitive endpoint	100% in river mainstem [(b)]	**46%** (61%)	**0%** (27%)	100% (100%)	100% (87%)	100% (100%)	-	-
Maximum effect score in mainstem	2	**3**	**3**	1	1	1	0	0
Protection of Birds								
Integrated effect size for most sensitive endpoint	<10%	5%	5%	3%	3%	3%	3%	2%
Proportion of MU with concentrations <L1 benchmark for most sensitive endpoint	100% in river mainstem [(b)]	100% (100%)	100% (100%)	100% (100%)	100% (100%)	100% (100%)	100%	100%
Maximum effect score in mainstem	2	1	1	1	1	1	0	0
Protection of Benthic Invertebrates								
Integrated effect size for community endpoint	<20%	-	-	-	-	-	-	-
Proportion of MU with concentrations <L2 benchmark for community endpoint	100% in river mainstem [(b)]	100% (100%)	100% (100%)	100% (100%)	100% (100%)	100% (100%)	100% (100%)	100% (100%)
Maximum effect score in mainstem	3	1	1	1	1	1	0	0

- = not applicable, dose-response curve not available for EVWQP benchmarks. For MU6, assessment results presented for lotic and lentic bioaccumulation models.

(a) Derived from information contained in Appendix D. See Table 3 for definition of effect scores. **Bolded** values do not meet the criteria.

(b) Results shown as % of mainstem subunit area below criterion, with % of area in the MU below criterion shown in parentheses.

(c) No parentheses because upper bound estimate not available for lentic bioaccumulation model.

Table 12: Results of Integrated Assessments for Selenium—2017 to 2022

Assessment Criteria		MU1	MU2	MU3	MU4	MU5	MU6 (lotic)	MU6 (lentic)
Description	**Goal**							
Protection of Fish								
Integrated effect size for most sensitive endpoint	Best estimate of <10% (with upper bound estimate of <20%)	9.5% (12%)	**15% (20%)**	4% (7%)	7% (10%)	6% (9%)	4% (7%)	**11%** (c)
Proportion of MU with concentrations <L1 benchmark for most sensitive endpoint	100% in river mainstem (b)	**24%** (43%)	**0%** (27%)	100% (100%)	**0%** (70%)	**87%** (95%)	-	-
Maximum effect score in mainstem	2	**3**	**3**	1	**3**	**3**	1	3
Protection of Birds								
Integrated effect size for most sensitive endpoint	<10%	6%	5%	3%	4%	3%	3%	3%
Proportion of MU with concentrations <L1 benchmark for most sensitive endpoint	100% in river mainstem (b)	100% (100%)	100% (100%)	100% (100%)	100% (100%)	100% (100%)	100%	100%
Maximum effect score in mainstem	2	1	1	1	1	1	1	1
Protection of Benthic Invertebrates								
Integrated effect size for community endpoint	<20%	-	-	-	-	-	-	-
Proportion of MU with concentrations <L2 benchmark for community endpoint	100% in river mainstem (b)	100% (100%)	100% (100%)	100% (100%)	100% (100%)	100% (100%)	100% (100%)	100% (100%)
Maximum effect score in mainstem	3	2	1	1	1	1	1	1

- = not applicable, dose-response curve not available for EVWQP benchmarks. For MU6, assessment results presented for lotic and lentic bioaccumulation models.

(a) Derived from information contained in Appendix D. See Table 3 for definition of effect scores. **Bolded** values do not meet the criteria.

(b) Results shown as % of mainstem subunit area below criterion, with % of area in the MU below criterion shown in parentheses.

(c) No parentheses because upper bound estimate not available for lentic bioaccumulation model.

Table 13: Results of Integrated Assessments for Selenium—2023 to 2037

Assessment Criteria		MU1	MU2	MU3	MU4	MU5	MU6 (lotic)	MU6 (lentic)
Description	Goal							
Protection of Fish								
Integrated effect size for most sensitive endpoint	Best estimate of <10% (with upper bound estimate of <20%)	9% (12%)	**13%** (17%)	5% (7%)	6% (9%)	6% (9%)	4% (7%)	6% [(c)]
Proportion of MU with concentrations <L1 benchmark for most sensitive endpoint	100% in river mainstem [(b)]	100% (91%)	**0%** (27%)	100% (100%)	100% (88%)	100% (100%)	-	-
Maximum effect score in mainstem	2	1	**3**	1	1	1	0	0
Protection of Birds								
Integrated effect size for most sensitive endpoint	<10%	5%	5%	3%	4%	3%	3%	3%
Proportion of MU with concentrations <L1 benchmark for most sensitive endpoint	100% in river mainstem [(b)]	100% (100%)	100% (100%)	100% (100%)	100% (99%)	100% (100%)	100%	100%
Maximum effect score in mainstem	2	1	1	1	1	1	0	0
Protection of Benthic Invertebrates								
Integrated effect size for community endpoint	<20%	-	-	-	-	-	-	-
Proportion of MU with concentrations <L2 benchmark for community endpoint	100% in river mainstem [(b)]	100% (100%)	100% (100%)	100% (100%)	100% (100%)	100% (100%)	100% (100%)	100% (100%)
Maximum effect score in mainstem	3	1	1	1	1	1	0	0

- = not applicable, dose-response curve not available for EVWQP benchmarks. For MU6, assessment results presented for lotic and lentic bioaccumulation models.

(a) Derived from information contained in Appendix D. See Table 3 for definition of effect scores. **Bolded** values do not meet the criteria.

(b) Results shown as % of mainstem subunit area below criterion, with % of area in the MU below criterion shown in parentheses.

(c) No parentheses because upper bound estimate not available for lentic bioaccumulation model.

2.4 Summary

Results for Conditions in 2016 are as follows.

- All assessment criteria were met for birds, amphibians, and invertebrates in all MUs. For fish, assessment criteria were met for nitrate and sulphate in all MUs and for selenium in all MUs except MU1 and MU2.
- In the upper Fording River (MU1), the selenium assessment predicted low-magnitude effects on reproduction of WCT feeding in the mainstem upper Fording River during the period of egg provisioning. However, the area-weighted integrated effect across the upper Fording River WCT population remained below 10%. As discussed in Appendix A, it is expected that similar levels of potential effect will be predicted when the integrated assessment methodology is updated to incorporate fish use information. Effects of this magnitude would not be expected to result in population-level effects. This expectation has been confirmed by fisheries studies indicating that the upper Fording River WCT population is viable, robust, and in good condition compared to similar populations found in the upper Kootenay River (Cope 2016).
- In the lower Fording River (MU2), the selenium assessment predicted low-magnitude effects on reproduction of sensitive fish species. As discussed in the EVWQP, the integrated effect on fish in MU2 is expected to be lower than indicated by this calculation because fish species present in the lower Fording River are expected to be more tolerant to selenium than species used to derive the sensitive-species benchmarks. In addition, fish can move freely between the lower Fording River and the Elk River, where selenium concentrations and potential effect sizes are lower. As a result, the integrated effect on fish in MU2 is expected to be lower than indicated by this calculation, and population-level effects are not expected to occur. This assessment result for MU2 is consistent with that presented in Annex H of the EVWQP.

Results for conditions between 2017 and 2022 are as follows.

- All assessment criteria were met for birds, amphibians, and invertebrates in all MUs. For fish, assessment criteria were met for nitrate and sulphate in all MUs and for selenium in MU3. Considering the prevalence of lotic bioaccumulation conditions in the Canadian portion of Koocanusa Reservoir, the integrated potential effect on fish reproduction from selenium is also expected to meet the assessment criterion.
- In the upper Fording River (MU1) and Elk River (MU4 and MU5), the assessment predicted low-magnitude effects (up to 15%) of selenium on reproduction of sensitive fish species feeding in some portions of the mainstem during the period of egg provisioning. However, the area-weighted integrated effect across the MUs remained below 10%. As discussed in Appendix A, it is expected that similar levels of potential effect will be predicted when the integrated assessment methodology for MU1 is updated to incorporate fish use information. Effects of this magnitude would not be expected to result in population-level effects even to sensitive species. Results for MU1 will continue to be evaluated by ongoing monitoring of the upper Fording River WCT population (Cope et al 2017).
- In the lower Fording River (MU2), results for fish were the same as the analysis of Conditions in 2016 and consistent with that presented in the EVWQP, indicating a potential for low-magnitude effects of selenium on reproduction of sensitive fish species. As described above, potential effects on fish in MU2 are expected to be lower than indicated by this calculation, and population-level effects are not expected to occur.

Results for conditions after 2022 are as follows.

- All assessment criteria were met for birds, amphibians, and invertebrates in all MUs. As discussed in Appendix A, it is expected that similar levels of potential effect will be predicted when the integrated assessment methodology for MU1 is updated to incorporate fish use information. For fish, assessment criteria were met in all MUs except for selenium and sulphate in MU2.
- Selenium assessment results for the lower Fording River (MU2) were the same as the analysis of Conditions in 2016 and consistent with that presented in the EVWQP, indicating a potential for low-magnitude effects of selenium on reproduction of sensitive fish species. As described above, potential effects on fish in MU2 are expected to be lower than indicated by this calculation, and population-level effects are not expected to occur.
- Sulphate assessment results for MU2 indicated a potential for low-magnitude effects (up to 11%) on early life stages of sensitive fish species spawning in the mainstem lower Fording River. As discussed above for selenium, these potential effects are expected to be offset by the ability of fish to move freely between the lower Fording River and the Elk River, where sulphate concentrations and potential effect sizes are lower.

3.0 COMPARISON TO MONITORING INFORMATION

3.1 Overview

The section evaluates the correspondence of integrated assessment results for Conditions in 2016 with recent biological community data for benthic invertebrates (Section 3.2) and fish (Section 3.3). Because the benchmarks used to populate the integrated assessment tables rely principally upon results of sensitive species and endpoints in site-specific toxicity testing, monitoring of resident biological communities provides an important cross-check of the biological and ecological significance of the assessment criteria discussed in Section 2.2.6.

3.2 Benthic Invertebrates

3.2.1 Methods

Detailed methodology used to evaluate benthic invertebrate community (BIC) data collected as part of Teck's 2015 RAEMP and 2016 LAEMPs are provided in Minnow (2018). An overview of methods is provided below.

BIC samples were collected in September 2015 from 40 reference and 59 mine-exposed stations. In September 2016, a subset of these reference (7 of 40) and mine-exposed (30 of 59) stations were sampled again to support LAEMPs. Minnow (2018) compared BIC endpoints to the normal range at reference areas, which was defined as the 2.5th to 97.5th percentiles for each endpoint. Minnow (2018) summarized data for BIC endpoints that were significantly correlated with mine-influenced water quality or are commonly-used endpoints. Based on discussions with the Environmental Monitoring Committee, the following four endpoints were selected to evaluate potential effects at the community level: total abundance (number of organisms per sample), taxonomic richness at lowest practical level of taxonomy (LPL richness), percent of organisms in the insect Orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) (Percent EPT), and percent of organisms in the Order Ephemeroptera (Percent E).

BIC results from Minnow (2018) were compiled for the four selected endpoints. BIC results for 2016 were used preferentially, as the 2016 sampling year matches the integrated assessment for Conditions in 2016. If BIC data were not available for 2016, then 2015 results were used. Each station was assigned as being within the normal

range (all four endpoints within the normal range) or below the normal range (one or more endpoints below the normal range).

For each station, BIC results were compared to the maximum invertebrate effect score generated from the integrated assessments for Conditions in 2016. That is, the maximum score from nitrate, sulphate, and selenium assessments was used. Invertebrate effect scores from the integrated assessment (range of 0 to 5; Table 3) were simplified into three categories for this comparison, representing negligible effects (score of 0 or 1), possible effects (score of 2 or 3), or likely effects (score of 4 or 5). Table 14 shows how combinations of monitoring results and effect scores were interpreted to align or not align.

Stations that fell into the “do not align” categories were investigated further to evaluate whether the misalignment was related to the integrated assessment approach or whether the misalignment could be explained by other site-specific factors (e.g., calcite, or a constituent other than nitrate, sulphate, or selenium). Benthic invertebrate communities are shaped by physical, biological, and chemical factors, and as such the categorical assignments conducted herein are not intended to be a definitive evaluation of causation.

Table 14: Interpretation of Benthic Invertebrate Monitoring and Integrated Assessment Results

Benthic Invertebrate Monitoring Results	Maximum Effect Score from Integrated Assessments of Selenium, Nitrate, and Sulphate for Conditions in 2016		
	Negligible (0 or 1)	Possible (2 or 3)	Likely (4 or 5)
Within the normal range	Align	Alignment uncertain	Do not align
One or more endpoints below the normal range	Do not align		Align

3.2.2 Results

BIC results for the majority of stations aligned with maximum effect scores (74%) (Table 15). There was misalignment for ten of 38 stations (26%). In all cases of misalignment, stations had maximum effect scores of 0 to 1 but had one or more BIC endpoints below the normal range, indicating that factors other than selenium, nitrate, and sulphate are associated with the observed benthic community alterations. These stations are discussed below.

- Three stations (LC_GRCK, LC_LC1, and GH_ER2) are reference locations with one or more BIC endpoints below the normal range. Sulphate, nitrate, and selenium concentrations were below WQGs, indicating that these constituents would not be expected to cause effects.
- Two stations are located on the Fording River in MU1 (FR_FR4, GH_PC2), where reductions in BIC endpoints are currently being investigated for potential cause. Nitrate concentrations have seasonally exceeded the level 1 or level 2 benchmarks. Ongoing work indicates that aqueous trends for selenium, nitrate, and sulphate do not correspond to trends in BIC indicators, suggesting that another factor is affecting benthic invertebrates.
- Three stations are located on tributaries and off-channels to the Fording River in MU1: Lake Mountain Creek (FR_LMP1), Porter Creek (GH_PC1), and Fording Oxbow (FO10-SP1). Aqueous concentrations of selenium, nitrate, and sulphate do not correspond with BIC indicators.
- One station is located in Michel Creek downstream of Corbin Creek (CM_MC2). Recent investigations have identified nickel as the likely cause of effects on the BIC at CM_MC2.

- One station in the Elk River (RG_ELKORES) was sampled in 2015 and 2016, and the degree of misalignment was small and inconsistent over time. BIC endpoints were within the normal range in 2015 and 2016, except for % EPT in 2016. Additional sampling was conducted in 2017 to investigate this result. In 2017, BIC endpoints were within the normal range .
- One station in Harmer Creek (EV_HC1) was sampled in 2015 and 2016, and the degree of misalignment was small. In both years, %EPT was below the normal range; however, other BIC endpoints were within the normal range (J. Ings, Minnow, pers. comm.).

Table 15: Comparison of Benthic Invertebrate Monitoring Results to the Integrated Assessment for Conditions in 2016

Benthic Invertebrate Monitoring	Maximum Effect Score from Integrated Assessment for Conditions in 2016		
	0 to 1	2 to 3	4 to 5
Within normal range	20	1	0
Below normal range	10	1	6

Note: Cells show number of monitoring locations that fall into each category (out of 35 total)

Overall, the comparison summarized above indicated good alignment between the integrated assessment results and monitoring data. Most stations had maximum effect scores of zero or 1 and were within normal range for all BIC metrics. All stations with maximum effect scores of 4 or 5 were below normal range for one or more BIC metrics. Where the integrated assessment results did not align with monitoring data (i.e., maximum score 0 or 1 but below normal range), observed effects were not associated with selenium, nitrate, or sulphate.

3.3 Fish

The correspondence of integrated assessment results for fish was conducted for MU1, for which there is a recent, multi-year, robust study that evaluated the WCT population in the upper Fording River.

Cope et al. (2017) completed a population study of WCT in the upper Fording River between 2012 and 2017. The study included review of existing information and field investigations to measure abundance, migration behaviour, and habitat. Cope et al. (2017) reported a significant increase in fry and juvenile densities and a stable to slight increase in sub-adults and adults. Overall, results of the population study show that the WCT population in the upper Fording River is viable, robust, and in good condition compared to similar populations found in the upper Kootenay River. These results align with the integrated assessment results for nitrate, sulphate, and selenium, which predicted an integrated effect size <10% across MU1 (Section 2.3).

4.0 SUMMARY OF KEY FINDINGS

The objective of this analysis was to evaluate projected water quality greater than Compliance Limits and SPOs. Constituent-specific assessments were conducted using the same approach used in the Annex H of the EVWQP, with the refinement that seasonality of receptor pathways was considered. The interpretation summarized below considers that the assessment criteria applied in this analysis were derived in the EVWQP to reflect attainment of regional protection goals for aquatic health. Where assessment criteria are met, those protection goals are considered to have been attained.

Key findings of the integrated assessment are summarized below.

Integrated assessment results (Conditions in 2016)

The assessment indicated that regional protection goals were met for birds, amphibians, and invertebrates in all MUs. For fish, assessment criteria were met for nitrate and sulphate in all MUs and for selenium in all MUs except MU1 and MU2.

The selenium assessment predicted a potential for low-magnitude effects on reproduction of WCT feeding in some reaches of the mainstem upper Fording River (MU1). However, the integrated effect across the MU remained below 10%. Effects of this magnitude would not be expected to result in population-level effects, and this expectation has been confirmed by monitoring (Cope 2016).

The selenium assessment also predicted a potential for low-magnitude effects (integrated effect 13%) on reproduction of sensitive fish species in the lower Fording River (MU2), consistent with the assessment conducted for the EVWQP. Because fish species present in this MU are expected to be more tolerant to selenium than species used to derive the benchmarks, and in addition can move freely between the lower Fording River and the Elk River, potential effects to fish in MU2 are expected to be lower than indicated by this calculation; population-level effects are not expected to occur.

Recent biological monitoring data for benthic invertebrates and fish were summarized to evaluate their correspondence to integrated assessment results for Conditions in 2016. Overall, the integrated assessment results aligned well with recent BIC monitoring data in the Elk Valley and the WCT population assessment in MU1. This finding supports use of the integrated assessment to evaluate projected conditions.

Integrated assessment results (2017 to 2022)

The assessment indicated that regional protection goals were met for birds, amphibians, and invertebrates in all MUs. For fish, the assessment indicated that regional protection goals were met for nitrate and sulphate in all MUs and for selenium in MU3. The integrated potential effect on fish reproduction in MU6 is also expected to meet regional protection goals.

In the upper Fording River (MU1) and Elk River (MU4 and MU5), the assessment predicted low-magnitude effects of selenium on reproduction of sensitive fish species in some mainstem reaches. However, the integrated effect across the MUs remained below 10%. Effects of this magnitude would not be expected to result in population-level effects even to sensitive species.

In the lower Fording River (MU2), results for fish were the same as the analysis of Conditions in 2016 and consistent with that presented in the EVWQP, indicating a potential for low-magnitude effects of selenium on reproduction of sensitive fish species. As described above, potential effects on fish in MU2 are expected to be lower than indicated by this calculation and population-level effects are not expected to occur.

Integrated assessment results (after 2022)

The assessment indicated that regional protection goals were met for birds, amphibians, and invertebrates in all MUs. For fish, the assessment indicated that regional protection goals were met except for selenium and sulphate in MU2.

Selenium assessment results for the lower Fording River (MU2) were the same as the analysis of Conditions in 2016 and consistent with that presented in the EVWQP, indicating a potential for low-magnitude effects of

selenium on reproduction of sensitive fish species. As described above, potential effects on fish in MU2 are expected to be lower than indicated by this calculation and population-level effects are not expected to occur.

Sulphate assessment results for MU2 indicated a potential for low-magnitude effects (up to 11%) on early life stages of sensitive fish species spawning in the mainstem lower Fording River. As discussed above for selenium, these potential effects are expected to be offset by the ability of fish to move freely between the lower Fording River and the Elk River, where sulphate concentrations and potential effect sizes are lower.

Signature Page

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https://golderassociates.sharepoint.com/sites/22006e/p1792554teckimplplanupdate/shared documents/sirs/ipa_rd3/reporting/10_annex i - integrated effects/annexi_2019_ipa_iea_final.docx

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APPENDIX A

2019 Follow-up Analyses

TECHNICAL MEMORANDUM

DATE 23 July 2019

TO Jessica Mackie, Lead - Water Quality
Teck Coal Limited

CC

FROM Emily-Jane Costa, Adrian de Bruyn **EMAIL ecosta@golder.com; adebruyn@golder.com**

FOLLOW-UP ANALYSES IN SUPPORT OF INTEGRATED EFFECTS ASSESSMENT FOR THE 2019 IMPLEMENTATION PLAN ADJUSTMENT

Golder Associates Ltd. (Golder) is pleased to provide Teck Coal Limited (Teck) with the following analysis undertaken in support of the integrated effects assessment prepared for the 2019 Implementation Plan Adjustment (IPA). The work outlined herein was conducted in response to discussions and feedback provided by representatives of the Ktunaxa Nation Council (KNC) and British Columbia Ministry of Environment and Climate Change Strategy (ENV) at a workshop held 1 May 2019 in Vancouver, BC. A proposed scope was provided to KNC and ENV for review and discussed by teleconference on 28 May 2019. The analysis provided herein follows the proposed scope reviewed by KNC and ENV.

1.0 OVERVIEW

The objective of the analysis presented herein was to help resolve uncertainty around spatially-integrated effects calculations for westslope cutthroat trout (WCT; *Oncorhynchus clarki lewisi*) in the upper Fording River, referred to as Management Unit 1 (MU1) in the Elk Valley Water Quality Plan (EVWQP). Specifically, uncertainty was identified by KNC related to the area-weighted calculation of spatially-integrated effects, and how sensitive this calculation might be to incorporating differential fish use of different parts of the MU, as opposed to assuming that fish use all available habitats equally.

The analysis to address uncertainty in spatially-integrated effects calculations consisted of two parts. Part 1 was a sensitivity analysis that evaluated how incorporating information on fish use of different areas in MU1 could affect integrated effects estimates for reproduction of WCT. The sensitivity analysis involved calculating spatially-integrated reproductive effects estimates for scenarios that simulated preferential fish use of areas with relatively high dietary selenium concentrations, and comparing these to estimates calculated by the area-weighted approach used in the 2019 IPA. A similar comparison was performed for modelled effects of nitrate and sulphate on sensitive early life stages of WCT. Part 2 was an analysis of measured fish tissue selenium data from MU1 that complements and validates the modelling of selenium undertaken in Part 1. Part 2 involved using tissue monitoring data to estimate the current distribution of egg selenium concentrations in the upper Fording River WCT population, and then using this distribution to calculate an estimate of integrated reproductive effects across the population. Comparison of measured exposure and potential effects (from Part 2) to modelled exposure and potential effects (from Part 1) provided a “reality check” on the spatially-integrated assessment calculation and evaluated the extent to which the methods used in the 2019 IPA are supported by recent monitoring data.

The following sections present methods (Section 2.0), results (Section 3.0), key findings (Section 4.0), and an assessment of uncertainty (Section 5.0).

2.0 METHODS

2.1 Part 1: Sensitivity Analysis

The sensitivity analysis involved three steps:

- Step 1: Estimate relative fish use of areas in MU1. For selenium, relative fish use was estimated for adult WCT during spawning, overwintering, and summer rearing seasons, as reflected in reported seasonal patterns of WCT distribution. Potential exposure to nitrate and sulphate was considered relative to the reported distribution of WCT fry.
- Step 2: Estimate exposure in each area. Dietary selenium concentrations were estimated during each season in each area identified in Step 1. Seasonal nitrate and sulphate concentrations during the period when sensitive early life stages are present (June to August) were obtained from the 2019 IPA analysis.
- Step 3: Calculate and compare spatially-integrated effects estimates: 1) weighted by area of fish-accessible habitat, consistent with the 2019 IPA; and 2) weighted by estimated relative fish use from Step 1. Spatially-integrated effects estimates were calculated for potential effects of selenium on WCT reproduction and potential effects of nitrate and sulphate on early life stages of WCT.

2.1.1 Fish Use Scenarios

Fish use scenarios were defined to reflect patterns of fish distribution reported by Cope et al. (2016, 2017). To incorporate this information into the spatially-integrated assessment, Fording River segments established by Cope et al. (2016, 2017) were aligned with habitat subunits used in the 2019 IPA integrated effects tables as summarized in Table 1. Fish use in different portions of the study area was then estimated for each season from tables, figures, and maps in Cope et al. (2016, 2017).

Table 1: Habitat Sub-unit and River Segment Pairing for the Fording River

Habitat Sub-unit (Annex I of IPA)	River Description and Segment (Cope et al. 2016, 2017)
Upstream of FRO (FR_UFR1)	Headwaters (S11)
	Above Henretta (S10)
Downstream of Henretta Creek (FR_FR1)	Turnbull Br. to above Henretta (S9; top)
Between Clode Creek and Kilmarnock Creek (FR_FR2)	Turnbull Br. to above Henretta (S9; bottom)
	Diversion reach to Turnbull Br. (S8)
Between Swift and Cataract creeks (FR_FR4)	F2 side road to Diversion Reach (S7)
Downstream of Porter Creek (GH_PC2)	Chauncey Cr. to F2 side road (S6)
	S-bends to Chauncey Creek (S5)
	Ewin Cr. To S-bends (S4)
	Above Fording Br. To Ewin Creek (S3)
	GHO to above Fording Bridge (S2)
Downstream of Greenhills Creek (GH_FR1)	Josephine Falls to GHO (S1)
Fording Oxbow	S6 Oxbow

Fish use for the selenium assessment was estimated as follows:

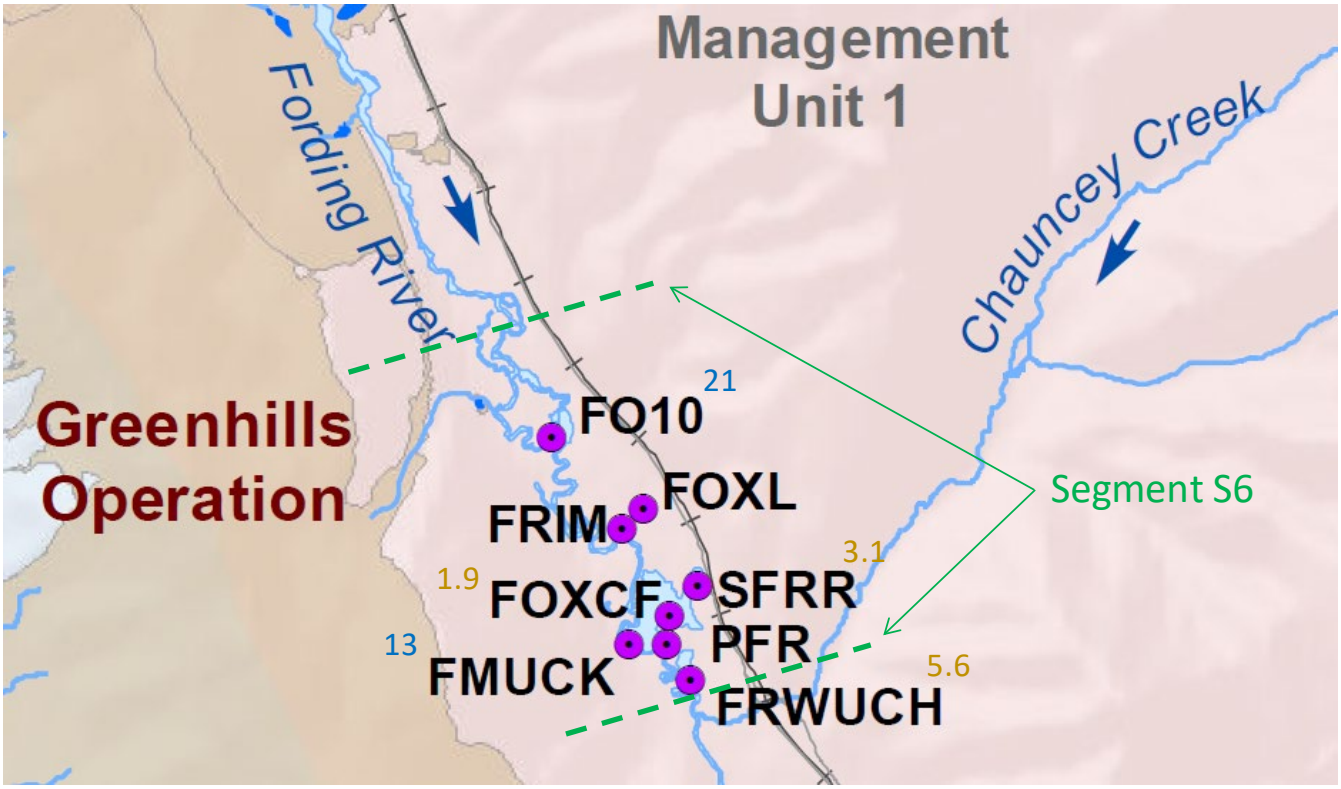
- **Overwintering**. Cope et al. (2016) defined the overwintering period as November through February, and noted that the shoulder seasons of October and March were excluded to facilitate the identification of critical habitat. Fish use in this season was depicted on Figure 3.3.14 in Cope et al. (2016), reproduced herein as Figure 3.1-2. The raw data used to generate the heat map were used to calculate proportional fish use for each segment in Table 2.1-1. For segment S6, fish were assumed to use only off-channel (oxbow) areas for overwintering (i.e., no fish use was assigned to mainstem portions of segment S6), following the interpretation provided by Cope et al. (2016).
- **Spawning**. Cope et al. (2016, Section 2.5.1.1.2) defined the spawning period for WCT as mid-May to mid-July. Fish use in this season was depicted on Figure 3.3.14 in Cope et al. (2016), reproduced herein as Figure 3.1-2. The raw data used to generate the heat map were used to calculate proportional fish use for each segment in Table 2.1-1. For segment S6, fish use was split evenly between mainstem and off-channel (oxbow) areas.
- **Summer rearing**. Cope et al. (2016) defined the summer rearing period as mid-July through September. Fish use in this season was depicted on Figure 3.3.23 of Cope et al. (2016), reproduced herein as Figure 3.1-3. The raw data used to generate the heat map were used herein to calculate proportional fish use for each segment in Table 2.1-1. For segment S6, fish use was split evenly between mainstem and off-channel (oxbow) areas.

Cope et al. (2016) identified the Fording River oxbow area in segment S6 as habitat for spawning, overwintering, and summer rearing. Review of aqueous and benthic invertebrate selenium concentrations reported for off-channel sample locations the Fording River oxbow area (see Section 2.1.2 for details) indicated that selenium exposure in this area is heterogenous (Figure 1). Therefore, the Fording River oxbow area was separated into two habitat types, one representing lotic/low-exposure conditions with relatively low dietary selenium concentrations, and one representing semi-lentic/lentic conditions with relatively high dietary selenium concentrations. Fish use of these two habitat types was assigned based on reported seasonal fish distribution within segment S6, as follows:

- Overwintering and summer rearing in segment S6 were reported to occur mostly or entirely in the downstream portion near Chauncey Creek (Section 3.1.1). Reported aqueous and benthic invertebrate selenium concentrations in this area indicate that bioaccumulation is consistent with the lotic model, and that most sample locations (3 of 4 locations) exhibit no apparent influence of mainstem water quality (Section 2.1.2). Fish use of this area was split evenly between lotic/low-exposure conditions (with relatively low dietary selenium concentrations) and semi-lentic/lentic conditions (with relatively high dietary selenium concentrations). Dietary exposure in each habitat type was estimated from measured benthic invertebrate selenium concentrations at the four sample locations in the downstream portion of segment S6 (i.e., FRWUCH, SFFR, FOXCF, and FMUCK).
- Spawning was reported to occur across the entire S6 segment (Section 3.1.1). Reported off-channel aqueous and benthic invertebrate selenium concentrations across segment S6 were more evenly split between lotic/low-exposure (3 of 5 sample locations) and semi-lentic/lentic conditions (2 of 5 sample locations). Fish use in the spawning season was therefore split evenly between lotic/low-exposure conditions and semi-lentic/lentic conditions, and dietary exposure in each habitat type was estimated from measured benthic invertebrate selenium concentrations at all five sample locations in segment S6 (Section 2.1.2).

For the nitrate and sulphate assessments, reported average fry counts from 2015 and 2017 (Table 3.6 from Cope et al. 2017) were used to approximate the distribution of early life stages. The proportion of the population that each area represents was estimated as the product of the size of the area in hectares (product of segment length and wetted width; Table 3.1.1 of Cope et al. 2016) and the density of fry in the area. For segment S6, fry use was split evenly between the mainstem and off-channel (oxbow) areas.

Figure 1: Measured Invertebrate Selenium Concentrations at Lentic Stations Sampled in Fording River Segment S6.



Notes: Fording River segment S6 (green dashed lines) estimated from Cope et al. (2016). Lentic stations are annotated with 2018 invertebrate selenium concentration (*n*=3; geometric mean shown) in blue (reflecting higher, more "lentic" concentrations) or orange (reflecting lower, more "lotic" concentrations). Concentrations are in milligrams per kilogram dry weight. Stations without annotation did not have invertebrate selenium concentrations.

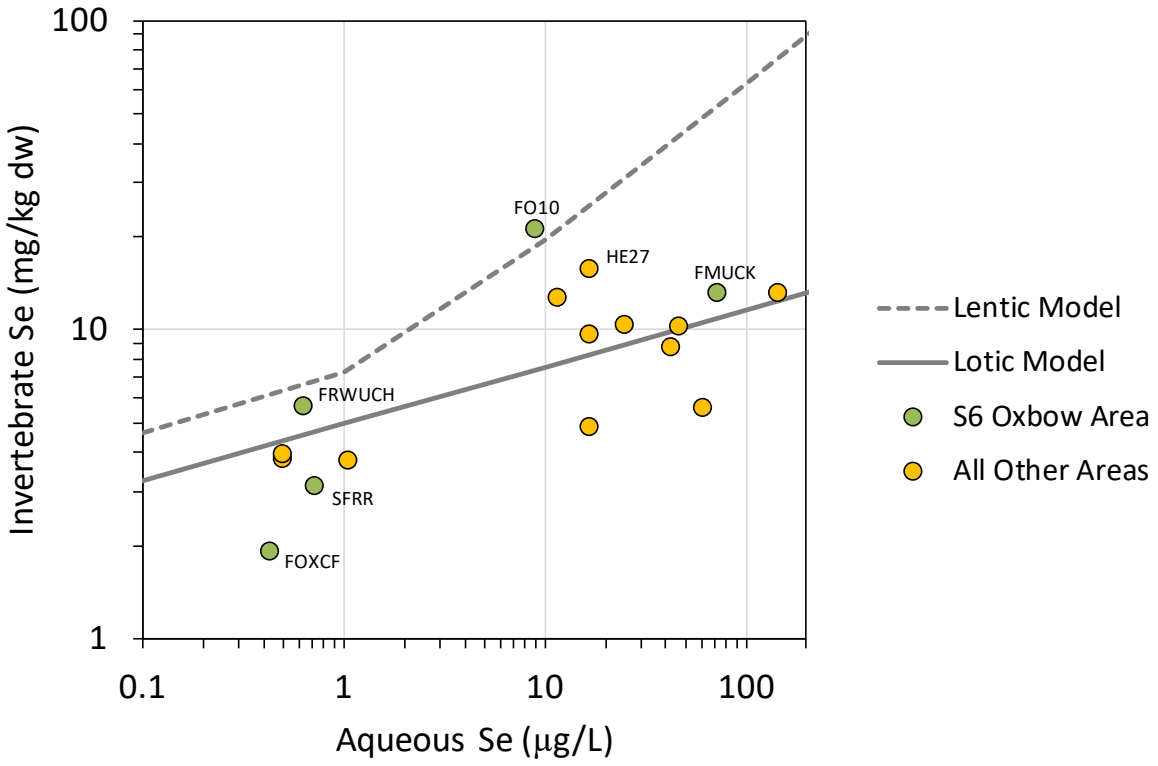
2.1.2 Estimation of Dietary Selenium Concentrations

Dietary selenium exposure in each area was estimated by considering both measured and modelled benthic invertebrate selenium concentrations. Measured concentrations were obtained from Minnow (2013, 2018). Values measured in 2018 were available for all areas except Henretta Creek downstream of FRO (2015 data used) and Chauncey Creek (2012 data used). Modelled concentrations were calculated using the lotic and lentic bioaccumulation models used in the EVWQP and described in Teck (2014).

A comparison of measured benthic invertebrate selenium concentrations to the lotic and lentic bioaccumulation models is shown in Figure 2. For most areas, values were plotted as a geometric mean of reported benthic invertebrate selenium concentrations paired with aqueous selenium concentrations in summer, which is when invertebrate tissue sampling occurred. Off-channel sample locations in segment S6 (indicated on Figure 1) were

plotted separately on Figure 2 because aqueous and benthic invertebrate selenium concentrations in that area exhibited heterogeneity across sampling locations.

Figure 2: Measured Invertebrate Selenium Concentrations Relative to Bioaccumulation Models



Notes: Concentrations are in micrograms per litre (µg/L) or milligrams per kilogram dry weight (mg/kg dw). S6 oxbow area = locations annotated on Figure 2.1-1. All Other Areas = locations with fish use in overwinter, summer, or spawning seasons. Henretta Pit Lake is annotated as HE27.

Data from the Fording Oxbow area, shown as green symbols on Figure 2, indicate that some off-channel sampling areas (specifically, FRWUCH, SFFR, and FOXCF) exhibit little or no mainstem influence on aqueous selenium concentrations, indicating that they are fed by water from upland sources. Accordingly, benthic invertebrate selenium concentrations in these areas are relatively low. The remaining two off-channel areas in segment S6 exhibit higher benthic invertebrate selenium concentrations. One of these (FO10) appears to have partial influence of mainstem Fording River water quality, reflected in a reported aqueous selenium concentration of 9 µg/L. The reported benthic invertebrate selenium concentration from FO10 conforms to the lentic bioaccumulation model. The other off-channel area shown on Figure 2, which is a flooded “meadow” upstream of Chauncey Creek (FMUCK), exhibits mainstem water quality (aqueous selenium ~70 µg/L) and conforms to the lotic bioaccumulation model.

Data from elsewhere in MU1, shown as yellow symbols on Figure 2, indicate that mainstem and tributary sites generally conform to or are lower than the lotic bioaccumulation model. The notable exception is Henretta Pit Lake (denoted HE27), which has previously been identified as having semi-lentic bioaccumulation conditions.

In consideration of the comparison of measured and modelled benthic invertebrate selenium concentrations described above, dietary selenium concentrations for fish in each area were estimated as follows:

- For mainstem, tributary, and Henretta Pit Lake locations (i.e., all areas except segment S6), modelled invertebrate selenium concentrations were calculated for each season and fish use area identified in Step 1 by using maximum monthly aqueous selenium concentrations in each season as inputs to the lotic and lentic selenium bioaccumulation models. In no case did measured data from these locations conform to the lentic model (Figure 2), which indicates these fish use areas that have lotic or semi-lentic conditions. If the measured concentration was within 20% of or lower than the lotic modelled concentration, then the lotic modelled concentration was used herein. If the measured concentration was greater than the lotic modelled concentration by 20% or more, then the measured concentration was used as the best estimate of dietary selenium exposure.
- As discussed in Section 2.1.1, dietary selenium concentrations in segment S6 were estimated for lotic/low-exposure areas (represented by FRWUCH, SFFR, and FOXCF) and semi-lentic/lentic areas (represented by FMUCK in the downstream portion of segment S6, and by FO10 in the upstream portion). The dietary selenium concentration in lotic/low-exposure areas was estimated as the geometric mean of data from FRWUCH, SFFR, and FOXCF. The dietary selenium concentration in semi-lentic/lentic areas was estimated either as the reported concentration at FMUCK (for overwinter and summer rearing seasons, when fish use in that segment is concentrated near Chauncey Creek), or as the geometric mean of reported concentrations at FMUCK and FO10 (for the spawning season, when fish use is distributed throughout the segment).

2.1.3 Spatially-Integrated Effects Calculation

Spatially-integrated effects were estimated using a calculation weighted by area (consistent with the 2019 IPA) and weighted by relative fish use (as estimated in Step 1). Methods for this step were as follows:

- Effects were calculated in the 2019 IPA for Conditions in 2016 (represented by projected water quality concentrations for 2016; Section 2.2.3 of Annex I) because this allowed a comparison of output from the sensitivity analysis with recent biological monitoring data. To align with the seasons defined for WCT distribution, peak concentrations were assessed for the months of overwintering (October to March), spawning (defined as April to June for selenium to reflect dietary exposure of adults, and defined as June to August for sulphate and nitrate to reflect direct exposure of embryos and alevins), and summer rearing (July to September).
- Selenium exposure was modelled for all three seasons, although there is uncertainty in the toxicological relevance of results for the overwintering period. Low temperatures and shorter days in winter are expected to result in relatively low or negligible rates of algal production, which would limit selenium uptake during the period when aqueous selenium concentrations are typically highest. As well, low temperatures would result in reduced or negligible feeding and growth of benthic invertebrates (many of which enter resting stages over winter) and reduced metabolism and feeding of fish. The summer rearing season is expected to have the highest rates of production, feeding, and growth, and is therefore expected to be the most relevant season for selenium uptake and trophic transfer to fish.

- Sulphate and nitrate exposure were modelled using spawning season water quality, as this represents the window during which sensitive early life stages of fish would be exposed (see Section 2.2.4.1 of Annex I for further discussion).
- Effects calculations were performed using the same bioaccumulation and toxicity data as the updated EVWQP integrated effects tables that were presented for Conditions in 2016 in the 2019 IPA, with refinements to how dietary selenium concentrations were estimated for areas with semi-lentic conditions (Section 2.1.2).
- Estimates of spatially-integrated effects were compared between a calculation weighted by area and calculations weighted by relative fish use (Section 2.1.1). Both estimates were compared to the level 1 and 2 critical effect sizes of 10% and 20% developed for the EVWQP (see Annex I for rationale).

2.2 Part 2: Fish Tissue Selenium Data Evaluation

This evaluation was conducted as follows:

- Step 1: Recent WCT tissue selenium data from MU1 were compiled from local and regional monitoring programs and baseline studies. Muscle selenium concentrations were converted to estimated egg selenium concentrations using a previously-established statistical relationship.
- Step 2: Sampling locations were reviewed to assess spatial coverage and representativeness, and compiled data were summarized as an estimated distribution of egg selenium concentrations across MU1.
- Step 3: A total percent reproductive effect of selenium on the MU1 WCT population was estimated from the distribution of egg selenium concentrations.

The calculation in Part 2 provides a form of validation of the spatially-integrated effects calculation presented in the 2019 IPA and in Part 1. The spatially-integrated effects calculation in Part 1 models potential effects from the spatial pattern of selenium exposures and integrates these across the MU to estimate a total reproductive effect. This calculation incorporates multiple margins of safety (discussed in Annex O of the EVWQP) that are expected to result in an over-estimate of potential reproductive effects. The evaluation in Part 2 provides an independent calculation of the same total reproductive effect, in this case based on measured data. The evaluation in Part 2 incorporates no margins of safety, but rather is a direct estimation of what reproductive effect would be expected given the observed fish tissue selenium data.

2.2.1 Compilation and Conversion of WCT Tissue Selenium Data

Recent WCT tissue selenium data from MU1 were compiled from local and regional monitoring programs and baseline studies. The compilation included muscle and egg/ovary data collected from 2015 to 2018 to provide sufficient data to describe a distribution of recent selenium concentrations in WCT tissue. Data sources were:

- Minnow. 2018. Elk River Watershed Regional Aquatic Effects Monitoring Program (RAEMP) Report, 2015-2016 (muscle n = 29; ovary n = 1)
- Golder. 2018. Aquatic Health Baseline Report, FRO – Turnbull West Project (muscle n = 4)
- Nautilus. 2015. Fording River Westslope Cutthroat Trout Gamete Study, Final Report (egg n = 15)
- Data collected in 2018 under RAEMP. Data package. (muscle n = 16)

Muscle selenium concentration data were converted to estimated egg selenium concentrations using a statistical relationship derived by Nautilus and Interior Reforestation (2011), as cited in Minnow (2018):

$$Egg\ Se = (Muscle\ Se)^{0.98} \times 1.686$$

2.2.2 Estimation of the Distribution of Fish Egg Selenium Concentrations across MU1

Sampling locations were reviewed to assess whether the spatial coverage of sampling would be expected to encompass the overall distribution of fish egg selenium concentrations across MU1, and to confirm that the dataset would provide an unbiased characterization of this overall distribution. In particular, sampling locations were reviewed to confirm that the dataset was not skewed by intensive sampling in an area disproportionate to the contribution of that area to the total WCT population. For this assessment, the proportion of the dataset contributed by each location (i.e., how many samples from each area relative to the total number of samples) was compared to the estimated proportional use of that area by fish in each season (from Part 1). Following this review, data were summarized by fitting a statistical distribution. A log-normal fit was selected, characterized as the mean and standard deviation of $\log_{10}$-transformed egg selenium concentrations.

2.2.3 Estimation of Potential Reproductive Effect

The fitted log-normal distribution of fish egg selenium concentrations was integrated with the concentration-response relationship for WCT using the same calculation developed for the EVWQP. The output of this calculation is an estimated total potential reproductive effect across a population of individuals represented by the distribution. The estimated total potential reproductive effect was compared to modelled values derived in Part 1 and to the level 1 and 2 critical effect sizes of 10% and 20% developed for the EVWQP (see Annex I for rationale).

2.2.4 Comparison of Measured and Modelled Egg Selenium Concentrations

The compiled measured and estimated egg selenium concentrations were compared to modelled data from Part 1 to evaluate how well the integrated assessment methodology simulates the observed distribution of fish exposures in MU1.

3.0 RESULTS

3.1 Part 1: Sensitivity Analysis

3.1.1 Fish Use Scenarios

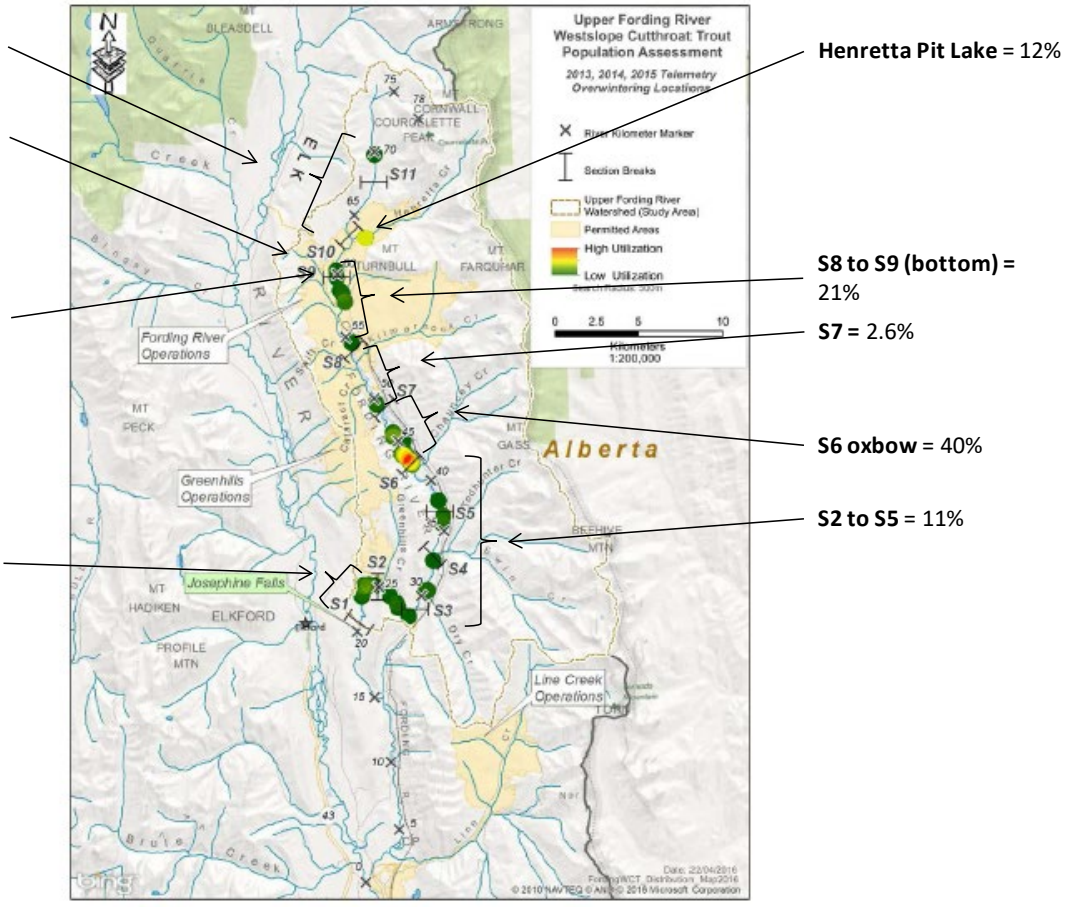
Fish use estimates are presented in Table 2 and summarized below. Fish use estimates for spawning, overwintering, and summer rearing are also annotated on the Cope et al. (2016) maps, which are reproduced herein in Figure 3 to Figure 5.

- **Overwintering**. Fish use was highest in the segment S6 oxbow area upstream of Chauncey Creek, followed by Henretta Pit Lake, and Fording River segments S7 to S9 (Figure 3).
- **Spawning**. Fish use was highest in Fording River segments 8 and 9 (Clode Flats area), followed by Fording River segments S2 to S6 (including the oxbow) (Figure 4).
- **Summer rearing**. In contrast to spawning and overwintering, the summer rearing distribution was more spatially-distributed throughout the mainstem Fording River from segment S1 to S10, including the Fording

River Oxbow in segment S6 (Figure 5). Lower Henretta Creek and Henretta Pit Lake were also identified as high use areas.

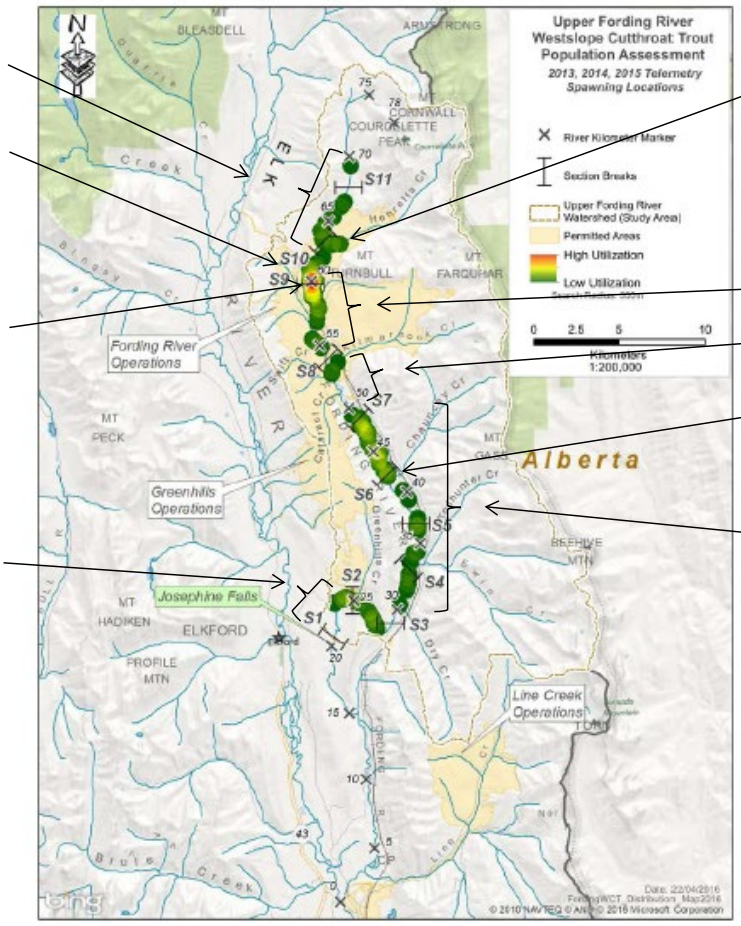
- **Early life stages**. Fish use was highest in Fording River segment 8 (Clode Flats area), followed by Fording River segment S6 (including the oxbow), Lake Mountain Creek, and Greenhills Creek.

Figure 3: Overwintering Season Westslope Cutthroat Trout Occupancy Rates (Figure 3.3.19 from Cope et al. 2016).



Note: Figure annotated with fish use from Table 2.

Figure 4: Spawning Season Westslope Cutthroat Trout Occupancy Rates (Figure 3.3.14 from Cope et al. 2016).



Henretta Pit Lake = 1.6%
Henretta Downstream = 1.6%

S8 to S9 (bottom) = 25%

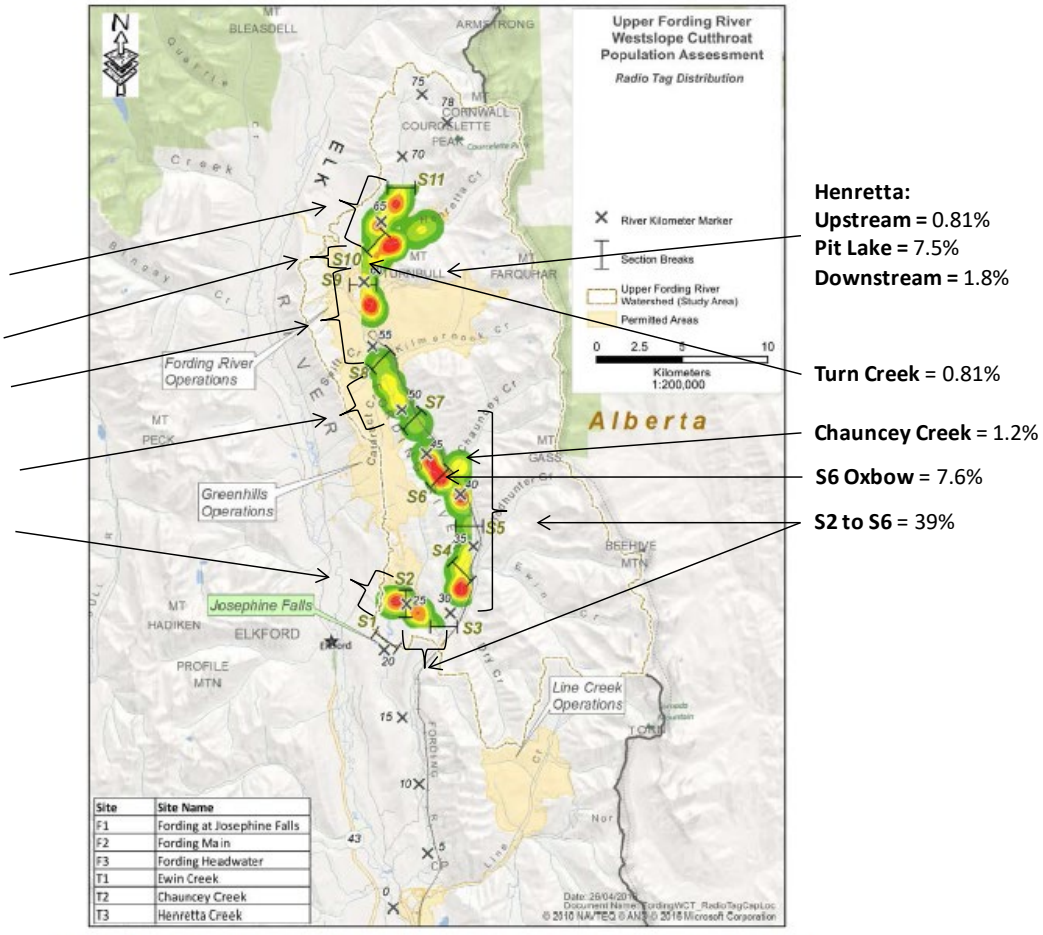
S7 = 3.1%

Chauncey Creek = 0.8%

S2 to S6 = 33%
S6 Oxbow = 10.8%

Note: Figure annotated with fish use from Table 2.

Figure 5: Summer-Rearing Season Westslope Cutthroat Trout Occupancy Rates (Figure 3.3.23 from Cope et al. 2016).



Note: Figure annotated with fish use from Table 2.

Table 2: Habitat and Estimated Fish Use

Habitat Sub-unit	Fish Accessible Habitat (ha) (1)	Approximate River Segment	Relative Fish Use (% of Total) (2)			
			Over-winter	Spawning	Summer Rearing	Early Life Stages
Fording River						
Upstream of FRO (FR_UFR1)	5.9	S10-S11	3.8	7.8	7.0	1.3
Downstream of Henretta Creek (FR_FR1)	10	S9	1.1	5.0	2.9	-
Between Clode Creek and Kilmarnock Creek (FR_FR2)	4.4	S8-S9	21	25	15	75
Between Swift and Cataract creeks (FR_FR4)	9.8	S7	2.6	3.1	10	-
Downstream of Porter Creek (GH_PC2)	47	S2-S6	11	33	39	15
Downstream of Greenhills Creek (GH_FR1)	9.1	S1	7.5	4.7	6.2	-
Henretta Creek upstream of FRO	1.8	-	-	-	0.81	-
Henretta Creek downstream of FRO (FR_HC1)	2.7	-	-	1.6	1.8	0.003
Henretta Pit Lake	3.3 (3)	-	12	1.6	7.5	-
Clode Creek (FR_CC1)	0.027	-	0.75	6.2	-	-
Fish Pond Creek (FR_FC1)	0.2 (4)	-	-	0.78	-	0.013
Turn Creek (FR_FRM8)	0.1 (4)	-	1.1	-	0.81	
Lake Mountain Creek (FR_LMP1)	0.01 (5)	-	-	-	-	0.022
Chauncey Creek	0.4	-	-	0.78	1.2	-
Ewin Creek	3.9	-	-	-	-	0.013
LCO Dry Creek (LC_DC1)	8.4	-	-	-	-	0.008
Greenhills Creek (GH_GH1)	2.4	-	-	-	-	0.02
Off-channel Habitats						
Fording Oxbow (Lentic/Semi-Lentic) (6)	3.3	S6 Oxbow	20	5.4	3.8	9
Fording Oxbow (Lotic/Low Exposure) (6)			20	5.4	3.8	

Notes:
1. Habitat areas obtained from Annex I of the 2019 IPA except where otherwise noted.
2. Fish use estimates from Cope et al. (2016, 2017), as described in Section 2.1.1.
3. Habitat area obtained from the Tributary Management Plan
4. Habitat area estimated from Google Earth.
5. Habitat area obtained from Cope et al. (2017).
6. Fording Oxbow separated into two rows to represent distinct patterns of selenium exposure (Section 2.1.2).

3.1.2 Estimation of Dietary Selenium Concentrations

Measured and modelled invertebrate selenium concentrations are provided in Table 3.

Table 3: Measured and Modelled Invertebrate Selenium Concentrations

Habitat Sub-unit	Overwinter (October – March)					Spawning (April – June)					Summer Rearing (July – September)				
	Aqueous Se (µg/L)	Invertebrate Se (mg/kg dw)				Aqueous Se (µg/L)	Invertebrate Se (mg/kg dw)				Aqueous Se (µg/L)	Invertebrate Se (mg/kg dw)			
		Lotic Model	Lentic Model	Measured	Value Used in Analysis		Lotic Model	Lentic Model	Measured	Value Used in Analysis		Lotic Model	Lentic Model	Measured	Value Used in Analysis
Fording River															
Upstream of FRO (FR_UFR1)	1.1	5.0	7.4	3.8	5.0	1.1	5.0	7.4	3.8	5.0	1.1	5.0	7.4	3.8	5.0
Downstream of Henretta Creek (FR_FR1)	20	8.6	27.9	13	13	15	8.2	24	13	13	12	7.8	21	13	13
Between Clode Creek and Kilmarnock Creek (FR_FR2)	40	9.8	39	10	9.8	27	9.1	32	10	9.1	25	9.0	31	10	9.0
Between Swift and Cataract creeks (FR_FR4)	64	11	50	8.7	11	44	10	41	8.7	10	42	9.9	40	8.7	9.9
Downstream of Porter Creek (GH_PC2)	90	11	59	5.6	11	62	11	49	5.6	11	62	11	49	5.6	11
Downstream of Greenhills Creek (GH_FR1)	58	10.5	47.5	10	10	38	9.7	38	10	9.7	47	10	43	10	10
Tributaries and Henretta Pit Lake															
Henretta Creek upstream of FRO	-	-	-	-	-	-	-	-	-	-	0.5	4.4	5.9	3.8	4.4
Henretta Creek downstream of FRO (FR_HC1)	-	-	-	-	-	25	9.0	31	9.6	9.0	17	8.3	25	9.6	8.3
Henretta Pit Lake [2]	40	9.8	39	16	16	25	9.0	31	16	16	17	8.3	25	16	16
Clode Creek (FR_CC1)	174	13	83	13	13	128	12	71	13	12	-	-	-	-	-
Fish Pond Creek (FR_FC1) [3]	-	-	-	-	-	24	8.9	30	4.8	8.9	-	-	-	-	-
Turn Creek (FR_FRM8) [3]	3.0	6.1	11	- [5]	6.1	-	-	-	-	-	2.6	5.9	10	- [5]	5.9
Chauncey Creek	-	-	-	-	-	0.5	4.4	5.9	3.9	4.4	0.5	4.4	5.9	3.9	4.4
Off-channel Habitats															
Fording Oxbow (semi-lentic/lentic) [4]	Varies[6]	-	-	13	13	Varies[6]	-	-	16	16	Varies[6]	-	-	13	13
Fording Oxbow (lotic/low exposure) [4]	Varies[6]	-	-	3.2	3	Varies[6]	-	-	3.2	3	Varies[6]	-	-	3.2	3

Notes: '-'= fish use of habitat sub-unit was not identified for the corresponding season (Table 2). Shading = Measured concentration is 20% or more higher than lotic model concentration.

1. Measured invertebrate concentration from 2018, except Henretta Creek downstream of FRO (2015) and Chauncey Creek (2012).
2. Aqueous selenium concentration for Henretta Creek downstream of FRO was adopted for Henretta Pit Lake.
3. Water quality is not routinely monitored at Fish Pond Creek and Turn Creek. Concentration was set equal to the maximum concentration observed for corresponding months between 2010 and 2013 (Fish Pond Creek) or between 2017 to 2018 (Turn Creek).
4. Rationale for measured invertebrate selenium concentrations in Fording Oxbow is provided in Section 2.1.2.
5. Measured invertebrate selenium concentration is not available for this location.
6. Aqueous selenium concentrations are variable in the Fording Oxbow area (see Section 2.1.2).

3.1.3 Spatially-Integrated Effects Calculations

3.1.3.1 Nitrate

Integrated assessment results for nitrate are provided in Table 4. The integrated effect size for the calculation weighted by area (4.5%) was higher than the calculation weighted by relative fish use (2.7%). Both estimates were below the level 1 critical effect size of 10%.

Table 4: Results of Integrated Assessment for Nitrate

Habitat Sub-unit	Fish Accessible Habitat (ha)	Fish Use (%)	Peak projected monthly average (June to August)		Sensitive Species Effect Size
			Nitrate (mg/L)	Hardness (mg/L as $CaCO_3$)	
Fording River					
Upstream of FRO (FR_UFR1)	5.9	1.3	0.05	156	0%
Between Clode and Kilmarnock creeks (FR_FR2)	4.4	75	6.5	388	1.7%
Downstream of Porter Creek (GH_PC2)	47	15	17	499	6.9%
Tributaries					
Henretta Creek downstream of FRO (FR_HC1)	2.7	0.003	2.5	307	0%
Fish Pond Creek (FR_FC1)	0.2	0.013	4.0	243	1.6%
Lake Mountain Creek (FR_LMP1)	0.01	0.022	0.56	292	0%
LCO Dry Creek (LC_DC1)	8.4	0.008	0.26	153	0%
Greenhills Creek (GH_GH1)	2.4	0.02	4.7	917	0.1%
Ewin Creek	3.9	0.013	0.05	156	0%
Off-Channel Habitats					
Fording Oxbow	3.3	9	12	418	4.8%
Overall	78	100			
Integrated Effect Size – Weighted by Habitat					4.5%
Integrated Effect Size – Weighted by Fish Use					2.7%

3.1.3.2 Sulphate

Integrated assessment results for sulphate are provided in Table 5. The integrated effect size for the calculation weighted by area alone (1.4%) was higher than the calculation weighted by relative fish use (0.7%). Both estimates were below the level 1 critical effect size of 10%.

Table 5: Results of Integrated Assessment for Sulphate

Habitat Sub-unit	Fish Accessible Habitat (ha)	Fish Use (%)	Peak projected monthly average (June to August)		Sensitive Species Effect Size
			Sulphate (mg/L)	Hardness (mg/L as $CaCO_3$)	
Fording River					
Upstream of FRO (FR_UFR1)	5.9	1.3	19	156	0%
Between Clode and Kilmarnock creeks (FR_FR2)	4.4	75	153	388	1%
Downstream of Porter Creek (GH_PC2)	47	15	224	499	1%
Tributaries					
Henretta Creek downstream of FRO (FR_HC1)	2.7	0.003	119	307	0%
Fish Pond Creek (FR_FC1)	0.2	0.013	83	243	0%
Lake Mountain Creek (FR_LMP1)	0.01	0.022	94.0	292	0%
LCO Dry Creek (LC_DC1)	8.4	0.008	9.9	153	0%
Greenhills Creek (GH_GH1)	2.4	0.02	579	917	14%
Ewin Creek	3.9	0.013	19	156	0%
Off-Channel Habitats					
Fording Oxbow	3.3	9	179	418	1%
Overall	78	100			
Integrated Effect Size – Weighted by Habitat					1.4%
Integrated Effect Size – Weighted by Fish Use					0.7%

3.1.3.3 Selenium

Integrated assessment results for selenium are provided in Table 6. The integrated effect size calculated from fish use was equal to that calculated from area for overwintering (fish use and habitat: 12%) and similar to that calculated from area for spawning (fish use: 9.4%; area: 9.7%) and summer rearing (fish use: 9.3%; area: 9.2%). All calculated integrated effect sizes in spring and summer were below the level 1 critical effect size, indicating that both spatial integration methods support a conclusion that population-level effects of selenium would not be expected. Calculated integrated effect sizes in winter were larger than in spring and summer but did not differ between the two spatial integration methods and remained below the level 2 critical effect size; further, the toxicological relevance of overwinter selenium exposure is uncertain and expected to be low (Section 2.1.3).

Table 6: Results of Integrated Assessment for Selenium

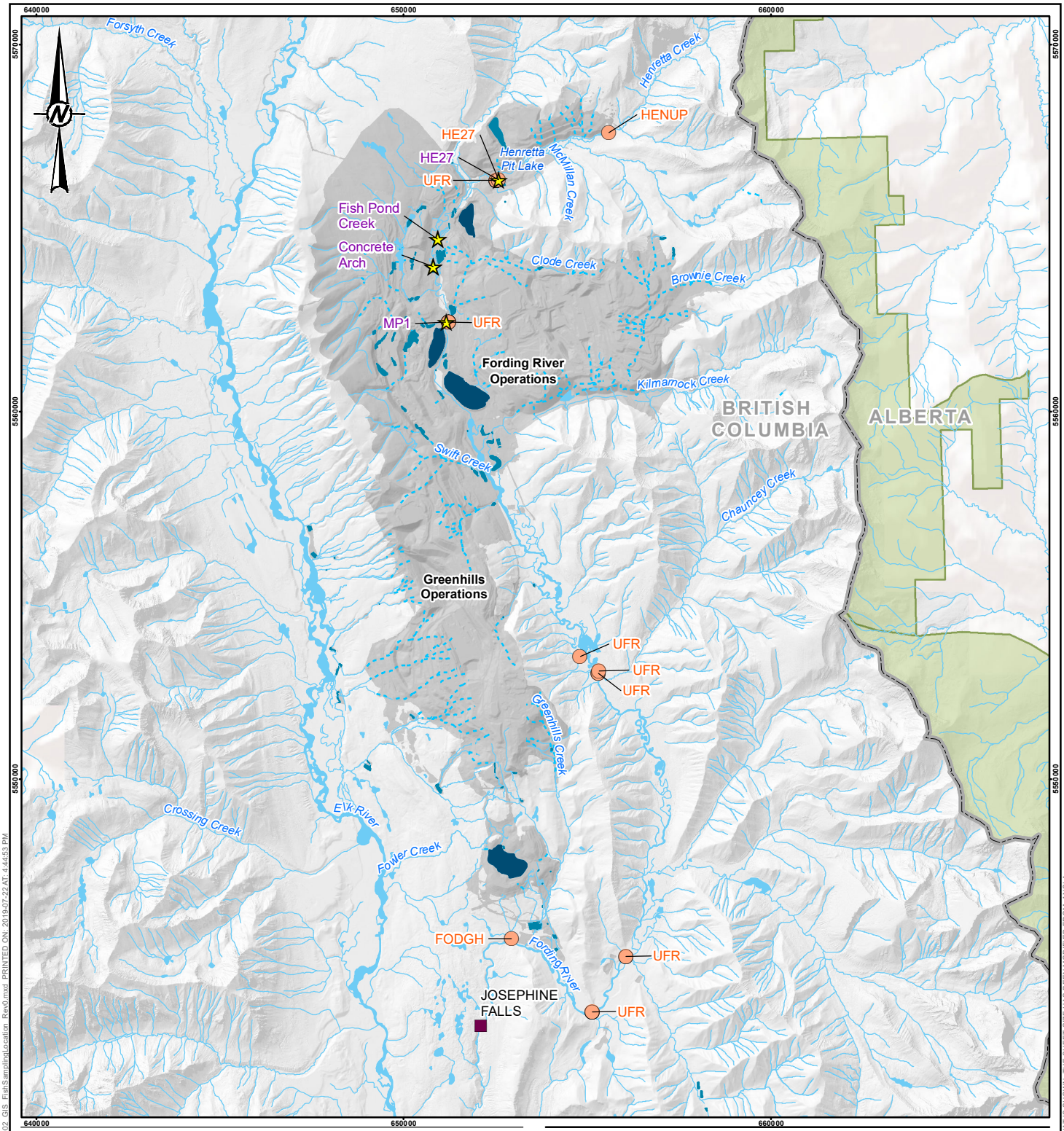
Habitat Sub-unit	Overwinter						Spawning						Summer Rearing					
	Fish Accessible Habitat (ha) [1]	Fish Use (%) [1]	Aqueous Se (October to March)	Best Estimate Inv Se (mg/kg dw) [2]	Estimated Mean Egg Se (mg/kg dw) [2]	Effect Size (WCT Reproduction) [2]	Fish Accessible Habitat (ha) [1]	Fish Use (%) [1]	Aqueous (April to June)	Best Estimate Inv Se (mg/kg dw) [2]	Estimated Mean Egg Se (mg/kg dw) [2]	Effect Size (WCT Reproduction) [2]	Fish Accessible Habitat (ha) [1]	Fish Use (%) [1]	Aqueous (July to September)	Best Estimate Inv Se (mg/kg dw) [2]	Estimated Mean Egg Se (mg/kg dw) [2]	Effect Size (WCT Reproduction) [2]
Fording River																		
Upstream of FRO (FR_UFR1)	5.9	3.8%	1.1	5.0	11	0.9%	5.9	7.8%	1.1	5.0	11	0.9%	5.9	7.0%	1.1	5.0	11	0.9%
Downstream of Henretta Creek (FR_FR1)	10	1.1%	20.4	12.6	22	17%	10	5.0%	15	12.6	22	17%	10	2.9%	12	13	22	17%
Between Clode and Kilmarnock creeks (FR_FR2)	4.4	21%	40	9.8	16	6.3%	4.4	25%	27	9.1	15	4.5%	4.4	15%	25	9.0	15	4.2%
Between Swift and Cataract creeks (FR_FR4)	9.8	2.6%	64	11	18	9.2%	9.8	3.1%	44	10.0	17	6.8%	9.8	10%	42	9.9	17	6.6%
Downstream of Porter Creek (GH_PC2)	47	11%	90	11	19	12%	47	33%	62	11	18	8.9%	47	39%	62	11	18	8.9%
Downstream of Greenhills Creek (GH_FR1)	9.1	7.5%	58	10.5	18	8.5%	9.1	4.7%	38	9.7	16	6.0%	9.1	6.2%	47	10	17	7.2%
Tributaries and Lakes																		
Henretta Creek upstream of FRO	-	-	-	-	-	-	-	-	-	-	-	-	1.8	0.81%	0.5	4.4	11	0.9%
Henretta Creek downstream of FRO (FR_HC1)	-	-	-	-	-	-	2.7	1.6%	25	9.0	15	4.2%	2.7	1.8%	17	8.3	14	2.9%
Henretta Pit Lake	3.3	12%	40	16	27	35%	3.3	1.6%	25	15.6	27	35%	3.3	7.5%	17	16	27	35%
Clode Creek (FR_CC1)	0.027	0.75%	174	13	22	19%	0.027	6.2%	128	12.1	21	15%	-	-	-	-	-	-
Fish Pond Creek (FR_FC1)	-	-	-	-	-	-	0.2	0.78%	24	8.9	15	4.0%	-	-	-	-	-	-
Turn Creek (FR_FRM8)	0.1	1.1%	3.0	6.1	11	0.9%	-	-	-	-	-	-	0.1	0.81%	2.6	5.9	11	0.9%
Chauncey Creek	-	-	-	-	-	-	0.4	0.78%	0.5	4.4	11	0.9%	0.4	1.2%	0.5	4.4	11	0.9%
Off-channel Habitats																		
Fording Oxbow (semi-lentic/lentic)	0.83	20%	Varies[3]	13	22	18%	1.3	5.4%	Varies[3]	16	29	41%	0.83	3.8%	Varies[3]	13	22	18%
Fording Oxbow (lotic/ low exposure)	2.5	20%	Varies[3]	3.2	11	0.8%	2.0	5.4%	Varies[3]	3.2	11	0.8%	2.5	3.8%	Varies[3]	3.2	11	0.8%
Overall	93	100%					96	100					98	100				
Integrated Effect Size – Weighted by Habitat						12%						9.7%						9.2%
Integrated Effect Size – Weighted by Fish Use						12%						9.4%						9.3%

Notes:
'-'= Fish use was not identified in the habitat sub-unit for the corresponding season (Table 2).
1. Fish accessible habitat and fish use obtained from Table 2.
2. Effect size calculated using lotic bioaccumulation model or measured invertebrate selenium concentration, as outlined in Section 3.1.2.
3. Aqueous selenium concentrations are variable in the Fording Oxbow area (see Section 2.1.2).

3.2 Part 2: Fish Tissue Selenium Data Evaluation

3.2.1 Compilation of WCT Tissue Selenium Data

Selenium concentrations were obtained from sampling of fish tissue in 2015 to 2018 at one reference location (Henretta Creek upstream of FRO) and seven mine-exposed locations, including Henretta Pit Lake and along the Fording River to downstream of Greenhills Creek. Sampling locations and corresponding monitoring stations are shown on Figure 6. The compilation of fish tissue selenium concentration data is included in Attachment 1.



LEGEND

- JOSEPHINE FALLS
- SURFACE FLOW WATERCOURSE
- SUBSURFACE FLOW WATERCOURSE
- SEDIMENT POND
- TAILINGS POND
- WATERBODY
- BRITISH COLUMBIA - ALBERTA BOUNDARY
- PARK/PROTECTED
- PERMITTED DISTURBANCE BOUNDARY

FISH SAMPLING LOCATIONS

- EGGS/OVARY
- MUSCLE

0 2 4

1:150,000 KILOMETRES

REFERENCE(S)

BASE DATA OBTAINED FROM TECK COAL LIMITED. IMAGERY (2018) OBTAINED FROM PLANET LABS GEOMATICS CORP.
DATUM: NAD 83 PROJECTION: UTM ZONE 11

CLIENT
TECK COAL LIMITED

PROJECT
2019 IMPLEMENTATION PLAN ADJUSTMENT

TITLE
FISH TISSUES SAMPLING LOCATIONS IN THE UPPER FORDING RIVER

CONSULTANT
GOLDER

YYYY-MM-DD	2019-07-22
DESIGNED	KW
PREPARED	PS
REVIEWED	JC
APPROVED	ADB

PROJECT NO.	PHASE	REV.	FIGURE
1792554	1302	0	6

3.2.2 Examination of the Distribution of Fish Egg Selenium Concentrations across MU1

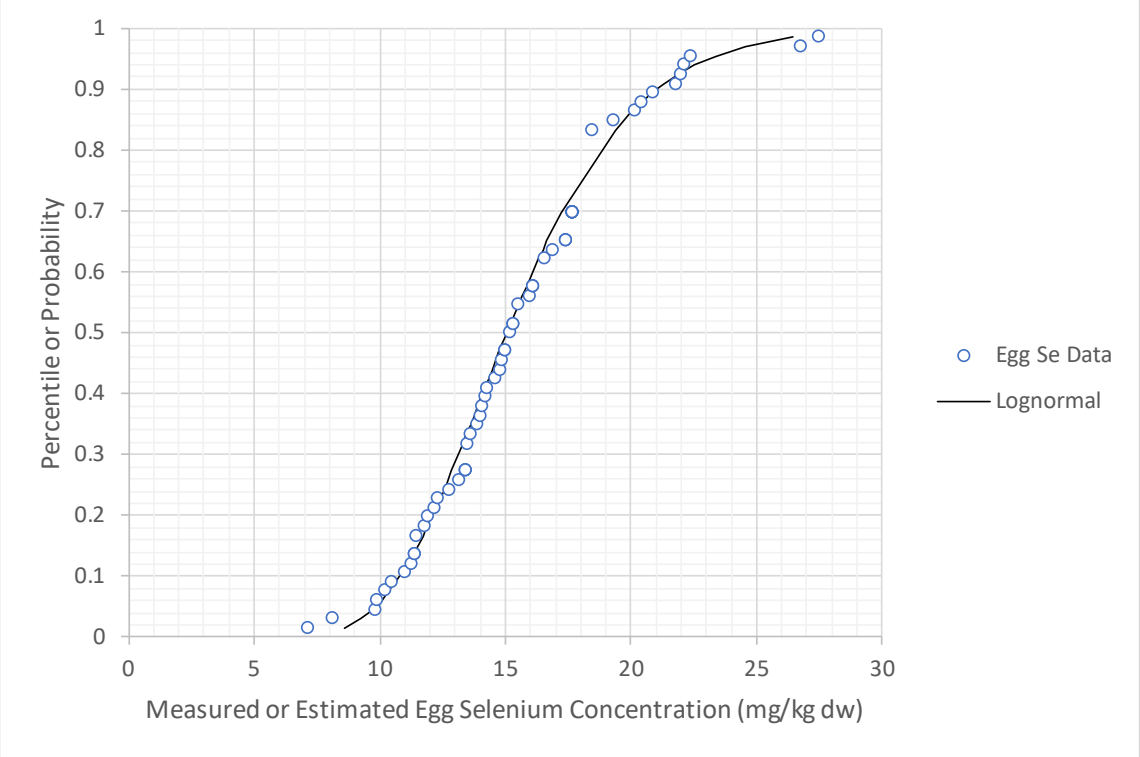
Review of sampling locations (Figure 6) indicated that sampling was distributed approximately evenly from Henretta Pit Lake to downstream of Greenhills Creek. Sampling intensity also roughly corresponded to proportional fish use in different portions of MU1 (Table 7). Henretta Pit Lake may have been over-represented in the tissue dataset (17% of tissue data, compared to 2-12% proportional fish use), whereas mine-affected tributaries may have been under-represented (2% of tissue data, compared to up to 6% fish use for Clode Creek during spawning). However, Table 7 indicates that there was no selenium exposure condition that was highly sampled but had low use, or that had high use but very few samples. It is also expected that fish captured in any particular location would reflect an integrated exposure over some larger spatial area. Overall, the compiled data were considered to provide a reasonable estimate of the distribution of exposures across MU1.

Table 7: Distribution of Tissue Samples Collected in MU1 (2015-2018) and Proportional Fish Use

Exposure Conditions	Tissue Sampling Intensity (% of total dataset)	Proportional Fish Use in Corresponding Areas (range over seasons; Table 2)
Upstream of FRO and reference tributaries	6% (Henretta upstream of FRO)	0-1% (Henretta upstream of FRO) 4-7% (Fording upstream of FRO) 0-1% Chauncey Creek
Henretta Pit Lake	17% (Henretta Pit Lake)	2-12% (Henretta Pit Lake)
Fording River adjacent and downstream of FRO	18% (at Concrete Arch) 15% (at Multiplate) 15% (above Chauncey) 14% (upper Fording)	1-5% (downstream of Henretta) 15-25% (between Clode and Kilmarnock) 3-10% (between Swift and Cataract) 11-39% (downstream of Porter) 4-20% (Fording Oxbow Area)
Mine-affected tributaries	2% (Fish Pond Creek)	0-2% (Henretta downstream of FRO) 0-1% (Fish Pond Creek) 0-6% (Clode Creek) 0-1% (Turn Creek)
Fording River downstream of GHO	12% (downstream of Greenhills)	5-8% (downstream of Greenhills)

The distribution of measured and estimated egg selenium concentrations for the Upper Fording River WCT population is shown in Figure 7. Data were well described by a log-normal distribution with geometric mean of 1.178 and a standard deviation of 0.113 log units.

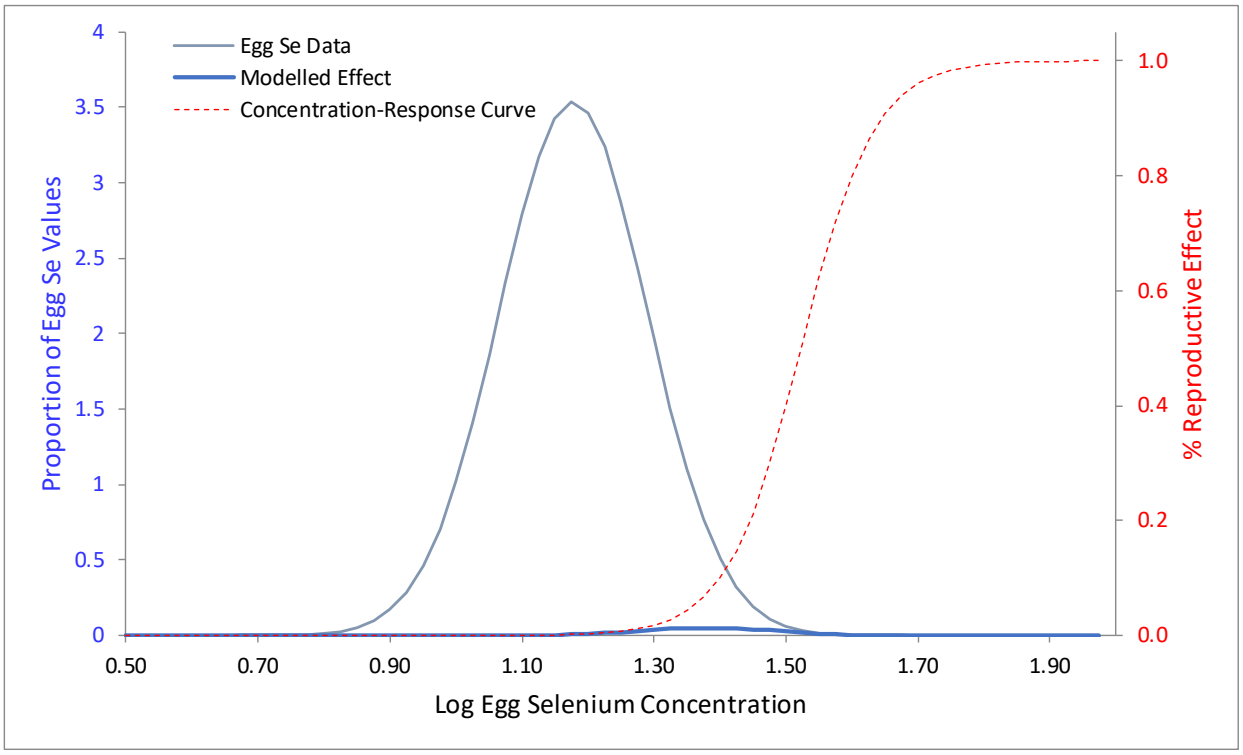
Figure 7: Distribution of Egg Selenium Concentrations in Upper Fording River Westslope Cutthroat Trout



3.2.3 Estimation of Reproductive Effect

Figure 8 shows the fitted log-normal distribution of egg selenium concentrations (light grey curve) in comparison to the reproductive effects curve for WCT (dashed red curve), and the modelled effect calculated by integrating these two curves (bold blue curve). As can be seen from Figure 8, most of the measured and estimated egg selenium concentrations are less than the 10% effects concentration (EC_{10}) of 25 mg/kg dw in eggs. As a result, most of the fitted distribution shown on Figure 8 is associated with <10% modelled reproductive effects. Integrated across the whole estimated distribution, the total potential effect on WCT reproduction was calculated to be 1.25%.

Figure 8: Integration of Egg Selenium Concentrations in Upper Fording River Westslope Cutthroat Trout with the Reproductive Effects Curve



3.2.4 Comparison of Measured and Modelled Fish Egg Selenium Concentrations

The compiled egg selenium concentrations (Section 3.2.1) are plotted below in Figures 9 and 10 in comparison to the concentrations that were modelled in Part 1 from benthic invertebrate selenium data for each assessed area.

Figure 9 shows that measured egg selenium concentrations generally align to modelled values in the mainstem Fording River upstream and downstream of FRO and GHO. Measured concentrations are on average lower than modelled values in Henretta Pit Lake and the mainstem Fording River adjacent to FRO. In Henretta Pit Lake, the egg selenium value modelled in Part 1 (27.4 mg/kg dw) was calculated from reported invertebrate data. The modelled value matches the upper end of measured concentrations in Henretta Pit Lake, which suggests that the fish captured in Henretta Pit Lake reflect a range of feeding locations that include areas with lower dietary selenium concentrations. In the mainstem Fording River adjacent to FRO, the egg selenium value modelled in Part 1 (21.6 mg/kg dw) was calculated from a reported invertebrate selenium concentration of 13 mg/kg dw at FR_FR1 (Fording River downstream of Henretta Creek). Measured fish tissue concentrations adjacent to FRO are similar to those measured elsewhere in the mainstem upper Fording River (i.e., averaging between 10 and 15 mg/kg dw), which suggests that the modelled concentration for this location may over-estimate exposure.

Figure 10 compares measured and modelled egg selenium concentrations in terms of the estimated distributions for each modelled season. This comparison indicates that the modelled egg selenium concentrations generally fall in the same range as measured values but tend to be skewed to higher values, especially for overwintering. These observations support the general expectation that the modelling analysis tends to over-estimate actual exposure, and further underscore the uncertain relevance of dietary selenium concentrations during winter.

Figure 9: Comparison of Measured and Modelled Egg Selenium Concentrations for Assessed Portions of MU1

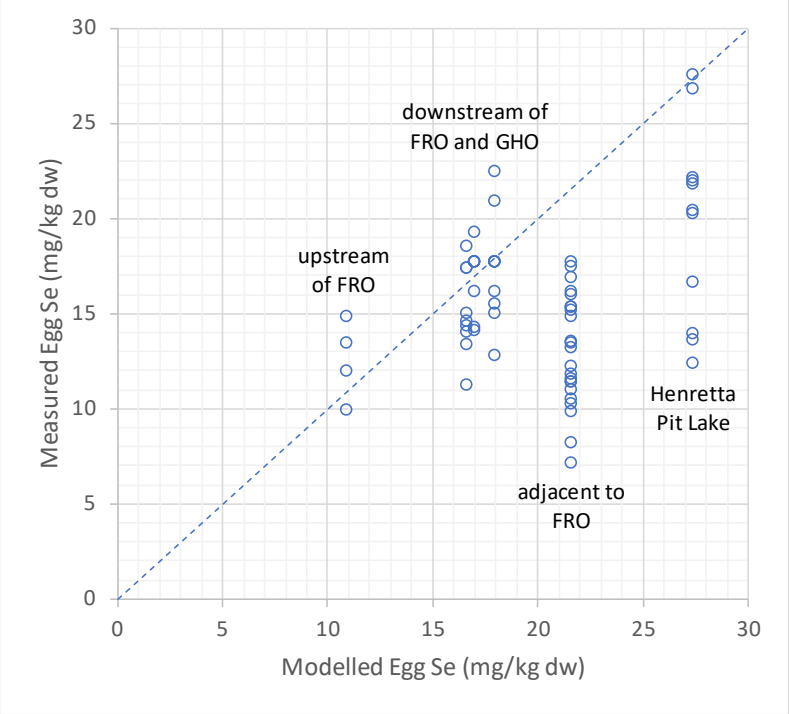
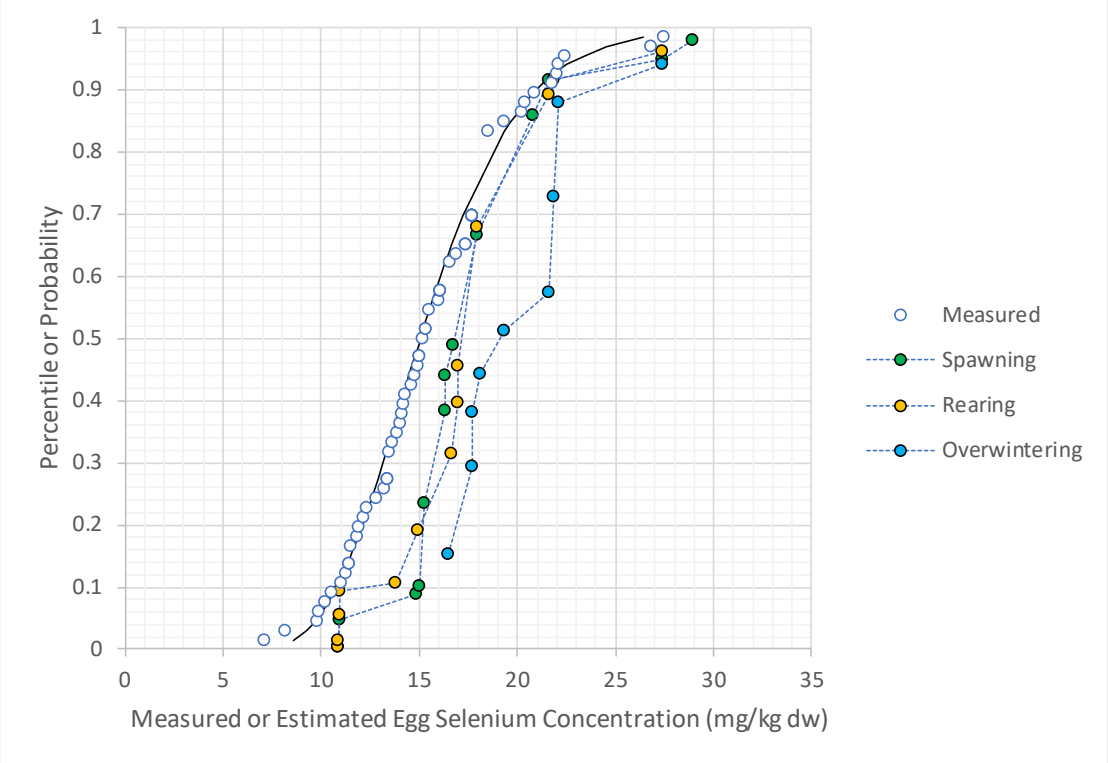


Figure 10: Comparison of Distributions of Measured and Modelled Egg Selenium Concentrations across MU1



4.0 SUMMARY OF KEY FINDINGS

Key findings of the analysis presented herein are:

- Spatially-integrated effects for nitrate, sulphate, and selenium calculated in Part 1 indicated that the weighting approach used (i.e., by habitat area or fish use) could affect the calculation of integrated effects, although the direction of the effect varied by parameter and season. For nitrate and sulphate, the integrated effect size calculated from fish use was lower than that weighted by area. For selenium, the integrated effect size calculated from fish use was slightly higher than (summer), equal to (overwinter), or slightly lower than (spawning) that weighted by area.
- Spatially-integrated modelled effects of nitrate and sulphate on fish early life stages met the level 1 critical effect size of 10% in all modelled scenarios. Modelled effects of selenium on fish reproduction were below the level 1 critical effect size in spring and summer and were similar between spatial integration methods in those seasons. Modelled effects of selenium on fish reproduction in winter were slightly greater than the level 1 critical effect size but were equal for the two spatial integration methods and have uncertain ecotoxicological relevance.
- The evaluation of WCT tissue selenium data presented in Part 2 calculated an integrated reproductive effect of 1.25% across the upper Fording River WCT population. The reason for the smaller reproductive effect size indicated by monitoring data (Part 2) compared to the modelling analysis (Part 1) was likely at least in part related to the margins of safety in the integrated effects calculations. As detailed in Annex O of the EVWQP, this calculation incorporated conservative choices and assumptions to account for residual uncertainty. Potential reasons for the difference are discussed below.

One important difference between the calculations in Part 1 and Part 2 relates to the effect of fish movement and resulting averaging of the exposure of individual fish. The spatially-integrated effects calculation (Part 1) uses the spatial distribution of selenium exposures to calculate a spatial distribution of potential reproductive effects by simulating a large number of “sub-populations” of WCT. In each modelled sub-unit, the calculation simulates an assemblage of individual fish that are exposed only to the selenium exposure conditions in that sub-unit. This is accomplished by modelling an average fish tissue selenium concentration, simulating a distribution of individuals around that average, and modelling potential effects across the simulated distribution as depicted on Figure 8. This approach was developed for the EVWQP.

The calculation used in Part 1 is not expected to be a realistic simulation of actual exposure of fish in each sub-unit, because fish are expected to move around the MU and feed in different areas, and thereby “average out” their exposure (and this expectation was supported by the analysis presented in Section 3.2.4). The calculation is expected to provide a conservative assessment because it over-represents the statistical tails of the exposure distribution by simulating uniformly low exposure in reference sub-units and uniformly high exposure in sub-units with relatively high selenium exposure. This over-representation of the tails has the effect of inflating the overlap between exposure (the blue curve on Figure 8) and the reproductive effects curve (the red dashed curve on Figure 8), which results in a higher modelled effects and higher modelled total reproductive effect when sub-units are integrated over the MU. For example, Figure 8 shows a case in which the mean modelled fish egg selenium concentration would not be expected to cause any discernible reproductive effects; however, simulating a distribution around that modelled mean produces a right-hand tail of the distribution that overlaps with the concentration-response curve.

In contrast to the spatially-integrated effects calculation, the analysis in Part 2 inherently captures the effect of fish movement and spatial averaging of exposures. Each individual fish plotted on Figure 7 is expected to have averaged out its exposure conditions over the portion of MU1 in which it had been feeding in the months and years prior to spawning. Each point on Figure 7 reflects an individual fish's exposure history and taken together they are assumed to reflect the distribution of exposure histories for fish in MU1. Inflated statistical tails of the exposure distribution are not present in this characterization because of that individual averaging effect.

The comparison of modelled and measured fish egg selenium concentrations in Section 3.2.4 indicates that the analysis in Part 1, and by extension the approach adopted for the EVWQP and the 2019 IPA, provides a conservative over-estimate of both exposure (as illustrated in Figure 10) and potential effects (as discussed above).

5.0 UNCERTAINTY

Key sources of uncertainty related to the analyses presented herein are:

- **Estimated Dietary Selenium Concentrations**. Estimated dietary selenium concentrations for the present analysis were obtained by considering modelled estimates (from 2016 water quality) and 2018 measured concentrations in benthic invertebrates. Differences between modelled and measured estimates might in part be related to the different years used in this evaluation, but may also reflect variability in measured data and/or conservatism in the calculation of bioaccumulation from maximum monthly water quality. Uncertainty in the best estimate was in part offset by adopting the higher of measured concentrations and concentrations calculated by the lotic bioaccumulation model.
- **Water Quality in Fish Pond Creek, Turn Creek, and Henretta Pit Lake**. Aqueous concentrations in 2016 were not modelled for Fish Pond Creek, Turn Creek, or Henretta Pit Lake. Therefore, concentrations were obtained from the maximum concentration measured from 2010 to 2013 (Fish Pond Creek), the maximum concentration measured from 2017 to 2018 (Turn Creek), or modelled concentration for Henretta Creek downstream of Fording River Operations (Henretta Pit Lake). These are expected to be reasonable approximations.
- **Fish Feeding in the Fording River Oxbow Area**. Fish use and habitat in the Fording River oxbow area was assigned to two different exposure conditions to reflect the distribution of measured invertebrate selenium concentrations at off-channel sampling locations in the area. It was assumed for this calculation that the available benthic invertebrate selenium concentrations (replicate reported concentrations from five sampling locations) provided a reasonable approximation of the distribution of dietary selenium concentrations for fish feeding in the area. This assumption is consistent with the results of field studies undertaken for the EVWQP, which indicated that off-channel areas in the Elk Valley have variable exposure to mainstem water quality, and furthermore predominantly exhibit selenium concentrations in biota that are consistent with the lotic bioaccumulation model, with the "lentic" pattern of distinctly enhanced bioaccumulation being relatively uncommon.
- **WCT Tissue Sampling Locations**. The analysis in Part 2 included data from 65 WCT collected throughout the upper Fording River, Henretta Creek, and Henretta Pit Lake. Because no sampling was specifically undertaken in other tributaries of the upper Fording River, there is uncertainty in how well the dataset characterizes all fish in the upper Fording River population. To the extent that there may be individual fish that are part of the upper Fording River population but that reside predominantly in reference or mine-

affected tributaries, these individuals may not be fully captured by the estimated distributions. However, the telemetry data illustrated on Figures 3, 4, and 5 indicate that the majority of fish in the upper Fording River primarily reside in the mainstem and Henretta Creek. Based on this information, potential uncertainty related to tributary-resident fish would not be expected to materially affect the outcome of this assessment for the upper Fording River WCT population. The analysis presented herein did not include fish from isolated or fragmented WCT present in Greenhills Creek or upper Kilmarnock Creek because these fish are not part of the upper Fording River WCT population.

- **Ecotoxicological Relevance of Aqueous Selenium Concentrations in Winter**. Aqueous selenium concentrations at mine-affected locations typically exhibit annual peaks in winter months. However, winter months are also colder, darker, and have lower flows than other seasons. These conditions all tend to reduce the potential for aqueous selenium to be taken up by algae and transferred to higher trophic levels (as discussed in Section 2.1.3). The potential for aqueous selenium concentrations that occur in winter to affect biota such as fish is therefore uncertain. The scenarios evaluated herein that considered water quality in winter may overstate the potential for adverse effects to westslope cutthroat trout.

6.0 CLOSURE

We trust that the information provided in this technical memorandum is sufficient for your present needs. Should you require anything further, please contact the undersigned.

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EJC/AMD/jlb

https://golderassociates.sharepoint.com/sites/22006e/p1792554teckimplplanupdate/shared documents/sirs/ipa_rd3/reporting/10_annex i - integrated effects/appendixa_2019analyses/appendixa_2019iea_analyses_final_20190723.docx

7.0 REFERENCES

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ATTACHMENT 1

Fish Tissue Selenium Data - MU1

Table 1: Fish Tissue Selenium Data - MU1

Sample Location	Teck ID	RAEMP/ LAEMP ID	UTM Easting	UTM Northing	Area Type	Sample ID	Date	Data Source	Muscle Selenium (mg/kg dw)	Egg Selenium* (mg/kg dw)
Henretta Creek	FR_HC3**	HENUP	655584	5567599	lotic, reference	HEN1	1-Sep-17	a	7.36	11.9
Henretta Creek	FR_HC3**	HENUP	655584	5567599	lotic, reference	HEN2	1-Sep-17	a	8.29	13.4
Henretta Creek	FR_HC3**	HENUP	655584	5567599	lotic, reference	HEN3	1-Sep-17	a	9.16	14.8
Henretta Creek	FR_HC3**	HENUP	655584	5567599	lotic, reference	HEN4	1-Sep-17	a	6.06	9.9
Henretta Pit Lake	FR_HL1**	HE27	652588	5566323	lentic	HE27-WCT-01	6-May-15	b	8.6	13.9
Henretta Pit Lake	FR_HL1**	HE27	652588	5566323	lentic	HE27-WCT-03	11-May-15	b	12.7	20.4
Henretta Pit Lake	FR_HL1**	HE27	652588	5566323	lentic	HE27-WCT-04	11-May-15	b	13.6	21.8
Henretta Pit Lake	FR_HL1**	HE27	652588	5566323	lentic	HE27-WCT-06	11-May-15	b	13.7	22.0
Henretta Pit Lake	FR_HL1**	HE27	652588	5566323	lentic	HE27-WCT-09	11-May-15	b	16.8	26.8
Henretta Pit Lake	FR_HL1**	HE27	652588	5566323	lentic	HE27-WCT-09 (ovary)	11-May-15	b	NR	27.5
Henretta Pit Lake	FR_HL1**	HE27	652517	5566309	lentic	HE27-WCT-A1	20-Aug-15	b	8.4	13.6
Henretta Pit Lake	FR_HL1**	HE27	652517	5566309	lentic	HE27-WCT-A2	25-Aug-15	b	7.6	12.3
Henretta Pit Lake	FR_HL1**	HE27	652517	5566309	lentic	HE27-WCT-A3	25-Aug-15	b	13.8	22.1
Henretta Pit Lake	FR_HL1**	HE27	652517	5566309	lentic	HE27-WCT-A4	25-Aug-15	b	12.6	20.2
Henretta Pit Lake	FR_HL1**	HE27	652517	5566309	lentic	HE27-WCT-A5	25-Aug-15	b	10.3	16.6
Fording River at Concrete Arch	FR_FRDSCC1**	n/a	650804	5563956	lotic	F1	1-Jun-15	c	NR	11.4
Fording River at Concrete Arch	FR_FRDSCC1**	n/a	650804	5563956	lotic	F2	1-Jun-15	c	NR	11.8
Fording River at Concrete Arch	FR_FRDSCC1**	n/a	650804	5563956	lotic	F3	1-Jun-15	c	NR	11.0
Fording River at Concrete Arch	FR_FRDSCC1**	n/a	650804	5563956	lotic	F4	3-Jun-15	c	NR	11.5
Fording River at Concrete Arch	FR_FRDSCC1**	n/a	650804	5563956	lotic	F6	3-Jun-15	c	NR	16.9
Fording River at Concrete Arch	FR_FRDSCC1**	n/a	650804	5563956	lotic	F8	27-Jun-15	c	NR	15.3
Fording River at Concrete Arch	FR_FRDSCC1**	n/a	650804	5563956	lotic	F17	31-May-15	c	NR	17.4
Fording River at Concrete Arch	FR_FRDSCC1**	n/a	650804	5563956	lotic	F18	1-Jun-15	c	NR	8.16
Fording River at Concrete Arch	FR_FRDSCC1**	n/a	650804	5563956	lotic	F20	9-Jun-15	c	NR	13.5
Fording River at Concrete Arch	FR_FRDSCC1**	n/a	650804	5563956	lotic	F24	9-Jun-15	c	NR	13.2
Fording River at Concrete Arch	FR_FRDSCC1**	n/a	650804	5563956	lotic	F30	7-Jun-15	c	NR	10.2
Fording River at Concrete Arch	FR_FRDSCC1**	n/a	650804	5563956	lotic	F32	31-May-15	c	NR	11.4
Fish Pond Creek (above Clode)	n/a	n/a	650931	5564707	lotic	F27	8-Jun-15	c	NR	7.13
Fording River at Multiplate	FR_MULTIPLATE	MP1	651158	5562442	lotic	F19	9-Jun-15	c	NR	9.83
Fording River at Multiplate	FR_MULTIPLATE	MP1	651158	5562442	lotic	F31	28-May-15	c	NR	10.5
Fording River at Multiplate	FR_MULTIPLATE	MP1	651158	5562442	lotic	RG_MP1_WCT-1-M_20180911	11-Sep-18	d	9.9	16.0
Fording River at Multiplate	FR_MULTIPLATE	MP1	651158	5562442	lotic	RG_MP1_WCT-2-M_20180911	11-Sep-18	d	11	17.7
Fording River at Multiplate	FR_MULTIPLATE	MP1	651158	5562442	lotic	RG_MP1_WCT-3-M_20180911	11-Sep-18	d	7.5	12.2
Fording River at Multiplate	FR_MULTIPLATE	MP1	651158	5562442	lotic	RG_MP1_WCT-4-M_20180911	11-Sep-18	d	10	16.1
Fording River at Multiplate	FR_MULTIPLATE	MP1	651158	5562442	lotic	RG_MP1_WCT-5-M_20180911	11-Sep-18	d	8.3	13.4
Fording River at Multiplate	FR_MULTIPLATE	MP1	651158	5562442	lotic	RG_MP1_WCT-6-M_20180911	11-Sep-18	d	9.5	15.3
Fording River at Multiplate	FR_MULTIPLATE	MP1	651158	5562442	lotic	RG_MP1_WCT-7-M_20180911	11-Sep-18	d	9.4	15.2
Fording River at Multiplate	FR_MULTIPLATE	MP1	651158	5562442	lotic	RG_MP1_WCT-8-M_20180911	11-Sep-18	d	9.2	14.9
Upper Fording River	FR_FRABCH**	UFR	655314	5552947	lotic	UFR-WCT-01	11-May-15	b	13	20.9
Upper Fording River	FR_FRABCH**	UFR	655314	5552947	lotic	UFR-WCT-02	11-May-15	b	11	17.7
Upper Fording River	FR_FRABCH**	UFR	655314	5552947	lotic	UFR-WCT-03	11-May-15	b	7.9	12.8
Upper Fording River	FR_FRABCH**	UFR	655314	5552947	lotic	UFR-WCT-04	11-May-15	b	11	17.7
Upper Fording River	FR_FRABCH**	UFR	655314	5552947	lotic	UFR-WCT-05	11-May-15	b	9.6	15.5
Upper Fording River	FR_FRABCH**	UFR	654801	5553344	lotic	UFR-WCT-06	12-May-15	b	14	22.4
Upper Fording River	FR_FRABCH**	UFR	654801	5553344	lotic	UFR-WCT-07	12-May-15	b	11	17.7
Upper Fording River	FR_FRABCH**	UFR	654801	5553344	lotic	UFR-WCT-08	12-May-15	b	11	17.7
Upper Fording River	FR_FRABCH**	UFR	654801	5553344	lotic	UFR-WCT-09	12-May-15	b	10	16.1
Upper Fording River	FR_FRABCH**	UFR	654801	5553344	lotic	UFR-WCT-10	12-May-15	b	9.3	15.0
Upper Fording River	n/a	UFR	651221	5562442	lotic	UFR-WCT-A2	20-Aug-15	b	10.8	17.4
Upper Fording River	n/a	UFR	655308	5552882	lotic	UFR-WCT-A7	20-Aug-15	b	8.68	14.0
Upper Fording River	n/a	UFR	655308	5552882	lotic	UFR-WCT-A8	20-Aug-15	b	9.26	15.0
Upper Fording River	n/a	UFR	655136	5543662	lotic	UFR-WCT-A9	23-Aug-15	b	8.27	13.4
Upper Fording River	n/a	UFR	655136	5543662	lotic	UFR-WCT-A10	23-Aug-15	b	10.8	17.4
Upper Fording River	n/a	UFR	655136	5543662	lotic	UFR-WCT-A12	23-Aug-15	b	11.5	18.5
Upper Fording River	n/a	UFR	655136	5543662	lotic	UFR-WCT-A13	23-Aug-15	b	6.93	11.3
Upper Fording River	n/a	UFR	656060	5545175	lotic	UFR-WCT-A14	23-Aug-15	b	9.02	14.6
Upper Fording River	n/a	UFR	656060	5545175	lotic	UFR-WCT-A15	23-Aug-15	b	8.87	14.3
Fording River d/s Greenhills Cr	GH_FR1	FODGH***	652941	5545649	lotic	RG_FODCH_WCT-1-M_20180909	9-Sep-18	d	10	16.1
Fording River d/s Greenhills Cr	GH_FR1	FODGH***	652941	5545649	lotic	RG_FODCH_WCT-2-M_20180909	9-Sep-18	d	8.8	14.2
Fording River d/s Greenhills Cr	GH_FR1	FODGH***	652941	5545649	lotic	RG_FODCH_WCT-3-M_20180909	9-Sep-18	d	11	17.7
Fording River d/s Greenhills Cr	GH_FR1	FODGH***	652941	5545649	lotic	RG_FODCH_WCT-4-M_20180909	9-Sep-18	d	12	19.3
Fording River d/s Greenhills Cr	GH_FR1	FODGH***	652941	5545649	lotic	RG_FODCH_WCT-5-M_20180909	9-Sep-18	d	8.7	14.1
Fording River d/s Greenhills Cr	GH_FR1	FODGH***	652941	5545649	lotic	RG_FODCH_WCT-6-M_20180911	11-Sep-18	d	11	17.7
Fording River d/s Greenhills Cr	GH_FR1	FODGH***	652941	5545649	lotic	RG_FODCH_WCT-7-M_20180911	11-Sep-18	d	11	17.7
Fording River d/s Greenhills Cr	GH_FR1	FODGH***	652941	5545649	lotic	RG_FODCH_WCT-8-M_20180911	11-Sep-18	d	11	17.7

Notes: ID = identification code; mg/kg dw = milligram per killigram dry weight; n/a = not available; NR = not reported

* egg selenium concentrations were converted from muscle selenium concentrations using the equation Egg Se = Muscle $Se^{(1/1.0199)}$*1.6862 (from Nautilus and Interior Reforestation 2011 as cited in Minnow 2018). Where muscle selenium is NR, egg or ovary selenium was reported in mg/kg dw.

** approximated Teck station

*** samples are labeled FODCH but Golder assumes this is a typo (no RAEMP code FODCH exists, and sediment was collected from FODGH).

a = Golder (2018). Aquatic Health Baseline Report; Fording River Operations - Turnbull West Project. Prepared for Teck Coal Limited, dated May 2018.

b = Table HWCT.6 from Appendix H of Minnow (2018). Elk River Watershed Regional Aquatic Effects Monitoring Program (RAEMP) Report, 2015-2016. Prepared for Teck Coal Limited, dated January 2018.

c = Nautilus Environmental (2015). Fording River Westslope Cutthroat Trout Gamete Study. Final Report. Prepared for Teck Coal Limited, dated 31 March 2015.

d = Minnow (2018; unpublished data from Minnow for 2018-2020 RAEMP cycle).

APPENDIX B

Integrated Effect Tables – Nitrate

Assessment of potential effects related to Nitrate

		Standard Hardness	Pooled slope
Management unit	1	360	1.0003
Time period	2016		
Concentration at Order Station	17		
Hardness Condition - min from month when peak occurs	min monthly		
EVWQP Benchmarks			

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from January to December		Invertebrate Endpoints				Based on peak projected monthly average concentrations from June to August		Fish Endpoints		Based on peak projected monthly average concentrations from May to July		Amphibian Endpoints		Integrated Potential Effects		
				Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species (*C. dubia*)	Sensitive Species (*C. dubia*) Category	Community (*H. azteca*)	Community (*H. azteca*) Category	Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species	Sensitive Species Category	Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species	Sensitive Species Category	Fish	Invertebrates	Amphibians
Fording River																				
FRus - Upstream of FRO (FR_UFR1)	5.9	5.9	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
FR1 - Downstream of Henretta Creek (FR_FR1)	10	10	no	5.3	342	~ 2%	< L1	~ 1%	< L1	1.7	256	~ 0%	≤ WQG	1.1	226	~ 0%	≤ WQG	1	1	1
FR2 - Downstream of Clode Creek and upstream of Kilmarnock Creek (	4.4	4.4	no	11.2	490	~ 5%	< L1	~ 3%	< L1	6.5	388	~ 2%	< L1	5.2	336	~ 0%	< L1	1	1	1
FR3 - Between Swift and Cataract creeks (FR_FR4)	9.8	9.8	no	19	631	~ 9%	< L1	~ 4%	< L1	12	450	~ 4%	< L1	11	395	~ 1%	< L1	1	1	1
FR3b - Downstream of Porter Creek (GH_PC2)	47	47	no	28	751	~ 15%	L1-L2	~ 7%	< L1	17	499	~ 7%	< L1	16	444	~ 1%	< L1	1	2	1
FR4 - Downstream of Greenhills Creek (GH_FR1)	9.1	9.1	no	17	583	~ 9%	< L1	~ 4%	< L1	12	418	~ 5%	< L1	11	369	~ 1%	< L1	1	1	1
Tributaries																				
Henretta Creek upstream of FRO	1.8	1.9	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Henretta Creek downstream of FRO (FR_HC1)	2.7	2.7	no	11	551	~ 4%	< L1	~ 2%	< L1	2.5	307	~ 0%	≤ WQG	1.8	269	~ 0%	≤ WQG	1	1	1
Clode Creek (FR_CC1)	0.027	0.027	no	86	1205	~ 42%	> L2	~ 19%	> L2	83	1187	~ 24%	> L2	81	1137	~ 2%	< L1	5	5	3
Lake Mountain Creek (FR_LMP1)	0.01	0.31	no	1.0	344	~ 0%	≤ WQG	~ 0%	≤ WQG	0.56	292	~ 0%	≤ WQG	0.4	250	~ 0%	≤ WQG	0	0	0
Kilmarnock Creek (FR_KC1)	0	1.3	no	119	1393	~ 51%	> L2	~ 24%	> L2	48	630	-	-	48	630	~ 2%	< L1	-	5	3
Swift Creek (GH_SC1)	0.0072	0.31	no	55	2209	~ 6%	< L1	~ 3%	< L1	55	2209	~ 4%	< L1	55	2209	~ 1%	< L1	1	1	1
Cataract Creek (GH_CC1)	0	0.027	no	33	2936	~ 1%	< L1	~ 1%	< L1	33	2936	-	-	32	2725	~ 0%	< L1	-	1	1
Porter Creek (GH_PC1)	0.28	0.28	no	1.5	737	~ 0%	≤ WQG	~ 0%	≤ WQG	1.2	656	~ 0%	≤ WQG	1.2	650	~ 0%	≤ WQG	0	0	0
LCO Dry Creek (LC_DC1)	8.4	8.4	no	0.95	177	~ 0%	≤ WQG	~ 0%	≤ WQG	0.26	153	~ 0%	≤ WQG	0.17	148	~ 0%	≤ WQG	0	0	0
Greenhills Creek (GH_GH1)	2.4	2.4	no	7.4	1079	~ 0%	< L1	~ 0%	< L1	4.7	917	~ 0%	< L1	4.5	718	~ 0%	< L1	1	1	1
Chauncey Creek	0.4	8.3	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Ewin Creek	3.9	5.6	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Ewin Side Draw	2.9	3.0	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
McQuarrie Creek	0.69	0.75	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Moore Creek	0	0.17	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	-	-	0.05	156	~ 0%	≤ WQG	-	0	0
Todhunter Creek	2.0	2.0	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Other reference tributaries	3.8	3.8	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Off-Channel Habitats																				
FRus - off-channel	0	0.01	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	-	-	0.05	156	~ 0%	≤ WQG	-	0	0
FR1 - off-channel, mainstem WQ	0.96	0.98	no	5.3	342	~ 2%	< L1	~ 1%	< L1	1.7	256	~ 0%	≤ WQG	1.1	226	~ 0%	≤ WQG	1	1	1
FR2 - off-channel, mainstem WQ	0.17	1.1	no	11.2	490	~ 5%	< L1	~ 3%	< L1	6.5	388	~ 2%	< L1	5.2	336	~ 0%	< L1	1	1	1
FR3 - off-channel, mainstem WQ	0.037	0.057	no	19	631	~ 9%	< L1	~ 4%	< L1	12	450	~ 4%	< L1	11	395	~ 1%	< L1	1	1	1
FR3b - off-channel, mainstem WQ	0.33	1.2	no	28	751	~ 15%	L1-L2	~ 7%	< L1	17	499	~ 7%	< L1	16	444	~ 1%	< L1	1	2	1
FR4 - off-channel, mainstem WQ	1.6	6.4	no	17	583	~ 9%	< L1	~ 4%	< L1	12	418	~ 5%	< L1	11	369	~ 1%	< L1	1	1	1
FR1 - off-channel, intermediate WQ	0.96	0.98	no	2.6	249	~ 1%	≤ WQG	~ 1%	≤ WQG	0.84	206	~ 0%	≤ WQG	0.55	191	~ 0%	≤ WQG	0	0	0
FR2 - off-channel, intermediate WQ	0.17	1.1	no	5.6	323	~ 3%	< L1	~ 2%	< L1	3.2	272	~ 1%	< L1	2.6	246	~ 0%	≤ WQG	1	1	1
FR3 - off-channel, intermediate WQ	0.037	0.057	no	9.4	393	~ 6%	< L1	~ 3%	< L1	5.9	303	~ 2%	< L1	5.4	276	~ 1%	< L1	1	1	1
FR3b - off-channel, intermediate WQ	0.33	1.2	no	14	454	~ 10%	< L1	~ 5%	< L1	8.5	327	~ 4%	< L1	8.1	300	~ 1%	< L1	1	1	1
FR4 - off-channel, intermediate WQ	1.6	6.4	no	8.5	369	~ 5%	< L1	~ 3%	< L1	5.9	287	~ 3%	< L1	5.5	263	~ 1%	< L1	1	1	1
FR1 - off-channel, reference WQ	0.96	0.98	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
FR2 - off-channel, reference WQ	0.17	1.1	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
FR3 - off-channel, reference WQ	0.037	0.057	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
FR3b - off-channel, reference WQ	0.33	1.2	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
FR4 - off-channel, reference WQ	1.6	6.4	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Fording Oxbow	3.3	3.3	no	17	583	~ 9%	< L1	~ 4%	< L1	12	418	~ 5%	< L1	11	369	~ 1%	< L1	1	1	1
Overall	128	160		-	-	~ 7%		~ 3%		-	-	~ 4%		-	-	~ 1%				

Assessment of potential effects related to Nitrate

		Standard Hardness	Pooled slope
Management unit	2	360	1.0003
Time period	2016		
Concentration at Order Station	12		
Hardness Condition - min from month when peak occurs	min monthly		
EVWQP Benchmarks			

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from January to December		Invertebrate Endpoints				Fish Endpoints		Based on peak projected monthly average concentrations from May to July		Amphibian Endpoints		Integrated Potential Effects		
				Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species (*C. dubia*)	Sensitive Species (*C. dubia*) Category	Community (*H. azteca*)	Community (*H. azteca*) Category	Sensitive Species	Sensitive Species Category	Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species	Sensitive Species Category	Fish	Invertebrates	Amphibians
Fording River																		
Upstream of Line Creek (LC_FRDSDC)	37	37	no	18	557	~ 11%	L1-L2	~ 5%	< L1	~ 6%	< L1	11	358	~ 1%	< L1	1	2	1
FR5 - Downstream of Line Creek (LC_LC5)	10	10	no	12	522	~ 5%	< L1	~ 3%	< L1	~ 3%	< L1	9.3	332	~ 1%	< L1	1	1	1
Tributaries																		
Grace Creek	2.7	3.2	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Line Creek (LC_LC4)	8.4	8.4	no	9.2	517	~ 3%	< L1	~ 2%	< L1	~ 2%	< L1	9.0	429	~ 1%	< L1	1	1	1
South Line Creek (LC_SLC)	4.0	5.2	no	0.046	156	~ 0%	≤ WQG	~ 0%	≤ WQG	~ 0%	≤ WQG	0.046	156	~ 0%	≤ WQG	0	0	0
Teepee Creek	1.5	1.5	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Unnamed tributaries	12	12	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Off-channel Habitats																		
Fording River upstream of Line Creek - off-channel, mainstem WQ	0.36	1.3	no	18	557	~ 11%	L1-L2	~ 5%	< L1	~ 6%	< L1	11	358	~ 1%	< L1	1	2	1
Fording River downstream of Line Creek - off-channel, mainstem WQ	0	0													-			
Fording River upstream of Line Creek - off-channel, intermediate WQ	0.36	1.3	no	8.8	356	~ 6%	< L1	~ 3%	< L1	~ 4%	< L1	5.7	257	~ 1%	< L1	1	1	1
Fording River downstream of Line Creek - off-channel, intermediate WQ	0	0													-			
Fording River upstream of Line Creek - off-channel, reference WQ	0.36	1.3	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Fording River downstream of Line Creek - off-channel, reference WQ	0	0																
Overall	78	82		-	-	~ 6%		~ 3%		~ 4%		-	-	~ 1%		-	-	-

Assessment of potential effects related to Nitrate

		Standard Hardness	Pooled slope
Management unit	3	200	1.0003
Time period	2016		
Concentration at Order Station	0.67		
Hardness Condition - min from month when peak occurs	min monthly		
EVWQP Benchmarks			

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from January to December		Invertebrate Endpoints		Fish Endpoints	Based on peak projected monthly average concentrations from May to July		Amphibian Endpoints	Integrated Potential Effects		
				Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species (*C. dubia*) Category	Community (*H. azteca*) Category	Sensitive Species Category	Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species Category	Fish	Invertebrates	Amphibians
Elk River														
Upstream of GHO	150	150	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
ER1 - Downstream of GHO (ER_ER1)	57	57	no	0.67	204	≤ WQG	≤ WQG	≤ WQG	0.28	172	≤ WQG	0	0	0
Tributaries														
Aldridge Creek	3.7	8.6	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Bingay Creek	7.6	8.2	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Bleasdell Creek	1.9	4.3	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Boivin Creek	12	12	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Brûlé Creek	19	19	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Cadorna Creek	11	11	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Crossing Creek	0.033	2.4	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Forsyth Creek	12	14	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Gardner Creek	0.15	1.6	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Hornickel Creek	1.0	1.3	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Leask Creek (GH_LC1)	0	0	no									-	-	-
Lowe Creek	2.1	2.6	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Mickelson Creek (GH_MC1)	0	0.83	no	71	1927	> L2	< L1	-	71	1927	< L1	-	3	1
Osborne Creek	1.0	1.1	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Quarrie Creek	0.73	5.7	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Thompson Creek (GH_TC1)	1.3	1.3	no	25	1401	L1-L2	< L1	< L1	25	1401	< L1	1	2	1
Tobermory Creek	0	2.0	no	0.05	156	≤ WQG	≤ WQG	-	0.05	156	≤ WQG	-	0	0
Weary Creek	0.7	1.2	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Weigert Creek	10.0	10.0	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Wolfram Creek (GH_WC1)	0	0	no									-	-	-
Other named tribs	0.82	3.1	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Unnamed tribs	35	35	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Off-channel Habitats														
Elk River upstream of GHO - off-channel, mainstem WQ	0	0												
Elk River downstream of GHO - off-channel, mainstem WQ	0.77	2.9	no	0.67	204	≤ WQG	≤ WQG	≤ WQG	0.28	172	≤ WQG	0	0	0
Elk River upstream of GHO - off-channel, intermediate WQ	0	0												
Elk River downstream of GHO - off-channel, intermediate WQ	0.77	2.9	no	0.34	180	≤ WQG	≤ WQG	≤ WQG	0.14	164	≤ WQG	0	0	0
Elk River upstream of GHO - off-channel, reference WQ	0	0												
Elk River downstream of GHO - off-channel, reference WQ	0.77	2.9	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Overall	329	361		-	-	-	-	-	-	-	-	-	-	-

Assessment of potential effects related to Nitrate

		Standard Hardness	Pooled slope
Management unit	4	200	1.0003
Time period	2016		
Concentration at Order Station	4.8		
Hardness Condition - min from month when peak occurs	min monthly		
EVWQP Benchmarks			

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from January to December		Invertebrate Endpoints			Fish Endpoints	Based on peak projected monthly average concentrations from May to July		Amphibian Endpoints	Integrated Potential Effects		
				Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species (*C. dubia*)	Sensitive Species (*C. dubia*) Category	Community (*H. azteca*) Category	Sensitive Species Category	Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species Category	Fish	Invertebrates	Amphibians
Elk River															
ER2 - Downstream of the Fording River (EV_ER4)	41	41	no	4.8	329	~ 11.6%	L1-L2	< L1	< L1	3.0	218	≤ WQG	1	2	1
Michel Creek															
MC5 - Downstream of CMO (CM_MC2)	5.4	5.4	no	3.6	660	~ 4%	< L1	< L1	< L1	3.6	660	< L1	1	1	1
MC4 - Downstream of CMO PII	24	24	no	0.7	248	negligible	≤ WQG	≤ WQG	≤ WQG	0.7	248	≤ WQG	0	0	0
MC3 - Upstream of EVO (EV_MC3)	19	19	no	0.6	230	negligible	≤ WQG	≤ WQG	≤ WQG	0.6	230	≤ WQG	0	0	0
MC1 - Mouth (EV_MC1)	28	28	no	5.0	417	~ 10%	< L1	< L1	< L1	3.3	325	< L1	1	1	1
Other Tributaries															
Alexander Creek	39	41	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Bodie Creek (EV_BC1)	0	0.52	no	42	1533	~ 86%	> L2	> L2	-	41	1470	< L1	-	5	3
Bray Creek	0.14	1.3	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Carbon Creek	1.6	2.5	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Cummings Creek	18	18	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Dalzell Creek	1.0	1.0	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Erickson Creek (EV_EC1)	0.77	3.7	no	14	882	~ 12%	L1-L2	< L1	< L1	13	822	< L1	1	2	1
EVO Dry Creek (EV_DC1)	0	1.9	no	4.5	1316	~ 3%	< L1	< L1	-	3.7	1077	< L1	-	1	1
Fir Creek	0.92	1.1	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Gate Creek (EV_GC1)	0	0	yes												
Grave Creek - Reference reach	0	3.7	no	0.05	156	negligible	≤ WQG	≤ WQG	-	0.05	156	≤ WQG	-	0	0
Grave Creek - Mine influenced reach (GV2)	1.5	5.1	no	0.74	328	negligible	≤ WQG	≤ WQG	≤ WQG	0.58	304	≤ WQG	0	0	0
Harmer Creek - Reference reach	0	1.1	no	0.05	156	negligible	≤ WQG	≤ WQG	-	0.05	156	≤ WQG	-	0	0
Harmer Creek -Mine influenced reach (EV_HC1)	0	6.6	no	1.2	435	negligible	≤ WQG	≤ WQG	-	0.94	401	≤ WQG	-	0	0
Leach Creek	21	22	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Littlemoor Creek	1.0	1.1	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Marten Creek	2.4	3.7	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Nordstrum Creek	2.9	3.1	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Saw Mill Creek	0.6	0.6	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Six Mile Creek (EV_SM1)	0.7	0.7	no	0.046	259	negligible	≤ WQG	≤ WQG	≤ WQG	0.046	211	≤ WQG	0	0	0
Snowslide Creek	0.45	0.45	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Telford Creek	0.57	2.0	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Wheeler Creek	5.1	6.7	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Other named tributaries	2.1	6.9	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Unnamed tributaries	23	23	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Off-channel Habitats															
Elk River downstream of the Fording River - off-channel, mainstem WQ	1.5	4.7	no	4.8	329	~ 12%	L1-L2	< L1	< L1	3.0	218	≤ WQG	1	2	1
Elk River downstream of the Fording River - off-channel, intermediate WQ	1.5	4.7	no	2.4	242	negligible	≤ WQG	≤ WQG	≤ WQG	1.5	187	≤ WQG	0	0	0
Elk River downstream of the Fording River - off-channel, reference WQ	1.5	4.7	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Overall	245	290		-	-	-	-	-	-	-	-	-	-	-	-

Assessment of potential effects related to Nitrate

		Standard Hardness	Pooled slope
Management unit	5	200.0	1.0003
Time period	2016		
Concentration at Order Station	2.8		
Hardness Condition - min from month when peak occurs	min monthly		
EVWQP Benchmarks			

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from January to		Invertebrate Endpoints		Fish Endpoints	Based on peak projected monthly average concentrations from May to		Amphibian Endpoints	Integrated Potential Effects		
				Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species (*C. dubia*) Category	Community (*H. azteca*) Category	Sensitive Species Category	Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species Category	Fish	Invertebrates	Amphibians
Elk River														
Between Michel Creek and ER3 (EV_ER2)	22	22	no	3.8	318	< L1	< L1	< L1	2.5	214	≤ WQG	1	1	1
ER3 to Elko (EV_ER1)	115	115	no	2.8	308	≤ WQG	≤ WQG	≤ WQG	2.2	214	≤ WQG	0	0	0
ER4 - Elko to Mouth (RG_ELKORES)	37	37	no	2.1	272	≤ WQG	≤ WQG	≤ WQG	1.8	204	≤ WQG	0	0	0
Tributaries														
Named tributaries	205	245	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Unnamed tributaries	33	33	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Off-channel Habitats														
Elk River between Michel Creek and ER3 - off-channel, mainstem WQ	0.32	3.5	no	3.8	318	< L1	< L1	< L1	2.5	214	≤ WQG	1	1	1
Elk River between ER3 and Elko - off-channel, mainstem WQ	8.4	20	no	2.8	308	≤ WQG	≤ WQG	≤ WQG	2.2	214	≤ WQG	0	0	0
Elk River downstream of Elko - off-channel, mainstem WQ	0.18	0.18	no	2.1	272	≤ WQG	≤ WQG	≤ WQG	1.8	204	≤ WQG	0	0	0
Elk River between Michel Creek and ER3 - off-channel, intermediate WQ	0.32	3.5	no	1.9	237	≤ WQG	≤ WQG	≤ WQG	1.3	185	≤ WQG	0	0	0
Elk River between ER3 and Elko - off-channel, intermediate WQ	8.4	20	no	1.4	232	≤ WQG	≤ WQG	≤ WQG	1.1	185	≤ WQG	0	0	0
Elk River downstream of Elko - off-channel, intermediate WQ	0.18	0.18	no	1.06	214	≤ WQG	≤ WQG	≤ WQG	0.9	180	≤ WQG	0	0	0
Elk River between Michel Creek and ER3 - off-channel, reference WQ	0.32	3.5	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Elk River between ER3 and Elko - off-channel, reference WQ	8.4	20	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Elk River downstream of Elko - off-channel, reference WQ	0.18	0.18	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Overall	439	522		-	-	-	-	-	-	-	-	-	-	-

Assessment of potential effects related to Nitrate

		Standard Hardness	Pooled slope
Management unit	1	360	1.0003
Time period	2017 to 2022		
Concentration at Order Station	20		
Hardness Condition - min from month when peak occurs	min monthly		
EVWQP Benchmarks			

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from January to December		Invertebrate Endpoints				Based on peak projected monthly average concentrations from June to August		Fish Endpoints		Based on peak projected monthly average concentrations from May to July		Amphibian Endpoints		Integrated Potential Effects		
				Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species (*C. dubia*)	Sensitive Species (*C. dubia*) Category	Community (*H. azteca*)	Community (*H. azteca*) Category	Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species	Sensitive Species Category	Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species	Sensitive Species Category	Fish	Invertebrates	Amphibians
Fording River																				
FRus - Upstream of FRO (FR_UFR1)	5.9	5.9	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
FR1 - Downstream of Henretta Creek (FR_FR1)	10	10	no	6.7	327	~ 4%	< L1	~ 2%	< L1	1.7	257	~ 0%	≤ WQG	1.7	221	~ 0%	≤ WQG	1	1	1
FR2 - Downstream of Clode Creek and upstream of Kilmarnock Creek (FR_FR	4.4	4.4	no	19	643	~ 9%	< L1	~ 4%	< L1	10.4	454	~ 3%	< L1	14	355	~ 1%	< L1	1	1	1
FR3 - Between Swift and Cataract creeks (FR_FR4)	9.8	9.8	no	24	610	~ 16%	L1-L2	~ 7%	< L1	15	546	~ 4%	< L1	19	440	~ 1%	< L1	1	2	1
FR3b - Downstream of Porter Creek (GH_PC2)	47	47	no	34	754	~ 21%	> L2	~ 9%	< L1	19	547	~ 7%	< L1	25	459	~ 1%	< L1	1	3	1
FR4 - Downstream of Greenhills Creek (GH_FR1)	9.1	9.1	no	20	567	~ 13%	L1-L2	~ 6%	< L1	12	432	~ 5%	< L1	12	320	~ 1%	< L1	1	2	1
Tributaries																				
Henretta Creek upstream of FRO	1.8	1.9	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Henretta Creek downstream of FRO (FR_HC1)	2.7	2.7	no	13	571	~ 5%	< L1	~ 3%	< L1	2.7	323	~ 0%	≤ WQG	3.2	291	~ 0%	< L1	1	1	1
Clode Creek (FR_CC1)	0.027	0.027	no	152	1461	~ 59%	> L2	~ 32%	> L2	125	1120	~ 43%	> L2	144	1276	~ 3%	L1-L2	5	5	4
Lake Mountain Creek (FR_LMP1)	0	0	yes																	
Kilmarnock Creek (FR_KC1)	0	1.3	no	146	1611	~ 53%	> L2	~ 26%	> L2	48	665	-	-	79	654	~ 3%	L1-L2	-	5	4
Swift Creek (GH_SC1)	0.0072	0.31	no	63	2627	~ 6%	< L1	~ 3%	< L1	50	2578	~ 2%	< L1	48	2269	~ 1%	< L1	1	1	1
Cataract Creek (GH_CC1)	0	0	yes																	
Porter Creek (GH_PC1)	0.28	0.28	no	1.4	1020	~ 0%	≤ WQG	~ 0%	≤ WQG	1.3	663	~ 0%	≤ WQG	1.4	875	~ 0%	≤ WQG	0	0	0
LCO Dry Creek (LC_DC1)	8.4	8.4	no	6.9	271	~ 6%	< L1	~ 3%	< L1	1.5	197	~ 0%	≤ WQG	0.93	189	~ 0%	≤ WQG	1	1	1
Greenhills Creek (GH_GH1)	2.4	2.4	no	14	1194	~ 1%	< L1	~ 1%	< L1	8.8	1073	~ 0%	< L1	6.6	971	~ 0%	< L1	1	1	1
Chauncey Creek	0.4	8.3	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Ewin Creek	3.9	5.6	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Ewin Side Draw	2.9	3.0	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
McQuarrie Creek	0.69	0.75	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Moore Creek	0	0.17	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	-	-	0.05	156	~ 0%	≤ WQG	-	0	0
Todhunter Creek	2.0	2.0	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Other reference tributaries	3.8	3.8	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Off-Channel Habitats																				
FRus - off-channel	0	0.01	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	-	-	0.05	156	~ 0%	≤ WQG	-	0	0
FR1 - off-channel, mainstem WQ	0.96	0.98	no	6.7	327	~ 4%	< L1	~ 2%	< L1	1.7	257	~ 0%	≤ WQG	1.7	221	~ 0%	≤ WQG	1	1	1
FR2 - off-channel, mainstem WQ	0.17	1.1	no	19	643	~ 9%	< L1	~ 4%	< L1	10.4	454	~ 3%	< L1	14	355	~ 1%	< L1	1	1	1
FR3 - off-channel, mainstem WQ	0.037	0.057	no	24	610	~ 16%	L1-L2	~ 7%	< L1	15	546	~ 4%	< L1	19	440	~ 1%	< L1	1	2	1
FR3b - off-channel, mainstem WQ	0.33	1.2	no	34	754	~ 21%	> L2	~ 9%	< L1	19	547	~ 7%	< L1	25	459	~ 1%	< L1	1	3	1
FR4 - off-channel, mainstem WQ	1.6	6.4	no	20	567	~ 13%	L1-L2	~ 6%	< L1	12	432	~ 5%	< L1	12	320	~ 1%	< L1	1	2	1
FR1 - off-channel, intermediate WQ	0.96	0.98	no	3.4	242	~ 2%	< L1	~ 1%	< L1	0.84	206	~ 0%	≤ WQG	0.87	189	~ 0%	≤ WQG	1	1	1
FR2 - off-channel, intermediate WQ	0.17	1.1	no	9.4	399	~ 5%	< L1	~ 3%	< L1	5.2	305	~ 2%	< L1	6.8	256	~ 1%	< L1	1	1	1
FR3 - off-channel, intermediate WQ	0.037	0.057	no	12	383	~ 10%	< L1	~ 5%	< L1	7.3	351	~ 3%	< L1	10	298	~ 1%	< L1	1	1	1
FR3b - off-channel, intermediate WQ	0.33	1.2	no	17	455	~ 15%	L1-L2	~ 7%	< L1	9.3	351	~ 4%	< L1	12	307	~ 1%	< L1	1	2	1
FR4 - off-channel, intermediate WQ	1.6	6.4	no	9.8	361	~ 7%	< L1	~ 4%	< L1	6.1	294	~ 3%	< L1	5.8	238	~ 1%	< L1	1	1	1
FR1 - off-channel, reference WQ	0.96	0.98	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
FR2 - off-channel, reference WQ	0.17	1.1	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
FR3 - off-channel, reference WQ	0.037	0.057	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
FR3b - off-channel, reference WQ	0.33	1.2	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
FR4 - off-channel, reference WQ	1.6	6.4	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Fording Oxbow	3.3	3.3	no	20	567	~ 13%	L1-L2	~ 6%	< L1	12	432	~ 5%	< L1	12	320	~ 1%	< L1	1	2	1
	128	159		-	-	~ 11%		~ 5%		-	-	~ 4%		-	-	~ 1%				

Assessment of potential effects related to Nitrate

		Standard Hardness	Pooled slope
Management unit	2	360	1.0003
Time period	2017 to 2022		
Concentration at Order Station	14		
Hardness Condition - min from month when peak occurs	min monthly		
EVWQP Benchmarks			

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from January to December		Invertebrate Endpoints				Fish Endpoints		Based on peak projected monthly average concentrations from May to July		Amphibian Endpoints		Integrated Potential Effects		
				Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species (*C. dubia*)	Sensitive Species (*C. dubia*) Category	Community (*H. azteca*)	Community (*H. azteca*) Category	Sensitive Species	Sensitive Species Category	Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species	Sensitive Species Category	Fish	Invertebrates	Amphibians
Fording River																		
Upstream of Line Creek (LC_FRDSDC)	37	37	no	21	507	~ 18%	> L2	~ 8%	< L1	~ 10%	< L1	12	307	~ 1%	< L1	1	3	1
FR5 - Downstream of Line Creek (LC_LC5)	10	10	no	14	523	~ 8%	< L1	~ 4%	< L1	~ 5%	< L1	10	308	~ 1%	< L1	1	1	1
Tributaries																		
Grace Creek	2.7	3.2	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Line Creek (LC_LC4)	8.4	8.4	no	12	551	~ 4%	< L1	~ 2%	< L1	~ 3%	< L1	6.6	334	~ 1%	< L1	1	1	1
South Line Creek (LC_SLC)	4.0	5.2	no	0.046	156	~ 0%	≤ WQG	~ 0%	≤ WQG	~ 0%	≤ WQG	0.046	156	~ 0%	≤ WQG	0	0	0
Teepee Creek	1.5	1.5	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Unnamed tributaries	12	12	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Off-channel Habitats																		
Fording River upstream of Line Creek - off-channel, mainstem WQ	0.36	1.3	no	21	507	~ 18%	> L2	~ 8%	< L1	~ 10%	< L1	12	307	~ 1%	< L1	1	3	1
Fording River downstream of Line Creek - off-channel, mainstem WQ	0	0																
Fording River upstream of Line Creek - off-channel, intermediate WQ	0.36	1.3	no	10.5	331	~ 10%	< L1	~ 5%	< L1	~ 6%	< L1	6.0	232	~ 1%	< L1	1	1	1
Fording River downstream of Line Creek - off-channel, intermediate WQ	0	0																
Fording River upstream of Line Creek - off-channel, reference WQ	0.36	1.3	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Fording River downstream of Line Creek - off-channel, reference WQ	0	0																
Overall	78	82		-	-	~ 10%		~ 5%		~ 6%		-	-	~ 1%		-	-	-

Assessment of potential effects related to Nitrate

		Standard Hardness	Pooled slope
Management unit	3	200	1.0003
Time period	2017 to 2022		
Concentration at Order Station	1.2		
Hardness Condition - min from month when peak occurs	min monthly		
EVWQP Benchmarks			

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from January to December		Invertebrate Endpoints		Fish Endpoints	Based on peak projected monthly average concentrations from May to July		Amphibian Endpoints	Integrated Potential Effects		
				Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species (*C. dubia*) Category	Community (*H. azteca*) Category	Sensitive Species Category	Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species Category	Fish	Invertebrates	Amphibians
Elk River														
Upstream of GHO	150	150	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
ER1 - Downstream of GHO (ER_ER1)	57	57	no	1.2	200	≤ WQG	≤ WQG	≤ WQG	0.36	175	≤ WQG	0	0	0
Tributaries														
Aldridge Creek	3.7	8.6	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Bingay Creek	7.6	8.2	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Bleasdell Creek	1.9	4.3	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Boivin Creek	12	12	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Brûlé Creek	19	19	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Cadorna Creek	11	11	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Crossing Creek	0.033	2.4	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Forsyth Creek	12	14	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Gardner Creek	0.15	1.6	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Hornickel Creek	1.0	1.3	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Leask Creek (GH_LC1)	0	0	no											
Lowe Creek	2.1	2.6	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Mickelson Creek (GH_MC1)	0	0.83	no	51	1324	> L2	< L1	-	49	1001	< L1	-	3	1
Osborne Creek	1.0	1.1	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Quarrie Creek	0.73	5.7	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Thompson Creek (GH_TC1)	1.3	1.3	no	20	1411	L1-L2	< L1	< L1	18	1079	< L1	1	2	1
Tobermory Creek	0	2.0	no	0.05	156	≤ WQG	≤ WQG	-	0.05	156	≤ WQG	-	0	0
Weary Creek	0.7	1.2	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Weigert Creek	10.0	10.0	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Wolfram Creek (GH_WC1)	0	0	no											
Other named tribs	0.82	3.1	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Unnamed tribs	35	35	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Off-channel Habitats														
Elk River upstream of GHO - off-channel, mainstem WQ	0	0												
Elk River downstream of GHO - off-channel, mainstem WQ	0.77	2.9	no	1.2	200	≤ WQG	≤ WQG	≤ WQG	0.36	175	≤ WQG	0	0	0
Elk River upstream of GHO - off-channel, intermediate WQ	0	0												
Elk River downstream of GHO - off-channel, intermediate WQ	0.77	2.9	no	0.59	178	≤ WQG	≤ WQG	≤ WQG	0.18	166	≤ WQG	0	0	0
Elk River upstream of GHO - off-channel, reference WQ	0	0												
Elk River downstream of GHO - off-channel, reference WQ	0.77	2.9	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Overall	329	361		-	-	-	-	-	-	-	-	-	-	-

Assessment of potential effects related to Nitrate

		Standard Hardness	Pooled slope
Management unit	4	200	1.0003
Time period	2017 to 2022		
Concentration at Order Station	6.0		
Hardness Condition - min from month when peak occurs	min monthly		
EVWQP Benchmarks			

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from January to December		Invertebrate Endpoints			Fish Endpoints	Based on peak projected monthly average concentrations from May to July		Amphibian Endpoints		Integrated Potential Effects		
				Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species (*C. dubia*)	Sensitive Species (*C. dubia*) Category	Community (*H. azteca*) Category	Sensitive Species Category	Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species	Sensitive Species Category	Fish	Invertebrates	Amphibians
Elk River																
ER2 - Downstream of the Fording River (EV_ER4)	41	41	no	6.0	306	~ 15.4%	L1-L2	< L1	< L1	3.5	221	~ 0.4%	< L1	1	2	1
Michel Creek																
MC5 - Downstream of CMO (CM_MC2)	5.4	5.4	no	3.1	367	~ 7%	< L1	< L1	< L1	2.4	461	~ 0%	≤ WQG	1	1	1
MC4 - Downstream of CMO PII	24	24	no	0.6	195	negligible	≤ WQG	≤ WQG	≤ WQG	0.5	212	negligible	≤ WQG	0	0	0
MC3 - Upstream of EVO (EV_MC3)	19	19	no	0.52	184	negligible	≤ WQG	≤ WQG	≤ WQG	0.4	202	negligible	≤ WQG	0	0	0
MC1 - Mouth (EV_MC1)	28	28	no	5.6	278	~ 16%	L1-L2	< L1	< L1	5.6	278	~ 0%	< L1	1	2	1
Other Tributaries																
Alexander Creek	39	41	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	negligible	≤ WQG	0	0	0
Bodie Creek (EV_BC1)	0	0.52	no	208	3305	~ 38%	> L2	< L1	-	62	1762	-	< L1	-	3	1
Bray Creek	0.14	1.3	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	negligible	≤ WQG	0	0	0
Carbon Creek	1.6	2.5	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	negligible	≤ WQG	0	0	0
Cummings Creek	18	18	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	negligible	≤ WQG	0	0	0
Dalzell Creek	1.0	1.0	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	negligible	≤ WQG	0	0	0
Erickson Creek (EV_EC1)	0.77	3.7	no	28	1205	~ 18%	> L2	< L1	< L1	27	1131	~ 1%	< L1	1	3	1
EVO Dry Creek (EV_DC1)	0	1.9	no	6.9	875	~ 6%	< L1	< L1	-	4.6	786	-	< L1	-	1	1
Fir Creek	0.92	1.1	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	negligible	≤ WQG	0	0	0
Gate Creek (EV_GC1)	0	0	yes													
Grave Creek - Reference reach	0	3.7	no	0.05	156	negligible	≤ WQG	≤ WQG	-	0.05	156	-	≤ WQG	-	0	0
Grave Creek - Mine influenced reach (GV2)	1.5	5.1	no	1.0	274	negligible	≤ WQG	≤ WQG	≤ WQG	0.83	236	negligible	≤ WQG	0	0	0
Harmer Creek - Reference reach	0	1.1	no	0.05	156	negligible	≤ WQG	≤ WQG	-	0.05	156	-	≤ WQG	-	0	0
Harmer Creek -Mine influenced reach (EV_HC1)	0	6.6	no	1.6	357	negligible	≤ WQG	≤ WQG	-	1.4	294	-	≤ WQG	-	0	0
Leach Creek	21	22	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	negligible	≤ WQG	0	0	0
Littlemoor Creek	1.0	1.1	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	negligible	≤ WQG	0	0	0
Marten Creek	2.4	3.7	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	negligible	≤ WQG	0	0	0
Nordstrum Creek	2.9	3.1	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	negligible	≤ WQG	0	0	0
Saw Mill Creek	0.6	0.6	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	negligible	≤ WQG	0	0	0
Six Mile Creek (EV_SM1)	0.7	0.7	no	0.046	256	negligible	≤ WQG	≤ WQG	≤ WQG	0.046	191	negligible	≤ WQG	0	0	0
Snowslide Creek	0.45	0.45	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	negligible	≤ WQG	0	0	0
Telford Creek	0.57	2.0	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	negligible	≤ WQG	0	0	0
Wheeler Creek	5.1	6.7	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	negligible	≤ WQG	0	0	0
Other named tributaries	2.1	6.9	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	negligible	≤ WQG	0	0	0
Unnamed tributaries	23	23	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	negligible	≤ WQG	0	0	0
Off-channel Habitats																
Elk River downstream of the Fording River - off-channel, mainstem WQ	1.5	4.7	no	6.0	306	~ 15%	L1-L2	< L1	< L1	3.5	221	~ 0%	< L1	1	2	1
Elk River downstream of the Fording River - off-channel, intermediate WQ	1.5	4.7	no	3.0	231	negligible	≤ WQG	≤ WQG	≤ WQG	1.8	188	negligible	≤ WQG	0	0	0
Elk River downstream of the Fording River - off-channel, reference WQ	1.5	4.7	no	0.05	156	negligible	≤ WQG	≤ WQG	≤ WQG	0.05	156	negligible	≤ WQG	0	0	0
Overall	245	290		-	-	-	-	-	-	-	-	-	-	-	-	-

Assessment of potential effects related to Nitrate

		Standard Hardness	Pooled slope
Management unit	5	200.0	1.0003
Time period	2017 to 2022		
Concentration at Order Station	3.0		
Hardness Condition - min from month when peak occurs	min monthly		
EVWQP Benchmarks			

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from January to December		Invertebrate Endpoints		Fish Endpoints	Based on peak projected monthly average concentrations from May to July		Amphibian Endpoints	Integrated Potential Effects		
				Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species (*C. dubia*) Category	Community (*H. azteca*) Category	Sensitive Species Category	Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species Category	Fish	Invertebrates	Amphibians
Elk River														
Between Michel Creek and ER3 (EV_ER2)	22	22	no	4.8	295	L1-L2	< L1	< L1	3.1	217	< L1	1	2	1
ER3 to Elko (EV_ER1)	115	115	no	3.0	310	< L1	< L1	< L1	2.4	199	≤ WQG	1	1	1
ER4 - Elko to Mouth (RG_ELKORES)	37	37	no	2.2	256	≤ WQG	≤ WQG	≤ WQG	1.6	192	≤ WQG	0	0	0
Tributaries														
Named tributaries	205	245	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Unnamed tributaries	33	33	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Off-channel Habitats														
Elk River between Michel Creek and ER3 - off-channel, mainstem WQ	0.32	3.5	no	4.8	295	L1-L2	< L1	< L1	3.1	217	< L1	1	2	1
Elk River between ER3 and Elko - off-channel, mainstem WQ	8.4	20	no	3.0	310	< L1	< L1	< L1	2.4	199	≤ WQG	1	1	1
Elk River downstream of Elko - off-channel, mainstem WQ	0.18	0.18	no	2.2	256	≤ WQG	≤ WQG	≤ WQG	1.6	192	≤ WQG	0	0	0
Elk River between Michel Creek and ER3 - off-channel, intermediate WQ	0.32	3.5	no	2.4	225	≤ WQG	≤ WQG	≤ WQG	1.5	186	≤ WQG	0	0	0
Elk River between ER3 and Elko - off-channel, intermediate WQ	8.4	20	no	1.5	233	≤ WQG	≤ WQG	≤ WQG	1.2	177	≤ WQG	0	0	0
Elk River downstream of Elko - off-channel, intermediate WQ	0.18	0.18	no	1.1	206	≤ WQG	≤ WQG	≤ WQG	0.8	174	≤ WQG	0	0	0
Elk River between Michel Creek and ER3 - off-channel, reference WQ	0.32	3.5	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Elk River between ER3 and Elko - off-channel, reference WQ	8.4	20	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Elk River downstream of Elko - off-channel, reference WQ	0.18	0.18	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Overall	439	522		-	-	-	-	-	-	-	-	-	-	-

Assessment of potential effects related to Nitrate

		Standard Hardness	Pooled slope
Management unit	1	360	1.0003
Time period	2023 to 2037		
Concentration at Order Station	9.5		
Hardness Condition - min from month when peak occurs	min monthly		
EVWQP Benchmarks			

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow related Loss of Habitat	Based on peak projected monthly average concentrations from January to December		Invertebrate Endpoints				Based on peak projected monthly average concentrations from June to August		Fish Endpoints		Based on peak projected monthly average concentrations from May to July		Amphibian Endpoints		Integrated Potential Effects		
				Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species (*C. dubia*)	Sensitive Species (*C. dubia*) Category	Community (*H. azteca*)	Community (*H. azteca*) Category	Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species	Sensitive Species Category	Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species	Sensitive Species Category	Fish	Invertebrates	Amphibians
Fording River																				
FRus - Upstream of FRO (FR_UFR1)	5.9	5.9	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
FR1 - Downstream of Henretta Creek (FR_FR1)	10	10	no	3.3	323	~ 1%	< L1	~ 1%	< L1	1.7	526	~ 0%	≤ WQG	1.3	350	~ 0%	≤ WQG	1	1	1
FR2 - Downstream of Clode Creek and upstream of Kilmarnock Creek (FR_	4.4	4.4	no	12	746	~ 2%	< L1	~ 2%	< L1	7.8	605	~ 1%	< L1	9	374	~ 1%	< L1	1	1	1
FR3 - Between Swift and Cataract creeks (FR_FR4)	9.8	9.8	no	14	776	~ 3%	< L1	~ 2%	< L1	10	602	~ 2%	< L1	12	405	~ 1%	< L1	1	1	1
FR3b - Downstream of Porter Creek (GH_PC2)	47	47	no	18	791	~ 5%	< L1	~ 3%	< L1	13	569	~ 3%	< L1	16	428	~ 1%	< L1	1	1	1
FR4 - Downstream of Greenhills Creek (GH_FR1)	9.1	9.1	no	9.5	588	~ 2%	< L1	~ 2%	< L1	8.6	450	~ 2%	< L1	6.9	301	~ 1%	< L1	1	1	1
Tributaries																				
Henretta Creek upstream of FRO	1.8	1.9	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Henretta Creek downstream of FRO (FR_HC1)	2.7	2.7	no	6.2	559	~ 1%	< L1	~ 1%	< L1	1.7	389	~ 0%	≤ WQG	1.9	368	~ 0%	≤ WQG	1	1	1
Clode Creek (FR_CC1)	0.027	0.027	no	203	1827	~ 61%	> L2	~ 34%	> L2	149	1594	~ 36%	> L2	163	1399	~ 3%	L1-L2	5	5	4
Lake Mountain Creek (FR_LMP1)	0	0	yes																	
Kilmarnock Creek (FR_KC1)	0	1.3	no	73	899	~ 48%	> L2	~ 23%	> L2	37	442	-	-	57	683	~ 2%	< L1	-	5	3
Swift Creek (GH_SC1)	0.0072	0.31	no	41	3382	~ 1%	< L1	~ 1%	< L1	36	3354	~ 1%	< L1	35	2705	~ 0%	< L1	1	1	1
Cataract Creek (GH_CC1)	0	0	yes																	
Porter Creek (GH_PC1)	0.28	0.28	no	1.3	997	~ 0%	≤ WQG	~ 0%	≤ WQG	1.1	586	~ 0%	≤ WQG	1.2	849	~ 0%	≤ WQG	0	0	0
LCO Dry Creek (LC_DC1)	8.4	8.4	no	131	1481	~ 52%	> L2	~ 26%	> L2	43	1030	~ 10%	< L1	26	673	~ 1%	< L1	3	5	3
Greenhills Creek (GH_GH1)	2.4	2.4	no	14	1217	~ 1%	< L1	~ 1%	< L1	8.3	1101	~ 0%	< L1	6.4	973	~ 0%	< L1	1	1	1
Chauncey Creek	0.4	8.3	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Ewin Creek	3.9	5.6	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Ewin Side Draw	2.9	3.0	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
McQuarrie Creek	0.69	0.75	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Moore Creek	0	0.17	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	-	-	0.05	156	~ 0%	≤ WQG	-	0	0
Todhunter Creek	2.0	2.0	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Other reference tributaries	3.8	3.8	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Off-Channel Habitats																				
FRus - off-channel	0	0.01	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	-	-	0.05	156	~ 0%	≤ WQG	-	0	0
FR1 - off-channel, mainstem WQ	0.96	0.98	no	3.3	323	~ 1%	< L1	~ 1%	< L1	1.7	526	~ 0%	≤ WQG	1.3	350	~ 0%	≤ WQG	1	1	1
FR2 - off-channel, mainstem WQ	0.17	1.1	no	12	746	~ 2%	< L1	~ 2%	< L1	7.8	605	~ 1%	< L1	9	374	~ 1%	< L1	1	1	1
FR3 - off-channel, mainstem WQ	0.037	0.057	no	14	776	~ 3%	< L1	~ 2%	< L1	10	602	~ 2%	< L1	12	405	~ 1%	< L1	1	1	1
FR3b - off-channel, mainstem WQ	0.33	1.2	no	18	791	~ 5%	< L1	~ 3%	< L1	13	569	~ 3%	< L1	16	428	~ 1%	< L1	1	1	1
FR4 - off-channel, mainstem WQ	1.6	6.4	no	9.5	588	~ 2%	< L1	~ 2%	< L1	8.6	450	~ 2%	< L1	6.9	301	~ 1%	< L1	1	1	1
FR1 - off-channel, intermediate WQ	0.96	0.98	no	1.7	240	~ 0%	≤ WQG	~ 0%	≤ WQG	0.85	341	~ 0%	≤ WQG	0.64	253	~ 0%	≤ WQG	0	0	0
FR2 - off-channel, intermediate WQ	0.17	1.1	no	6.2	451	~ 1%	< L1	~ 1%	< L1	3.9	381	~ 1%	< L1	4.5	265	~ 0%	< L1	1	1	1
FR3 - off-channel, intermediate WQ	0.037	0.057	no	7.1	466	~ 2%	< L1	~ 1%	< L1	5.1	379	~ 1%	< L1	6.0	281	~ 1%	< L1	1	1	1
FR3b - off-channel, intermediate WQ	0.33	1.2	no	9.0	474	~ 3%	< L1	~ 2%	< L1	6.5	362	~ 2%	< L1	7.8	292	~ 1%	< L1	1	1	1
FR4 - off-channel, intermediate WQ	1.6	6.4	no	4.8	372	~ 1%	< L1	~ 1%	< L1	4.3	303	~ 1%	< L1	3.4	229	~ 0%	< L1	1	1	1
FR1 - off-channel, reference WQ	0.96	0.98	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
FR2 - off-channel, reference WQ	0.17	1.1	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
FR3 - off-channel, reference WQ	0.037	0.057	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
FR3b - off-channel, reference WQ	0.33	1.2	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
FR4 - off-channel, reference WQ	1.6	6.4	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Fording Oxbow	3.3	3.3	no	9.5	588	~ 2%	< L1	~ 2%	< L1	8.6	450	~ 2%	< L1	6.9	301	~ 1%	< L1	1	1	1
	128	159		-	-	~ 5%		~ 3%		-	-	~ 2%		-	-	~ 1%				

Assessment of potential effects related to Nitrate

		Standard Hardness	Pooled slope
Management unit	2	360	1.0003
Time period	2023 to 2037		
Concentration at Order Station	8.0		
Hardness Condition - min from month when peak occurs	min monthly		
EVWQP Benchmarks			

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from January to December		Invertebrate Endpoints				Fish Endpoints		Based on peak projected monthly average concentrations from May to July		Amphibian Endpoints		Integrated Potential Effects		
				Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species (*C. dubia*)	Sensitive Species (*C. dubia*) Category	Community (*H. azteca*)	Community (*H. azteca*) Category	Sensitive Species	Sensitive Species Category	Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species	Sensitive Species Category	Fish	Invertebrates	Amphibians
Fording River																		
Upstream of Line Creek (LC_FRDSDC)	37	37	no	10	550	~ 3%	< L1	~ 2%	< L1	~ 2%	< L1	7.0	291	~ 1%	< L1	1	1	1
FR5 - Downstream of Line Creek (LC_LC5)	10	10	no	8.0	579	~ 2%	< L1	~ 1%	< L1	~ 1%	< L1	6.2	294	~ 1%	< L1	1	1	1
Tributaries																		
Grace Creek	2.7	3.2	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Line Creek (LC_LC4)	8.4	8.4	no	9.9	619	~ 2%	< L1	~ 1%	< L1	~ 2%	< L1	6.0	325	~ 1%	< L1	1	1	1
South Line Creek (LC_SLC)	4.0	5.2	no	0.046	156	~ 0%	≤ WQG	~ 0%	≤ WQG	~ 0%	≤ WQG	0.046	156	~ 0%	≤ WQG	0	0	0
Teepee Creek	1.5	1.5	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Unnamed tributaries	12	12	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Off-channel Habitats																		
Fording River upstream of Line Creek - off-channel, mainstem WQ	0.36	1.3	no	10	550	~ 3%	< L1	~ 2%	< L1	~ 2%	< L1	7.0	291	~ 1%	< L1	1	1	1
Fording River downstream of Line Creek - off-channel, mainstem WQ	0	0																
Fording River upstream of Line Creek - off-channel, intermediate WQ	0.36	1.3	no	4.9	353	~ 2%	< L1	~ 1%	< L1	~ 1%	< L1	3.5	224	~ 0%	< L1	1	1	1
Fording River downstream of Line Creek - off-channel, intermediate WQ	0	0																
Fording River upstream of Line Creek - off-channel, reference WQ	0.36	1.3	no	0.05	156	~ 0%	≤ WQG	~ 0%	≤ WQG	~ 0%	≤ WQG	0.05	156	~ 0%	≤ WQG	0	0	0
Fording River downstream of Line Creek - off-channel, reference WQ	0	0																
Overall	78	82		-	-	~ 2%		~ 1%		~ 1%		-	-	~ 0%		-	-	-

Assessment of potential effects related to Nitrate

		Standard Hardness	Pooled slope
Management unit	3	200	1.0003
Time period	2023 to 2037		
Concentration at Order Station	1.2		
Hardness Condition - min from month when peak occurs	min monthly		
EVWQP Benchmarks			

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from January to December		Invertebrate Endpoints		Fish Endpoints	Based on peak projected monthly average concentrations from May to July		Amphibian Endpoints	Integrated Potential Effects		
				Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species (*C. dubia*) Category	Community (*H. azteca*) Category	Sensitive Species Category	Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species Category	Fish	Invertebrates	Amphibians
Elk River														
Upstream of GHO	150	150	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
ER1 - Downstream of GHO (ER_ER1)	57	57	no	1.2	201	≤ WQG	≤ WQG	≤ WQG	0.35	180	≤ WQG	0	0	0
Tributaries														
Aldridge Creek	3.7	8.6	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Bingay Creek	7.6	8.2	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Bleasdell Creek	1.9	4.3	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Boivin Creek	12	12	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Brûlé Creek	19	19	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Cadorna Creek	11	11	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Crossing Creek	0.033	2.4	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Forsyth Creek	12	14	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Gardner Creek	0.15	1.6	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Hornickel Creek	1.0	1.3	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Leask Creek (GH_LC1)	0	0	no											
Lowe Creek	2.1	2.6	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Mickelson Creek (GH_MC1)	0	0.83	no	61	2847	L1-L2	< L1	-	57	1892	< L1	-	2	1
Osborne Creek	1.0	1.1	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Quarrie Creek	0.73	5.7	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Thompson Creek (GH_TC1)	1.3	1.3	no	9.9	1624	< L1	< L1	< L1	8.6	1238	< L1	1	1	1
Tobermory Creek	0	2.0	no	0.05	156	≤ WQG	≤ WQG	-	0.05	156	≤ WQG	-	0	0
Weary Creek	0.7	1.2	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Weigert Creek	10.0	10.0	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Wolfram Creek (GH_WC1)	0	0	no											
Other named tribs	0.82	3.1	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Unnamed tribs	35	35	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Off-channel Habitats														
Elk River upstream of GHO - off-channel, mainstem WQ	0	0												
Elk River downstream of GHO - off-channel, mainstem WQ	0.77	2.9	no	1.2	201	≤ WQG	≤ WQG	≤ WQG	0.35	180	≤ WQG	0	0	0
Elk River upstream of GHO - off-channel, intermediate WQ	0	0												
Elk River downstream of GHO - off-channel, intermediate WQ	0.77	2.9	no	0.62	179	≤ WQG	≤ WQG	≤ WQG	0.18	168	≤ WQG	0	0	0
Elk River upstream of GHO - off-channel, reference WQ	0	0												
Elk River downstream of GHO - off-channel, reference WQ	0.77	2.9	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Overall	329	361		-	-	-	-	-	-	-	-	-	-	-

Assessment of potential effects related to Nitrate

		Standard Hardness	Pooled slope
Management unit	4	200	1.0003
Time period	2023 to 2037		
Concentration at Order Station	3.6		
Hardness Condition - min from month when peak occurs	min monthly		
EVWQP Benchmarks			

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from January to December		Invertebrate Endpoints		Fish Endpoints	Based on peak projected monthly average concentrations from May to July		Amphibian Endpoints	Integrated Potential Effects		
				Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species (*C. dubia*) Category	Community (*H. azteca*) Category	Sensitive Species Category	Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species Category	Fish	Invertebrates	Amphibians
Elk River														
ER2 - Downstream of the Fording River (EV_ER4)	41	41	no	3.6	325	< L1	< L1	< L1	2.3	215	≤ WQG	1	1	1
Michel Creek														
MC5 - Downstream of CMO (CM_MC2)	5.4	5.4	no	1.7	371	≤ WQG	≤ WQG	≤ WQG	1.4	471	≤ WQG	0	0	0
MC4 - Downstream of CMO PII	24	24	no	0.3	195	≤ WQG	≤ WQG	≤ WQG	0.3	214	≤ WQG	0	0	0
MC3 - Upstream of EVO (EV_MC3)	19	19	no	0.3	185	≤ WQG	≤ WQG	≤ WQG	0.25	203	≤ WQG	0	0	0
MC1 - Mouth (EV_MC1)	28	28	no	3.1	373	< L1	< L1	< L1	1.9	261	≤ WQG	1	1	1
Other Tributaries														
Alexander Creek	39	41	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Bodie Creek (EV_BC1)	0	0.52	no	101	1690	> L2	< L1	-	63	1483	< L1	-	3	1
Bray Creek	0.14	1.3	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Carbon Creek	1.6	2.5	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Cummings Creek	18	18	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Dalzell Creek	1.0	1.0	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Erickson Creek (EV_EC1)	0.77	3.7	no	47	1397	> L2	< L1	< L1	47	1397	< L1	1	3	1
EVO Dry Creek (EV_DC1)	0	1.9	no	17	1385	< L1	< L1	-	13	1266	< L1	-	1	1
Fir Creek	0.92	1.1	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Gate Creek (EV_GC1)	0	0	yes											
Grave Creek - Reference reach	0	3.7	no	0.05	156	≤ WQG	≤ WQG	-	0.05	156	≤ WQG	-	0	0
Grave Creek - Mine influenced reach (GV2)	1.5	5.1	no	2.2	324	≤ WQG	≤ WQG	≤ WQG	2.0	264	≤ WQG	0	0	0
Harmer Creek - Reference reach	0	1.1	no	0.05	156	≤ WQG	≤ WQG	-	0.05	156	≤ WQG	-	0	0
Harmer Creek -Mine influenced reach (EV_HC1)	0	6.6	no	3.6	442	< L1	< L1	-	3.3	344	< L1	-	1	1
Leach Creek	21	22	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Littlemoor Creek	1.0	1.1	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Marten Creek	2.4	3.7	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Nordstrum Creek	2.9	3.1	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Saw Mill Creek	0.6	0.6	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Six Mile Creek (EV_SM1)	0.7	0.7	no	0.046	256	≤ WQG	≤ WQG	≤ WQG	0.046	191	≤ WQG	0	0	0
Snowslide Creek	0.45	0.45	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Telford Creek	0.57	2.0	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Wheeler Creek	5.1	6.7	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Other named tributaries	2.1	6.9	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Unnamed tributaries	23	23	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Off-channel Habitats														
Elk River downstream of the Fording River - off-channel, mainstem WQ	1.5	4.7	no	3.6	325	< L1	< L1	< L1	2.3	215	≤ WQG	1	1	1
Elk River downstream of the Fording River - off-channel, intermediate WQ	1.5	4.7	no	1.8	241	≤ WQG	≤ WQG	≤ WQG	1.1	185	≤ WQG	0	0	0
Elk River downstream of the Fording River - off-channel, reference WQ	1.5	4.7	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Overall	245	290		-	-	-	-	-	-	-	-	-	-	-

Assessment of potential effects related to Nitrate

		Standard Hardness	Pooled slope
Management unit	5	200.0	1.0003
Time period	2023 to 2037		
Concentration at Order Station	2.0		
Hardness Condition - min from month when peak occurs	min monthly		
EVWQP Benchmarks			

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from January to December		Invertebrate Endpoints		Fish Endpoints	Based on peak projected monthly average concentrations from May to July		Amphibian Endpoints	Integrated Potential Effects		
				Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species (*C. dubia*) Category	Community (*H. azteca*) Category	Sensitive Species Category	Nitrate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Sensitive Species Category	Fish	Invertebrates	Amphibians
Elk River														
Between Michel Creek and ER3 (EV_ER2)	22	22	no	2.9	311	≤ WQG	≤ WQG	≤ WQG	2.0	211	≤ WQG	0	0	0
ER3 to Elko (EV_ER1)	115	115	no	2.0	329	≤ WQG	≤ WQG	≤ WQG	1.5	204	≤ WQG	0	0	0
ER4 - Elko to Mouth (RG_ELKORES)	37	37	no	1.4	268	≤ WQG	≤ WQG	≤ WQG	1.0	210	≤ WQG	0	0	0
Tributaries														
Named tributaries	205	245	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Unnamed tributaries	33	33	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Off-channel Habitats														
Elk River between Michel Creek and ER3 - off-channel, mainstem WQ	0.32	3.5	no	2.9	311	≤ WQG	≤ WQG	≤ WQG	2.0	211	≤ WQG	0	0	0
Elk River between ER3 and Elko - off-channel, mainstem WQ	8.4	20	no	2.0	329	≤ WQG	≤ WQG	≤ WQG	1.5	204	≤ WQG	0	0	0
Elk River downstream of Elko - off-channel, mainstem WQ	0.18	0.18	no	1.4	268	≤ WQG	≤ WQG	≤ WQG	1.0	210	≤ WQG	0	0	0
Elk River between Michel Creek and ER3 - off-channel, intermediate WQ	0.32	3.5	no	1.4	233	≤ WQG	≤ WQG	≤ WQG	1.0	183	≤ WQG	0	0	0
Elk River between ER3 and Elko - off-channel, intermediate WQ	8.4	20	no	0.99	243	≤ WQG	≤ WQG	≤ WQG	0.74	180	≤ WQG	0	0	0
Elk River downstream of Elko - off-channel, intermediate WQ	0.18	0.18	no	0.71	212	≤ WQG	≤ WQG	≤ WQG	0.52	183	≤ WQG	0	0	0
Elk River between Michel Creek and ER3 - off-channel, reference WQ	0.32	3.5	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Elk River between ER3 and Elko - off-channel, reference WQ	8.4	20	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Elk River downstream of Elko - off-channel, reference WQ	0.18	0.18	no	0.05	156	≤ WQG	≤ WQG	≤ WQG	0.05	156	≤ WQG	0	0	0
Overall	439	522		-	-	-	-	-	-	-	-	-	-	-

APPENDIX C

Integrated Effect Tables - Sulfate

Assessment of potential effects related to Sulphate

Management unit	1
Time period	2016
Concentration at Order Station	284
Hardness Condition - min from month when peak occurs	min monthly
EVWQP Benchmarks	

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from Jan to Dec			Invertebrate Endpoints				Based on peak projected monthly average concentrations from June to Aug			Fish Endpoints		Based on peak projected monthly average concentrations from May to July			Amphibian Endpoints		Integrated Potential Effects		
				Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Applicable WQG value (mg/L)	Sensitive Species (*C. dubia*) Approximate Effect Size	Sensitive Species Category (*C. dubia*)	Community (*C. triangulifer*) Approximate Effect Size	Community Category (*C. triangulifer*)	Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Applicable WQG value (mg/L)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Applicable WQG value (mg/L)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Fish	Invertebrates	Amphibians
Fording River Mainstem																							
FRus - Upstream of FRO (FR_UFR1)	5.9	5.9	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
FR1 - Downstream of Henretta Creek (FR_FR1)	10	10	no	147	350	429	~ 0%	< WQG	~ 0%	< WQG	85	256	429	~ 0%	< WQG	64	226	429	~ 0%	< WQG	0	0	0
FR2 - Downstream of Clode Creek and upstream of Kilmarnock Creek (F	4.4	4.4	no	198	480	429	~ 1%	< WQG	~ 0%	< WQG	153	388	429	~ 1%	< WQG	124	336	429	~ 1%	< WQG	0	0	0
FR3 - Between Swift and Cataract creeks (FR_FR4)	9.8	9.8	no	292	631	429	~ 2%	< WQG	~ 1%	< WQG	193	450	429	~ 1%	< WQG	160	395	429	~ 1%	< WQG	0	0	0
FR3b - Downstream of Porter Creek (GH_PC2)	47	47	no	374	751	429	~ 3%	< WQG	~ 2%	< WQG	224	499	429	~ 1%	< WQG	190	444	429	~ 1%	< WQG	0	0	0
FR4 - Downstream of Greenhills Creek (GH_FR1)	9.1	9.1	no	284	590	429	~ 2%	< WQG	~ 1%	< WQG	179	418	429	~ 1%	< WQG	148	369	429	~ 1%	< WQG	0	0	0
Tributaries																							
Henretta Creek upstream of FRO	1.8	1.9	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Henretta Creek downstream of FRO (FR_HC1)	2.7	2.7	no	270	551	429	~ 1%	< WQG	~ 1%	< WQG	119	307	429	~ 0%	< WQG	92	269	429	~ 0%	< WQG	0	0	0
Clode Creek (FR_CC1)	0.027	0.027	no	461	1187	429	~ 6%	< L1	~ 3%	< L1	461	1187	429	~ 8%	< L1	447	1137	429	~ 7%	< L1	1	1	1
Lake Mountain Creek (FR_LMP1)	0.01	0.31	no	119	344	429	~ 0%	< WQG	~ 0%	< WQG	94	292	429	~ 0%	< WQG	72	250	429	~ 0%	< WQG	0	0	0
Kilmarnock Creek (FR_KC1)	0	1.3	no	729	1393	429	~ 17%	L1-L2	~ 11%	L1-L2	279	630	429	-	< WQG	279	630	429	~ 3%	< WQG	-	3	1
Swift Creek (GH_SC1)	0.0072	0.31	no	1926	2766	429	~ 73%	> L2	~ 73%	> L2	1731	2534	429	~ 73%	> L2	1456	2209	429	~ 47%	> L2	5	5	5
Cataract Creek (GH_CC1)	0	0.027	no	2105	2977	429	~ 78%	> L2	~ 78%	> L2	2065	2936	429	-	> L2	1890	2725	429	~ 60%	> L2	-	5	5
Porter Creek (GH_PC1)	0.28	0.28	no	460	774	429	~ 6%	< L1	~ 3%	< L1	376	656	429	~ 5%	< WQG	362	650	429	~ 5%	< WQG	1	1	1
LCO Dry Creek (LC_DC1)	8.4	8.4	no	13	177	309	~ 0%	< WQG	~ 0%	< WQG	9.9	153	309	~ 0%	< WQG	9.1	148	309	~ 0%	< WQG	0	0	0
Greenhills Creek (GH_GC1)	2.4	2.4	no	808	1230	429	~ 21%	> L2	~ 15%	L1-L2	579	917	429	~ 14%	L1-L2	430	718	429	~ 7%	< L1	3	4	1
Chauncey Creek	0.4	8.3	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Ewin Creek	3.9	5.6	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Ewin Side Draw	2.9	3.0	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
McQuarrie Creek	0.69	0.75	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Moore Creek	0	0.17	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	-	< WQG	19	156	309	~ 0%	< WQG	-	0	0
Todhunter Creek	2.0	2.0	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Other reference tributaries	3.8	3.8	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Off-Channel Habitats																							
FRus - off-channel	0	0.01	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	-	< WQG	19	156	309	~ 0%	< WQG	-	0	0
FR1 - off-channel, mainstem WQ	0.96	0.98	no	147	350	429	~ 0%	< WQG	~ 0%	< WQG	85	256	429	~ 0%	< WQG	64	226	429	~ 0%	< WQG	0	0	0
FR2 - off-channel, mainstem WQ	0.17	1.1	no	198	480	429	~ 1%	< WQG	~ 0%	< WQG	153	388	429	~ 1%	< WQG	124	336	429	~ 1%	< WQG	0	0	0
FR3 - off-channel, mainstem WQ	0.037	0.057	no	292	631	429	~ 2%	< WQG	~ 1%	< WQG	193	450	429	~ 1%	< WQG	160	395	429	~ 1%	< WQG	0	0	0
FR3b - off-channel, mainstem WQ	0.33	1.2	no	374	751	429	~ 3%	< WQG	~ 2%	< WQG	224	499	429	~ 1%	< WQG	190	444	429	~ 1%	< WQG	0	0	0
FR4 - off-channel, mainstem WQ	1.6	6.4	no	284	590	429	~ 2%	< WQG	~ 1%	< WQG	179	418	429	~ 1%	< WQG	148	369	429	~ 1%	< WQG	0	0	0
FR1 - off-channel, intermediate WQ	0.96	0.98	no	83	253	429	~ 0%	< WQG	~ 0%	< WQG	52	206	429	~ 0%	< WQG	42	191	429	~ 0%	< WQG	0	0	0
FR2 - off-channel, intermediate WQ	0.17	1.1	no	109	318	429	~ 0%	< WQG	~ 0%	< WQG	86	272	429	~ 0%	< WQG	71	246	429	~ 0%	< WQG	0	0	0
FR3 - off-channel, intermediate WQ	0.037	0.057	no	155	393	429	~ 0%	< WQG	~ 0%	< WQG	106	303	429	~ 0%	< WQG	90	276	429	~ 0%	< WQG	0	0	0
FR3b - off-channel, intermediate WQ	0.33	1.2	no	196	454	429	~ 1%	< WQG	~ 0%	< WQG	121	327	429	~ 0%	< WQG	105	300	429	~ 0%	< WQG	0	0	0
FR4 - off-channel, intermediate WQ	1.6	6.4	no	152	373	429	~ 0%	< WQG	~ 0%	< WQG	99	287	429	~ 0%	< WQG	83	263	429	~ 0%	< WQG	0	0	0
FR1 - off-channel, reference WQ	0.96	0.98	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
FR2 - off-channel, reference WQ	0.17	1.1	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
FR3 - off-channel, reference WQ	0.037	0.057	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
FR3b - off-channel, reference WQ	0.33	1.2	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
FR4 - off-channel, reference WQ	1.6	6.4	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Fording Oxbow	3.3	3.3	no	284	590	429	~ 2%	< WQG	~ 1%	< WQG	179	418	429	~ 1%	< WQG	148	369	429	~ 1%	< WQG	0	0	0
	128	160		-	-	-	~ 2%		~ 1%		-	-	-	~ 1.0%		-	-	-	~ 1%				

Assessment of potential effects related to Sulphate

Management unit	2
Time period	2016
Concentration at Order Station	239
Hardness Condition - min from month when peak occurs	min monthly
EVWQP Benchmarks	

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from Jan to Dec			Invertebrate Endpoints				Fish Endpoints		Based on peak projected monthly average concentrations from May to July			Amphibian Endpoints		Integrated Potential Effects		
				Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species (*C. dubia*) Approximate Effect Size	Sensitive Species Category (*C. dubia*)	Community (*C. triangulifer*) Approximate Effect Size	Community Category (*C. triangulifer*)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Fish	Invertebrates	Amphibians
Fording River																				
Upstream of Line Creek (LC_FRDSDC)	37	37	no	260	561	429	~ 1%	< WQG	~ 0%	< WQG	~ 2%	< WQG	139	358	429	~ 1%	< WQG	0	0	0
FR5 - Downstream of Line Creek (LC_LC5)	10	10	no	239	525	429	~ 1%	< WQG	~ 0%	< WQG	~ 2%	< WQG	139	359	429	~ 1%	< WQG	0	0	0
Tributaries																				
Grace Creek	2.7	3.2	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Line Creek (LC_LC4)	8.4	8.4	no	221	508	429	~ 1%	< WQG	~ 0%	< WQG	~ 1%	< WQG	174	429	429	~ 1%	< WQG	0	0	0
South Line Creek (LC_SLC)	4.0	5.2	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Teepee Creek	1.5	1.5	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Unnamed tributaries	12	12	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Off-channel Habitats																				
Fording River upstream of Line Creek - off-channel, mainstem WQ	0.36	1.3	no	260	561	429	~ 1%	< WQG	~ 0%	< WQG	~ 2%	< WQG	139	358	429	~ 1%	< WQG	0	0	0
Fording River downstream of Line Creek - off-channel, mainstem WQ	0	0																		
Fording River upstream of Line Creek - off-channel, intermediate WQ	0.36	1.3	no	139	359	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	79	257	429	~ 0%	< WQG	0	0	0
Fording River downstream of Line Creek - off-channel, intermediate WQ	0	0																		
Fording River upstream of Line Creek - off-channel, reference WQ	0.36	1.3	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Fording River downstream of Line Creek - off-channel, reference WQ	0	0																		
Overall	78	82		-	-	-	~ 1%		~ 0%		~ 1%		-	-	-	~ 1%				

Assessment of potential effects related to Sulphate

Management unit 3
Time period 2016
Concentration at Order Station 49
Hardness Condition - min from month when peak occurs min monthly
EVWQP Benchmarks

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from Jan to Dec			Invertebrate Endpoints				Fish Endpoints		Based on peak projected monthly average concentrations from May to July			Amphibian Endpoints		Integrated Potential Effects		
				Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species (*C. dubia*) Approximate Effect Size	Sensitive Species Category (*C. dubia*)	Community (*C. triangulifer*) Approximate Effect Size	Community Category (*C. triangulifer*)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Fish	Invertebrates	Amphibians
Elk River																				
Upstream of GHO	150	150	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
ER1 - Downstream of GHO (ER_ER1)	57	57	no	49	204	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	22	169	309	~ 0%	< WQG	0	0	0
Tributaries																				
Aldridge Creek	3.7	8.6	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Bingay Creek	7.6	8.2	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Bleasdell Creek	1.9	4.3	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Boivin Creek	12	12	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Brûlé Creek	19	19	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Cadorna Creek	11	11	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Crossing Creek	0.033	2.4	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Forsyth Creek	12	14	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Gardner Creek	0.15	1.6	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Hornickel Creek	1.0	1.3	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Leask Creek (GH_LC1)	0	0	no																	
Lowe Creek	2.1	2.6	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Mickelson Creek (GH_MC1)	0	0.83	no	1188	1930	429	~ 43%	> L2	~ 37%	> L2	-	> L2	1147	1927	429	~ 35%	> L2	-	5	5
Osborne Creek	1.0	1.1	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Quarrie Creek	0.73	5.7	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Thompson Creek (GH_TC1)	1.3	1.3	no	1080	1626	429	~ 37%	> L2	~ 30%	> L2	~ 45%	> L2	908	1401	429	~ 25%	> L2	5	5	5
Tobermory Creek	0	2.0	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	-	< WQG	19	156	309	~ 0%	< WQG	-	0	0
Weary Creek	0.7	1.2	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Weigert Creek	10.0	10.0	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Wolfram Creek (GH_WC1)	0	0	no																	
Other named tribs	0.82	3.1	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Unnamed tribs	35	35	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Off-channel Habitats																				
Elk River upstream of GHO - off-channel, mainstem WQ	0	0																		
Elk River downstream of GHO - off-channel, mainstem WQ	0.77	2.9	no	49	204	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	22	169	309	~ 0%	< WQG	0	0	0
Elk River upstream of GHO - off-channel, intermediate WQ	0	0																		
Elk River downstream of GHO - off-channel, intermediate WQ	0.77	2.9	no	25	180	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	11	163	309	~ 0%	< WQG	0	0	0
Elk River upstream of GHO - off-channel, reference WQ	0	0																		
Elk River downstream of GHO - off-channel, reference WQ	0.77	2.9	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Overall	329	361		-	-		~ 0%		~ 0%		~ 0%		-	-		~ 0%				

Assessment of potential effects related to Sulphate

Management unit	4
Time period	2016
Concentration at Order Station	123
Hardness Condition - min from month when peak occurs	min monthly
EVWQP Benchmarks	

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from Jan to Dec			Invertebrate Endpoints				Fish Endpoints		Based on peak projected monthly average concentrations from May to July			Amphibian Endpoints		Integrated Potential Effects		
				Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species (*C. dubia*) Approximate Effect Size	Sensitive Species Category (*C. dubia*)	Community (*C. triangulifer*) Approximate Effect Size	Community Category (*C. triangulifer*)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Fish	Invertebrates	Amphibians
Elk River																				
ER2 - Downstream of the Fording River (EV_ER4)	41	41	no	123	329	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	49	218	429	~ 0%	< WQG	0	0	0
Michel Creek																				
MC5 - Downstream of CMO (CM_MC2)	5.4	5.4	no	410	714	429	~ 4%	< WQG	~ 2%	< WQG	~ 6%	< WQG	393	660	429	~ 6%	< WQG	0	0	0
MC4 - Downstream of CMO PII	24	24	no	90	258	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
MC3 - Upstream of EVO (EV_MC3)	19	19	no	90	257	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	74	230	429	~ 0%	< WQG	0	0	0
MC1 - Mouth (EV_MC1)	28	28	no	198	417	429	~ 1%	< WQG	~ 0%	< WQG	~ 1%	< WQG	137	325	429	~ 1%	< WQG	0	0	0
Other Tributaries																				
Alexander Creek	39	41	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Bodie Creek (EV_BC1)	0	0.52	no	869	1533	429	~ 25%	> L2	~ 18%	L1-L2	-	> L2	816	1470	429	~ 21%	L1-L2	-	4	3
Bray Creek	0.14	1.3	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Carbon Creek	1.6	2.5	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Cummings Creek	18	18	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Dalzell Creek	1.0	1.0	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Erickson Creek (EV_EC1)	0.77	3.7	no	649	949	429	~ 13%	L1-L2	~ 8%	< L1	~ 18%	L1-L2	544	822	429	~ 10%	L1-L2	3	2	3
EVO Dry Creek (EV_DC1)	0	1.9	no	865	1316	429	~ 24%	> L2	~ 18%	L1-L2	-	> L2	722	1126	429	~ 17%	L1-L2	-	4	3
Fir Creek	0.92	1.1	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Gate Creek (EV_GC1)	0	0	yes																	
Grave Creek - Reference reach	0	3.7	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	-	< WQG	19	156	309	~ 0%	< WQG	-	0	0
Grave Creek - Mine influenced reach (GV2)	1.5	5.1	no	144	329	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	127	304	429	~ 1%	< WQG	0	0	0
Harmer Creek - Reference reach	0	1.1	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	-	< WQG	19	156	309	~ 0%	< WQG	-	0	0
Harmer Creek -Mine influenced reach (EV_HC1)	0	6.6	no	226	442	429	~ 1%	< WQG	~ 0%	< WQG	-	< WQG	199	401	429	~ 1%	< WQG	-	0	0
Leach Creek	21	22	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Littlemoor Creek	1.0	1.1	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Marten Creek	2.4	3.7	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Nordstrum Creek	2.9	3.1	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Saw Mill Creek	0.6	0.6	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Six Mile Creek (EV_SM1)	0.7	0.7	no	119	321	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	79	254	429	~ 0%	< WQG	0	0	0
Snowslide Creek	0.45	0.45	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Telford Creek	0.57	2.0	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Wheeler Creek	5.1	6.7	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Other named tributaries	2.1	6.9	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Unnamed tributaries	23	23	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Off-channel Habitats																				
Elk River downstream of the Fording River - off-channel, mainstem WQ	1.5	4.7	no	123	329	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	49	218	429	~ 0%	< WQG	0	0	0
Elk River downstream of the Fording River - off-channel, intermediate WQ	1.5	4.7	no	71	242	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	34	187	429	~ 0%	< WQG	0	0	0
Elk River downstream of the Fording River - off-channel, reference WQ	1.5	4.7	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Overall	245	290					~ 0%		~ 0%		~ 0%					~ 0%				

Assessment of potential effects related to Sulphate

Management unit	5
Time period	2016
Concentration at Order Station	113
Hardness Condition - min from month when peak occurs	min monthly
EVWQP Benchmarks	

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from Jan to Dec			Invertebrate Endpoints				Fish Endpoints		Based on peak projected monthly average concentrations from May to July			Amphibian Endpoints		Integrated Potential Effects		
				Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species (*C. dubia*) Approximate Effect Size	Sensitive Species Category (*C. dubia*)	Community (*C. triangulifer*) Approximate Effect Size	Community Category (*C. triangulifer*)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Fish	Invertebrates	Amphibians
Elk River																				
Between Michel Creek and ER3 (EV_ER2)	22	22	no	117	318	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	46	214	429	~ 0%	< WQG	0	0	0
ER3 to Elko (EV_ER1)	115	115	no	113	308	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	53	220	429	~ 0%	< WQG	0	0	0
ER4 - Elko to Mouth (RG_ELKORES)	37	37	no	90	272	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	45	210	429	~ 0%	< WQG	0	0	0
Tributaries																				
Named tributaries	205	245	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Unnamed tributaries	33	33	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Off-channel Habitats																				
Elk River between Michel Creek and ER3 - off-channel, mainstem WQ	0.32	3.5	no	117	318	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	46	214	429	~ 0%	< WQG	0	0	0
Elk River between ER3 and Elko - off-channel, mainstem WQ	8.4	20	no	113	308	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	53	220	429	~ 0%	< WQG	0	0	0
Elk River downstream of Elko - off-channel, mainstem WQ	0.18	0.18	no	90	272	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	45	210	429	~ 0%	< WQG	0	0	0
Elk River between Michel Creek and ER3 - off-channel, intermediate WQ	0.32	3.5	no	68	237	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	33	185	429	~ 0%	< WQG	0	0	0
Elk River between ER3 and Elko - off-channel, intermediate WQ	8.4	20	no	66	232	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	36	188	429	~ 0%	< WQG	0	0	0
Elk River downstream of Elko - off-channel, intermediate WQ	0.18	0.18	no	55	214	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	32	183	429	~ 0%	< WQG	0	0	0
Elk River between Michel Creek and ER3 - off-channel, reference WQ	0.32	3.5	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Elk River between ER3 and Elko - off-channel, reference WQ	8.4	20	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Elk River downstream of Elko - off-channel, reference WQ	0.18	0.18	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Overall	439	522					0%		0%		0%					0%				

Assessment of potential effects related to Sulphate

Management unit	1
Time period	2017 to 2022
Concentration at Order Station	396
Hardness Condition - min from month when peak occurs	min monthly
EVWQP Benchmarks	

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from Jan to Dec			Invertebrate Endpoints				Based on peak projected monthly average concentrations from June to Aug			Fish Endpoints		Based on peak projected monthly average concentrations from May to July			Amphibian Endpoints		Integrated Potential Effects		
				Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Applicable WQG value (mg/L)	Sensitive Species (*C. dubia*) Approximate Effect Size	Sensitive Species Category (*C. dubia*)	Community (*C. triangulifer*) Approximate Effect Size	Community Category (*C. triangulifer*)	Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Applicable WQG value (mg/L)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Applicable WQG value (mg/L)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Fish	Invertebrates	Amphibians
Fording River Mainstem																							
FRus - Upstream of FRO (FR_UFR1)	5.9	5.9	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
FR1 - Downstream of Henretta Creek (FR_FR1)	10	10	no	204	359	429	~ 1%	< WQG	~ 0%	< WQG	91	260	429	~ 0%	< WQG	109	231	429	~ 0%	< WQG	0	0	0
FR2 - Downstream of Clode Creek and upstream of Kilmarnock Creek (F	4.4	4.4	no	512	840	429	~ 7%	< L1	~ 4%	< L1	318	628	429	~ 3%	< WQG	332	417	429	~ 4%	< WQG	1	1	1
FR3 - Between Swift and Cataract creeks (FR_FR4)	9.8	9.8	no	524	841	429	~ 8%	< L1	~ 4%	< L1	320	637	429	~ 4%	< WQG	342	445	429	~ 4%	< WQG	1	1	1
FR3b - Downstream of Porter Creek (GH_PC2)	47	47	no	512	801	429	~ 7%	< L1	~ 4%	< L1	303	601	429	~ 3%	< WQG	341	462	429	~ 4%	< WQG	1	1	1
FR4 - Downstream of Greenhills Creek (GH_FR1)	9.1	9.1	no	396	583	429	~ 4%	< WQG	~ 2%	< WQG	232	474	429	~ 2%	< WQG	186	322	429	~ 1%	< WQG	0	0	0
Tributaries																							
Henretta Creek upstream of FRO	1.8	1.9	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Henretta Creek downstream of FRO (FR_HC1)	2.7	2.7	no	330	550	429	~ 2%	< WQG	~ 1%	< WQG	135	330	429	~ 0%	< WQG	175	312	429	~ 1%	< WQG	0	0	0
Clode Creek (FR_CC1)	0.027	0.027	no	811	1461	429	~ 21%	> L2	~ 15%	L1-L2	624	1281	429	~ 17%	L1-L2	691	1276	429	~ 16%	L1-L2	3	4	3
Lake Mountain Creek (FR_LMP1)	0	0	yes																				
Kilmarnock Creek (FR_KC1)	0	1.3	no	1016	1556	429	~ 33%	> L2	~ 26%	> L2	327	681	429	-	< WQG	536	697	429	~ 10%	L1-L2	-	5	4
Swift Creek (GH_SC1)	0.0072	0.31	no	2192	2624	429	~ 80%	> L2	~ 80%	> L2	1956	2578	429	~ 79%	> L2	1726	2269	429	~ 56%	> L2	5	5	5
Cataract Creek (GH_CC1)	0	0	yes																				
Porter Creek (GH_PC1)	0.28	0.28	no	675	1022	429	~ 14%	L1-L2	~ 9%	< L1	582	586	429	~ 14%	L1-L2	666	875	429	~ 15%	L1-L2	3	2	3
LCO Dry Creek (LC_DC1)	8.4	8.4	no	30	244	429	~ 0%	< WQG	~ 0%	< WQG	15	210	429	~ 0%	< WQG	12	189	429	~ 0%	< WQG	0	0	0
Greenhills Creek (GH_GC1)	2.4	2.4	no	1034	1350	429	~ 34%	> L2	~ 27%	> L2	785	1095	429	~ 26%	> L2	655	712	429	~ 15%	L1-L2	5	5	4
Chauncey Creek	0.4	8.3	no	1034	1350	429	~ 34%	> L2	~ 27%	> L2	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	3	5	3
Ewin Creek	3.9	5.6	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Ewin Side Draw	2.9	3.0	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
McQuarrie Creek	0.69	0.75	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Moore Creek	0	0.17	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	-	< WQG	19	156	309	~ 0%	< WQG	-	0	0
Todhunter Creek	2.0	2.0	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Other reference tributaries	3.8	3.8	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Off-Channel Habitats																							
FRus - off-channel	0	0.01	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	-	< WQG	19	156	309	~ 0%	< WQG	-	0	0
FR1 - off-channel, mainstem WQ	0.96	0.98	no	204	359	429	~ 1%	< WQG	~ 0%	< WQG	91	260	429	~ 0%	< WQG	109	231	429	~ 0%	< WQG	0	0	0
FR2 - off-channel, mainstem WQ	0.17	1.1	no	512	840	429	~ 7%	< L1	~ 4%	< L1	318	628	429	~ 3%	< WQG	332	417	429	~ 4%	< WQG	1	1	1
FR3 - off-channel, mainstem WQ	0.037	0.057	no	524	841	429	~ 8%	< L1	~ 4%	< L1	320	637	429	~ 4%	< WQG	342	445	429	~ 4%	< WQG	1	1	1
FR3b - off-channel, mainstem WQ	0.33	1.2	no	512	801	429	~ 7%	< L1	~ 4%	< L1	303	601	429	~ 3%	< WQG	341	462	429	~ 4%	< WQG	1	1	1
FR4 - off-channel, mainstem WQ	1.6	6.4	no	396	583	429	~ 4%	< WQG	~ 2%	< WQG	232	474	429	~ 2%	< WQG	186	322	429	~ 1%	< WQG	0	0	0
FR1 - off-channel, intermediate WQ	0.96	0.98	no	112	257	429	~ 0%	< WQG	~ 0%	< WQG	55	208	429	~ 0%	< WQG	64	193	429	~ 0%	< WQG	0	0	0
FR2 - off-channel, intermediate WQ	0.17	1.1	no	266	498	429	~ 1%	< WQG	~ 1%	< WQG	169	392	429	~ 1%	< WQG	175	287	429	~ 1%	< WQG	0	0	0
FR3 - off-channel, intermediate WQ	0.037	0.057	no	272	499	429	~ 1%	< WQG	~ 1%	< WQG	170	396	429	~ 1%	< WQG	181	300	429	~ 1%	< WQG	0	0	0
FR3b - off-channel, intermediate WQ	0.33	1.2	no	265	479	429	~ 1%	< WQG	~ 1%	< WQG	161	379	429	~ 1%	< WQG	180	309	429	~ 1%	< WQG	0	0	0
FR4 - off-channel, intermediate WQ	1.6	6.4	no	208	369	429	~ 1%	< WQG	~ 0%	< WQG	126	315	429	~ 0%	< WQG	102	239	429	~ 0%	< WQG	0	0	0
FR1 - off-channel, reference WQ	0.96	0.98	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
FR2 - off-channel, reference WQ	0.17	1.1	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
FR3 - off-channel, reference WQ	0.037	0.057	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
FR3b - off-channel, reference WQ	0.33	1.2	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
FR4 - off-channel, reference WQ	1.6	6.4	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Fording Oxbow	3.3	3.3	no	396	583	429	~ 4%	< WQG	~ 2%	< WQG	232	474	429	~ 2%	< WQG	186	322	429	~ 1%	< WQG	0	0	0
	128	159		-	-	-	~ 5%		~ 3%		-	-	-	~ 2%		-	-	-	~ 3%				

Assessment of potential effects related to Sulphate

Management unit	2
Time period	2017 to 2022
Concentration at Order Station	354
Hardness Condition - min from month when peak occurs	min monthly
EVWQP Benchmarks	

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from Jan to Dec			Invertebrate Endpoints				Fish Endpoints		Based on peak projected monthly average concentrations from May to July			Amphibian Endpoints		Integrated Potential Effects		
				Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species (*C. dubia*) Approximate Effect Size	Sensitive Species Category (*C. dubia*)	Community (*C. triangulifer*) Approximate Effect Size	Community Category (*C. triangulifer*)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Fish	Invertebrates	Amphibians
Fording River																				
Upstream of Line Creek (LC_FRDSDC)	37	37	no	362	552	429	~ 3%	< WQG	~ 1%	< WQG	~ 5%	< WQG	172	310	429	~ 1%	< WQG	0	0	0
FR5 - Downstream of Line Creek (LC_LC5)	10	10	no	354	537	429	~ 3%	< WQG	~ 1%	< WQG	~ 4%	< WQG	179	311	429	~ 1%	< WQG	0	0	0
Tributaries																				
Grace Creek	2.7	3.2	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Line Creek (LC_LC4)	8.4	8.4	no	341	564	429	~ 3%	< WQG	~ 1%	< WQG	~ 4%	< WQG	199	334	429	~ 1%	< WQG	0	0	0
South Line Creek (LC_SLC)	4.0	5.2	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Teepee Creek	1.5	1.5	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Unnamed tributaries	12	12	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Off-channel Habitats																				
Fording River upstream of Line Creek - off-channel, mainstem WQ	0.36	1.3	no	362	552	429	~ 3%	< WQG	~ 1%	< WQG	~ 5%	< WQG	172	310	429	~ 1%	< WQG	0	0	0
Fording River downstream of Line Creek - off-channel, mainstem WQ	0	0																		
Fording River upstream of Line Creek - off-channel, intermediate WQ	0.36	1.3	no	191	354	429	~ 1%	< WQG	~ 0%	< WQG	~ 1%	< WQG	95	233	429	~ 0%	< WQG	0	0	0
Fording River downstream of Line Creek - off-channel, intermediate WQ	0	0																		
Fording River upstream of Line Creek - off-channel, reference WQ	0.36	1.3	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Fording River downstream of Line Creek - off-channel, reference WQ	0	0																		
Overall	78	82		-	-	-	~ 2%		~ 1%		~ 3%		-	-	-	~ 1%				

Assessment of potential effects related to Sulphate

Management unit	3
Time period	2017 to 2022
Concentration at Order Station	82
Hardness Condition - min from month when peak occurs	min monthly
EVWQP Benchmarks	

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from Jan to Dec			Invertebrate Endpoints				Fish Endpoints		Based on peak projected monthly average concentrations from May to July			Amphibian Endpoints		Integrated Potential Effects		
				Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species (*C. dubia*) Approximate Effect Size	Sensitive Species Category (*C. dubia*)	Community (*C. triangulifer*) Approximate Effect Size	Community Category (*C. triangulifer*)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Fish	Invertebrates	Amphibians
Elk River																				
Upstream of GHO	150	150	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
ER1 - Downstream of GHO (ER_ER1)	57	57	no	82	200	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	30	175	309	~ 0%	< WQG	0	0	0
Tributaries																				
Aldridge Creek	3.7	8.6	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Bingay Creek	7.6	8.2	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Bleasdell Creek	1.9	4.3	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Boivin Creek	12	12	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Brûlé Creek	19	19	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Cadorna Creek	11	11	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Crossing Creek	0.033	2.4	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Forsyth Creek	12	14	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Gardner Creek	0.15	1.6	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Hornickel Creek	1.0	1.3	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Leask Creek (GH_LC1)	0	0	no																	
Lowe Creek	2.1	2.6	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Mickelson Creek (GH_MC1)	0	0.83	no	1030	1324	429	~ 34%	> L2	~ 27%	> L2	-	> L2	814	1291	429	~ 21%	L1-L2	-	5	4
Osborne Creek	1.0	1.1	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Quarrie Creek	0.73	5.7	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Thompson Creek (GH_TC1)	1.3	1.3	no	1280	1567	429	~ 48%	> L2	~ 42%	> L2	~ 55%	> L2	866	1229	429	~ 23%	> L2	5	5	5
Tobermory Creek	0	2.0	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	-	< WQG	19	156	309	~ 0%	< WQG	-	0	0
Weary Creek	0.7	1.2	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Weigert Creek	10.0	10.0	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Wolfram Creek (GH_WC1)	0	0	no																	
Other named tribs	0.82	3.1	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Unnamed tribs	35	35	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Off-channel Habitats																				
Elk River upstream of GHO - off-channel, mainstem WQ	0	0																		
Elk River downstream of GHO - off-channel, mainstem WQ	0.77	2.9	no	82	200	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	30	175	309	~ 0%	< WQG	0	0	0
Elk River upstream of GHO - off-channel, intermediate WQ	0	0																		
Elk River downstream of GHO - off-channel, intermediate WQ	0.77	2.9	no	41	178	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	15	166	309	~ 0%	< WQG	0	0	0
Elk River upstream of GHO - off-channel, reference WQ	0	0																		
Elk River downstream of GHO - off-channel, reference WQ	0.77	2.9	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Overall	329	361		-	-		~ 0%		~ 0%		~ 0%		-	-		~ 0%				

Assessment of potential effects related to Sulphate

Management unit	4
Time period	2017 to 2022
Concentration at Order Station	193
Hardness Condition - min from month when peak occurs	min monthly
EVWQP Benchmarks	

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from Jan to Dec			Invertebrate Endpoints				Fish Endpoints		Based on peak projected monthly average concentrations from May to July			Amphibian Endpoints		Integrated Potential Effects		
				Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species (*C. dubia*) Approximate Effect Size	Sensitive Species Category (*C. dubia*)	Community (*C. triangulifer*) Approximate Effect Size	Community Category (*C. triangulifer*)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Fish	Invertebrates	Amphibians
Elk River																				
ER2 - Downstream of the Fording River (EV_ER4)	41	41	no	193	328	429	~ 1%	< WQG	~ 0%	< WQG	~ 1%	< WQG	81	222	429	~ 0%	< WQG	0	0	0
Michel Creek																				
MC5 - Downstream of CMO (CM_MC2)	5.4	5.4	no	414	415	429	~ 4%	< WQG	~ 2%	< WQG	~ 7%	< WQG	375	514	429	~ 5%	< WQG	0	0	0
MC4 - Downstream of CMO PII	24	24	no	91	203	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	84	221	429	~ 0%	< WQG	0	0	0
MC3 - Upstream of EVO (EV_MC3)	19	19	no	84	192	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	73	210	429	~ 0%	< WQG	0	0	0
MC1 - Mouth (EV_MC1)	28	28	no	197	345	429	~ 1%	< WQG	~ 0%	< WQG	~ 1%	< WQG	189	278	429	~ 1%	< WQG	0	0	0
Other Tributaries																				
Alexander Creek	39	41	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Bodie Creek (EV_BC1)	0	0.52	no	2207	3305	429	~ 80%	> L2	~ 80%	> L2	-	> L2	1350	1621	429	~ 43%	> L2	-	5	5
Bray Creek	0.14	1.3	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Carbon Creek	1.6	2.5	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Cummings Creek	18	18	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Dalzell Creek	1.0	1.0	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Erickson Creek (EV_EC1)	0.77	3.7	no	891	1172	429	~ 26%	> L2	~ 19%	> L2	~ 33%	> L2	802	1143	429	~ 21%	L1-L2	5	5	4
EVO Dry Creek (EV_DC1)	0	1.9	no	1190	860	429	~ 43%	> L2	~ 37%	> L2	-	> L2	879	816	429	~ 24%	> L2	-	5	5
Fir Creek	0.92	1.1	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Gate Creek (EV_GC1)	0	0	yes																	
Grave Creek - Reference reach	0	3.7	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	-	< WQG	19	156	309	~ 0%	< WQG	-	0	0
Grave Creek - Mine influenced reach (GV2)	1.5	5.1	no	176	274	429	~ 0%	< WQG	~ 0%	< WQG	~ 1%	< WQG	161	237	429	~ 1%	< WQG	0	0	0
Harmer Creek - Reference reach	0	1.1	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	-	< WQG	19	156	309	~ 0%	< WQG	-	0	0
Harmer Creek -Mine influenced reach (EV_HC1)	0	6.6	no	279	357	429	~ 2%	< WQG	~ 1%	< WQG	-	< WQG	261	295	429	~ 3%	< WQG	-	0	0
Leach Creek	21	22	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Littlemoor Creek	1.0	1.1	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Marten Creek	2.4	3.7	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Nordstrum Creek	2.9	3.1	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Saw Mill Creek	0.6	0.6	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Six Mile Creek (EV_SM1)	0.7	0.7	no	133	261	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	70	205	429	~ 0%	< WQG	0	0	0
Snowslide Creek	0.45	0.45	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Telford Creek	0.57	2.0	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Wheeler Creek	5.1	6.7	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Other named tributaries	2.1	6.9	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Unnamed tributaries	23	23	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Off-channel Habitats																				
Elk River downstream of the Fording River - off-channel, mainstem WQ	1.5	4.7	no	193	328	429	~ 1%	< WQG	~ 0%	< WQG	~ 1%	< WQG	81	222	429	~ 0%	< WQG	0	0	0
Elk River downstream of the Fording River - off-channel, intermediate WQ	1.5	4.7	no	106	242	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	50	189	429	~ 0%	< WQG	0	0	0
Elk River downstream of the Fording River - off-channel, reference WQ	1.5	4.7	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Overall	245	290					~ 0%		~ 0%		~ 1%					~ 0%				

Assessment of potential effects related to Sulphate

Management unit	5
Time period	2017 to 2022
Concentration at Order Station	147
Hardness Condition - min from month when peak occurs	min monthly
EVWQP Benchmarks	

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from Jan to Dec			Invertebrate Endpoints				Fish Endpoints		Based on peak projected monthly average concentrations from May to July			Amphibian Endpoints		Integrated Potential Effects		
				Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species (*C. dubia*) Approximate Effect Size	Sensitive Species Category (*C. dubia*)	Community (*C. triangulifer*) Approximate Effect Size	Community Category (*C. triangulifer*)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Fish	Invertebrates	Amphibians
Elk River																				
Between Michel Creek and ER3 (EV_ER2)	22	22	no	180	313	429	~ 0%	< WQG	~ 0%	< WQG	~ 1%	< WQG	79	218	429	~ 0%	< WQG	0	0	0
ER3 to Elko (EV_ER1)	115	115	no	147	328	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	72	209	429	~ 0%	< WQG	0	0	0
ER4 - Elko to Mouth (RG_ELKORES)	37	37	no	110	267	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	53	200	429	~ 0%	< WQG	0	0	0
Tributaries																				
Named tributaries	205	245	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Unnamed tributaries	33	33	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Off-channel Habitats																				
Elk River between Michel Creek and ER3 - off-channel, mainstem WQ	0.32	3.5	no	180	313	429	~ 0%	< WQG	~ 0%	< WQG	~ 1%	< WQG	79	218	429	~ 0%	< WQG	0	0	0
Elk River between ER3 and Elko - off-channel, mainstem WQ	8.4	20	no	147	328	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	72	209	429	~ 0%	< WQG	0	0	0
Elk River downstream of Elko - off-channel, mainstem WQ	0.18	0.18	no	110	267	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	53	200	429	~ 0%	< WQG	0	0	0
Elk River between Michel Creek and ER3 - off-channel, intermediate WQ	0.32	3.5	no	99	235	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	49	187	429	~ 0%	< WQG	0	0	0
Elk River between ER3 and Elko - off-channel, intermediate WQ	8.4	20	no	83	242	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	45	182	429	~ 0%	< WQG	0	0	0
Elk River downstream of Elko - off-channel, intermediate WQ	0.18	0.18	no	65	211	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	36	178	309	~ 0%	< WQG	0	0	0
Elk River between Michel Creek and ER3 - off-channel, reference WQ	0.32	3.5	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Elk River between ER3 and Elko - off-channel, reference WQ	8.4	20	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Elk River downstream of Elko - off-channel, reference WQ	0.18	0.18	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Overall	439	522					0%		0%		0%					0%				

Assessment of potential effects related to Sulphate

Management unit	1
Time period	2023 to 2037
Concentration at Order Station	550
Hardness Condition - min from month when peak occurs	min monthly
EVWQP Benchmarks	

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from Jan to Dec			Invertebrate Endpoints				Based on peak projected monthly average concentrations from June to Aug			Fish Endpoints		Based on peak projected monthly average concentrations from May to July			Amphibian Endpoints		Integrated Potential Effects		
				Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Applicable WQG value (mg/L)	Sensitive Species (*C. dubia*) Approximate Effect Size	Sensitive Species Category (*C. dubia*)	Community (*C. triangulifer*) Approximate Effect Size	Community Category (*C. triangulifer*)	Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Applicable WQG value (mg/L)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	Applicable WQG value (mg/L)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Fish	Invertebrates	Amphibians
Fording River Mainstem																							
FRus - Upstream of FRO (FR_UFR1)	5.9	5.9	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
FR1 - Downstream of Henretta Creek (FR_FR1)	10	10	no	434	675	429	~ 5%	< L1	~ 2%	< L1	274	509	429	~ 2%	< WQG	268	350	429	~ 3%	< WQG	1	1	1
FR2 - Downstream of Clode Creek and upstream of Kilmarnock Creek (F	4.4	4.4	no	704	955	429	~ 16%	L1-L2	~ 10%	L1-L2	419	689	429	~ 7%	< WQG	476	509	429	~ 8%	< L1	1	3	1
FR3 - Between Swift and Cataract creeks (FR_FR4)	9.8	9.8	no	706	949	429	~ 16%	L1-L2	~ 10%	L1-L2	413	678	429	~ 7%	< WQG	471	530	429	~ 8%	< L1	1	3	1
FR3b - Downstream of Porter Creek (GH_PC2)	47	47	no	655	878	429	~ 13%	L1-L2	~ 8%	< L1	376	622	429	~ 5%	< WQG	429	527	429	~ 7%	< WQG	1	2	1
FR4 - Downstream of Greenhills Creek (GH_FR1)	9.1	9.1	no	550	761	429	~ 9%	< L1	~ 5%	< L1	320	544	429	~ 4%	< WQG	252	383	429	~ 2%	< WQG	1	1	1
Tributaries																							
Henretta Creek upstream of FRO	1.8	1.9	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Henretta Creek downstream of FRO (FR_HC1)	2.7	2.7	no	406	652	429	~ 4%	< WQG	~ 2%	< WQG	174	389	429	~ 1%	< WQG	230	368	429	~ 2%	< WQG	0	0	0
Clode Creek (FR_CC1)	0.027	0.027	no	1449	1686	429	~ 56%	> L2	~ 52%	> L2	1170	1617	429	~ 50%	> L2	1271	1605	429	~ 40%	> L2	5	5	5
Lake Mountain Creek (FR_LMP1)	0	0	yes																				
Kilmarnock Creek (FR_KC1)	0	1.3	no	822	841	429	~ 22%	> L2	~ 16%	L1-L2	351	462	429	-	< WQG	494	683	429	~ 9%	L1-L2	-	4	3
Swift Creek (GH_SC1)	0.0072	0.31	no	2495	3378	429	~ 85%	> L2	~ 86%	> L2	2455	3330	429	~ 87%	> L2	2422	3319	429	~ 71%	> L2	5	5	5
Cataract Creek (GH_CC1)	0	0	yes																				
Porter Creek (GH_PC1)	0.28	0.28	no	678	1024	429	~ 14%	L1-L2	~ 9%	< L1	584	586	429	~ 14%	L1-L2	669	877	429	~ 15%	L1-L2	3	2	3
LCO Dry Creek (LC_DC1)	8.4	8.4	no	1277	1952	429	~ 48%	> L2	~ 42%	> L2	727	1115	429	~ 23%	> L2	495	658	429	~ 9%	L1-L2	5	5	4
Greenhills Creek (GH_GC1)	2.4	2.4	no	1110	1529	429	~ 39%	> L2	~ 32%	> L2	819	1147	429	~ 28%	> L2	743	733	429	~ 18%	L1-L2	5	5	4
Chauncey Creek	0.4	8.3	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Ewin Creek	3.9	5.6	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Ewin Side Draw	2.9	3.0	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
McQuarrie Creek	0.69	0.75	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Moore Creek	0	0.17	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	-	< WQG	19	156	309	~ 0%	< WQG	-	0	0
Todhunter Creek	2.0	2.0	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Other reference tributaries	3.8	3.8	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Off-Channel Habitats																							
FRus - off-channel	0	0.01	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	-	< WQG	19	156	309	~ 0%	< WQG	-	0	0
FR1 - off-channel, mainstem WQ	0.96	0.98	no	434	675	429	~ 5%	< L1	~ 2%	< L1	274	509	429	~ 2%	< WQG	268	350	429	~ 3%	< WQG	1	1	1
FR2 - off-channel, mainstem WQ	0.17	1.1	no	704	955	429	~ 16%	L1-L2	~ 10%	L1-L2	419	689	429	~ 7%	< WQG	476	509	429	~ 8%	< L1	1	3	1
FR3 - off-channel, mainstem WQ	0.037	0.057	no	706	949	429	~ 16%	L1-L2	~ 10%	L1-L2	413	678	429	~ 7%	< WQG	471	530	429	~ 8%	< L1	1	3	1
FR3b - off-channel, mainstem WQ	0.33	1.2	no	655	878	429	~ 13%	L1-L2	~ 8%	< L1	376	622	429	~ 5%	< WQG	429	527	429	~ 7%	< WQG	1	2	1
FR4 - off-channel, mainstem WQ	1.6	6.4	no	550	761	429	~ 9%	< L1	~ 5%	< L1	320	544	429	~ 4%	< WQG	252	383	429	~ 2%	< WQG	1	1	1
FR1 - off-channel, intermediate WQ	0.96	0.98	no	227	415	429	~ 1%	< WQG	~ 0%	< WQG	146	333	429	~ 0%	< WQG	144	253	429	~ 1%	< WQG	0	0	0
FR2 - off-channel, intermediate WQ	0.17	1.1	no	361	555	429	~ 3%	< WQG	~ 1%	< WQG	219	422	429	~ 1%	< WQG	247	332	429	~ 2%	< WQG	0	0	0
FR3 - off-channel, intermediate WQ	0.037	0.057	no	362	552	429	~ 3%	< WQG	~ 1%	< WQG	216	417	429	~ 1%	< WQG	245	343	429	~ 2%	< WQG	0	0	0
FR3b - off-channel, intermediate WQ	0.33	1.2	no	337	517	429	~ 3%	< WQG	~ 1%	< WQG	197	389	429	~ 1%	< WQG	224	341	429	~ 2%	< WQG	0	0	0
FR4 - off-channel, intermediate WQ	1.6	6.4	no	284	458	429	~ 2%	< WQG	~ 1%	< WQG	170	350	429	~ 1%	< WQG	135	269	429	~ 1%	< WQG	0	0	0
FR1 - off-channel, reference WQ	0.96	0.98	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
FR2 - off-channel, reference WQ	0.17	1.1	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
FR3 - off-channel, reference WQ	0.037	0.057	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
FR3b - off-channel, reference WQ	0.33	1.2	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
FR4 - off-channel, reference WQ	1.6	6.4	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Fording Oxbow	3.3	3.3	no	550	761	429	~ 9%	< L1	~ 5%	< L1	320	544	429	~ 4%	< WQG	252	383	429	~ 2%	< WQG	1	1	1
	128	159		-	-	-	~ 12%		~ 8%		-	-	-	~ 5%		-	-	-	~ 5%				

Assessment of potential effects related to Sulphate

Management unit	2
Time period	2023 to 2037
Concentration at Order Station	477
Hardness Condition - min from month when peak occurs	min monthly
EVWQP Benchmarks	

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from Jan to Dec			Invertebrate Endpoints				Fish Endpoints		Based on peak projected monthly average concentrations from May to July			Amphibian Endpoints		Integrated Potential Effects		
				Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species (*C. dubia*) Approximate Effect Size	Sensitive Species Category (*C. dubia*)	Community (*C. triangulifer*) Approximate Effect Size	Community Category (*C. triangulifer*)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Fish	Invertebrates	Amphibians
Fording River																				
Upstream of Line Creek (LC_FRDSDC)	37	37	no	524	729	429	~ 8%	< L1	~ 4%	< L1	~ 11%	L1-L2	236	372	429	~ 2%	< WQG	3	1	1
FR5 - Downstream of Line Creek (LC_LC5)	10	10	no	477	685	429	~ 6%	< L1	~ 3%	< L1	~ 9%	< L1	237	356	429	~ 2%	< WQG	1	1	1
Tributaries																				
Grace Creek	2.7	3.2	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Line Creek (LC_LC4)	8.4	8.4	no	426	687	429	~ 5%	< WQG	~ 2%	< WQG	~ 7%	< WQG	250	358	429	~ 2%	< WQG	0	0	0
South Line Creek (LC_SLC)	4.0	5.2	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Teepee Creek	1.5	1.5	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Unnamed tributaries	12	12	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Off-channel Habitats																				
Fording River upstream of Line Creek - off-channel, mainstem WQ	0.36	1.3	no	524	729	429	~ 8%	< L1	~ 4%	< L1	~ 11%	L1-L2	236	372	429	~ 2%	< WQG	3	1	1
Fording River downstream of Line Creek - off-channel, mainstem WQ	0	0																		
Fording River upstream of Line Creek - off-channel, intermediate WQ	0.36	1.3	no	272	442	429	~ 1%	< WQG	~ 1%	< WQG	~ 2%	< WQG	128	264	429	~ 1%	< WQG	0	0	0
Fording River downstream of Line Creek - off-channel, intermediate WQ	0	0																		
Fording River upstream of Line Creek - off-channel, reference WQ	0.36	1.3	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Fording River downstream of Line Creek - off-channel, reference WQ	0	0																		
Overall	78	82		-	-	-	~ 5%		~ 3%		~ 7%		-	-	-	~ 2%				

Assessment of potential effects related to Sulphate

Management unit	3
Time period	2023 to 2037
Concentration at Order Station	115
Hardness Condition - min from month when peak occurs	min monthly
EVWQP Benchmarks	

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from Jan to Dec			Invertebrate Endpoints				Fish Endpoints		Based on peak projected monthly average concentrations from May to July			Amphibian Endpoints		Integrated Potential Effects		
				Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species (*C. dubia*) Approximate Effect Size	Sensitive Species Category (*C. dubia*)	Community (*C. triangulifer*) Approximate Effect Size	Community Category (*C. triangulifer*)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Fish	Invertebrates	Amphibians
Elk River																				
Upstream of GHO	150	150	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
ER1 - Downstream of GHO (ER_ER1)	57	57	no	115	229	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	38	181	309	~ 0%	< WQG	0	0	0
Tributaries																				
Aldridge Creek	3.7	8.6	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Bingay Creek	7.6	8.2	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Bleasdell Creek	1.9	4.3	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Boivin Creek	12	12	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Brûlé Creek	19	19	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Cadorna Creek	11	11	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Crossing Creek	0.033	2.4	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Forsyth Creek	12	14	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Gardner Creek	0.15	1.6	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Hornickel Creek	1.0	1.3	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Leask Creek (GH_LC1)	0	0	no																	
Lowe Creek	2.1	2.6	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Mickelson Creek (GH_MC1)	0	0.83	no	2406	3322	429	~ 83%	> L2	~ 84%	> L2	-	> L2	2122	2604	429	~ 66%	> L2	-	5	5
Osborne Creek	1.0	1.1	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Quarrie Creek	0.73	5.7	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Thompson Creek (GH_TC1)	1.3	1.3	no	1578	2000	429	~ 62%	> L2	~ 59%	> L2	~ 68%	> L2	1173	1243	429	~ 36%	> L2	5	5	5
Tobermory Creek	0	2.0	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	-	< WQG	19	156	309	~ 0%	< WQG	-	0	0
Weary Creek	0.7	1.2	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Weigert Creek	10.0	10.0	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Wolfram Creek (GH_WC1)	0	0	no																	
Other named tribs	0.82	3.1	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Unnamed tribs	35	35	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Off-channel Habitats																				
Elk River upstream of GHO - off-channel, mainstem WQ	0	0																		
Elk River downstream of GHO - off-channel, mainstem WQ	0.77	2.9	no	115	229	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	38	181	309	~ 0%	< WQG	0	0	0
Elk River upstream of GHO - off-channel, intermediate WQ	0	0																		
Elk River downstream of GHO - off-channel, intermediate WQ	0.77	2.9	no	57	193	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	168	309	~ 0%	< WQG	0	0	0
Elk River upstream of GHO - off-channel, reference WQ	0	0																		
Elk River downstream of GHO - off-channel, reference WQ	0.77	2.9	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Overall	329	361		-	-		~ 0%		~ 0%		~ 0%		-	-		~ 0%				

Assessment of potential effects related to Sulphate

Management unit	4
Time period	2023 to 2037
Concentration at Order Station	264
Hardness Condition - min from month when peak occurs	min monthly
EVWQP Benchmarks	

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from Jan to Dec			Invertebrate Endpoints				Fish Endpoints		Based on peak projected monthly average concentrations from May to July			Amphibian Endpoints		Integrated Potential Effects		
				Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species (*C. dubia*) Approximate Effect Size	Sensitive Species Category (*C. dubia*)	Community (*C. triangulifer*) Approximate Effect Size	Community Category (*C. triangulifer*)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Fish	Invertebrates	Amphibians
Elk River																				
ER2 - Downstream of the Fording River (EV_ER4)	41	41	no	264	377	429	~ 1%	< WQG	~ 1%	< WQG	~ 2%	< WQG	101	240	429	~ 0%	< WQG	0	0	0
Michel Creek																				
MC5 - Downstream of CMO (CM_MC2)	5.4	5.4	no	414	412	429	~ 4%	< WQG	~ 2%	< WQG	~ 7%	< WQG	375	511	429	~ 5%	< WQG	0	0	0
MC4 - Downstream of CMO PII	24	24	no	91	203	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	84	221	429	~ 0%	< WQG	0	0	0
MC3 - Upstream of EVO (EV_MC3)	19	19	no	84	192	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	73	210	429	~ 0%	< WQG	0	0	0
MC1 - Mouth (EV_MC1)	28	28	no	231	290	429	~ 1%	< WQG	~ 0%	< WQG	~ 2%	< WQG	170	317	429	~ 1%	< WQG	0	0	0
Other Tributaries																				
Alexander Creek	39	41	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Bodie Creek (EV_BC1)	0	0.52	no	1438	2056	429	~ 56%	> L2	~ 51%	> L2	-	> L2	1421	1946	429	~ 46%	> L2	-	5	5
Bray Creek	0.14	1.3	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Carbon Creek	1.6	2.5	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Cummings Creek	18	18	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Dalzell Creek	1.0	1.0	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Erickson Creek (EV_EC1)	0.77	3.7	no	1147	1691	429	~ 41%	> L2	~ 34%	> L2	~ 48%	> L2	1082	1513	429	~ 32%	> L2	5	5	5
EVO Dry Creek (EV_DC1)	0	1.9	no	1557	1169	429	~ 61%	> L2	~ 58%	> L2	-	> L2	1321	1266	429	~ 42%	> L2	-	5	5
Fir Creek	0.92	1.1	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Gate Creek (EV_GC1)	0	0	yes																	
Grave Creek - Reference reach	0	3.7	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	-	< WQG	19	156	309	~ 0%	< WQG	-	0	0
Grave Creek - Mine influenced reach (GV2)	1.5	5.1	no	221	324	429	~ 1%	< WQG	~ 0%	< WQG	~ 1%	< WQG	207	264	429	~ 0%	< WQG	0	0	0
Harmer Creek - Reference reach	0	1.1	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	-	< WQG	19	156	309	~ 0%	< WQG	-	0	0
Harmer Creek -Mine influenced reach (EV_HC1)	0	6.6	no	352	415	429	~ 3%	< WQG	~ 1%	< WQG	-	< WQG	340	344	429	~ 4%	< WQG	-	0	0
Leach Creek	21	22	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Littlemoor Creek	1.0	1.1	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Marten Creek	2.4	3.7	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Nordstrum Creek	2.9	3.1	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Saw Mill Creek	0.6	0.6	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Six Mile Creek (EV_SM1)	0.7	0.7	no	133	261	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	70	205	429	~ 0%	< WQG	0	0	0
Snowslide Creek	0.45	0.45	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Telford Creek	0.57	2.0	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Wheeler Creek	5.1	6.7	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Other named tributaries	2.1	6.9	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Unnamed tributaries	23	23	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Off-channel Habitats																				
Elk River downstream of the Fording River - off-channel, mainstem WQ	1.5	4.7	no	264	377	429	~ 1%	< WQG	~ 1%	< WQG	~ 2%	< WQG	101	240	429	~ 0%	< WQG	0	0	0
Elk River downstream of the Fording River - off-channel, intermediate WQ	1.5	4.7	no	141	267	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	60	198	429	~ 0%	< WQG	0	0	0
Elk River downstream of the Fording River - off-channel, reference WQ	1.5	4.7	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Overall	245	290					~ 1%		~ 0%		~ 1%					~ 0%				

Assessment of potential effects related to Sulphate

Management unit	5
Time period	2023 to 2037
Concentration at Order Station	193
Hardness Condition - min from month when peak occurs	min monthly
EVWQP Benchmarks	

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Physical or Flow-related Loss of Habitat	Based on peak projected monthly average concentrations from Jan to Dec			Invertebrate Endpoints				Fish Endpoints		Based on peak projected monthly average concentrations from May to July			Amphibian Endpoints		Integrated Potential Effects		
				Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species (*C. dubia*) Approximate Effect Size	Sensitive Species Category (*C. dubia*)	Community (*C. triangulifer*) Approximate Effect Size	Community Category (*C. triangulifer*)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Sulphate Concentration (mg/L)	Hardness (mg/L as $CaCO_3$)	WQG for Specified Hardness (mg/L SO_4)	Sensitive Species Approximate Effect Size	Sensitive Species Category	Fish	Invertebrates	Amphibians
Elk River																				
Between Michel Creek and ER3 (EV_ER2)	22	22	no	243	357	429	~ 1%	< WQG	~ 0%	< WQG	~ 2%	< WQG	98	235	429	~ 0%	< WQG	0	0	0
ER3 to Elko (EV_ER1)	115	115	no	193	376	429	~ 1%	< WQG	~ 0%	< WQG	~ 1%	< WQG	87	222	429	~ 0%	< WQG	0	0	0
ER4 - Elko to Mouth (RG_ELKORES)	37	37	no	143	298	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	64	211	429	~ 0%	< WQG	0	0	0
Tributaries																				
Named tributaries	205	245	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Unnamed tributaries	33	33	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Off-channel Habitats																				
Elk River between Michel Creek and ER3 - off-channel, mainstem WQ	0.32	3.5	no	243	357	429	~ 1%	< WQG	~ 0%	< WQG	~ 2%	< WQG	98	235	429	~ 0%	< WQG	0	0	0
Elk River between ER3 and Elko - off-channel, mainstem WQ	8.4	20	no	193	376	429	~ 1%	< WQG	~ 0%	< WQG	~ 1%	< WQG	87	222	429	~ 0%	< WQG	0	0	0
Elk River downstream of Elko - off-channel, mainstem WQ	0.18	0.18	no	143	298	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	64	211	429	~ 0%	< WQG	0	0	0
Elk River between Michel Creek and ER3 - off-channel, intermediate WQ	0.32	3.5	no	131	257	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	58	196	429	~ 0%	< WQG	0	0	0
Elk River between ER3 and Elko - off-channel, intermediate WQ	8.4	20	no	106	266	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	53	189	429	~ 0%	< WQG	0	0	0
Elk River downstream of Elko - off-channel, intermediate WQ	0.18	0.18	no	81	227	429	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	41	183	429	~ 0%	< WQG	0	0	0
Elk River between Michel Creek and ER3 - off-channel, reference WQ	0.32	3.5	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Elk River between ER3 and Elko - off-channel, reference WQ	8.4	20	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Elk River downstream of Elko - off-channel, reference WQ	0.18	0.18	no	19	156	309	~ 0%	< WQG	~ 0%	< WQG	~ 0%	< WQG	19	156	309	~ 0%	< WQG	0	0	0
Overall	439	522					0%		0%		0%					0%				

APPENDIX D

Integrated Effect Tables - Selenium

Assessment of potential effects related to selenium

Management unit 1
Time period 2016 - maximum projected monthly average concentrations under current conditions
Concentration at Order Station 57
EVWQP Benchmarks

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Loss of Majority of Flow	Peak Monthly Avg Selenium Concentration (µg/L)			Invertebrate Endpoints		Fish Endpoints		Bird Endpoints		Integrated Potential Effects		
				January to December	May and June (bird repro)	June to August (bird growth)	Sensitive Species	Community	Reproduction	Juvenile Growth	Reproduction	Juvenile Growth	Invertebrates	Fish	Birds
Fording River															
FRus - Upstream of FRO (FR_UFR1)	5.9	5.9	no	1.1	1.1	1.1	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
FR1 - Downstream of Henretta Creek (FR_FR1)	10	10	no	20	5.6	10	< L1	< L1	4%	< 7%	4%	3%	1	1	1
FR2 - Downstream of Clode Creek and upstream of Kilmarnock Creek (F	4.4	4.4	no	40	12	20	< L1	< L1	6%	< 9%	4%	4%	1	1	1
FR3 - Between Swift and Cataract creeks (FR_FR4)	9.8	9.8	no	64	33	41	< L1	< L1	9%	< 11%	6%	5%	1	1	1
FR3b - Downstream of Porter Creek (GH_PC2)	47	47	no	90	52	62	< L1	< L1	12%	< 13%	6%	6%	1	3	1
FR4 - Downstream of Greenhills Creek (GH_FR1)	9.1	9.1	no	58	38	47	< L1	< L1	9%	< 11%	6%	6%	1	1	1
Tributaries															
Henretta Creek upstream of FRO	1.8	1.9	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
Henretta Creek downstream of FRO (FR_HC1)	2.7	2.7	no	40	7.9	15	< L1	< L1	6%	< 9%	4%	3%	1	1	1
Clode Creek (FR_CC1)	0.027	0.027	no	174	127	146	L1-L2	< L1	19%	< 17%	8%	9%	2	3	1
Lake Mountain Creek (FR_LMP1)	0.01	0.31	no	28	12	19	< L1	< L1	5%	< 8%	4%	4%	1	1	1
Kilmarnock Creek (FR_KC1)	0	1.3	no	230	128	139	L1-L2	< L1	-	-	8%	9%	2	-	1
Swift Creek (GH_SC1)	0.0072	0.31	no	694	542	655	L1-L2	< L1	42%	< 28%	12%	17%	2	4	3
Cataract Creek (GH_CC1)	0	0.027	no	734	619	734	L1-L2	< L1	-	-	13%	17%	2	-	3
Porter Creek (GH_PC1)	0.28	0.28	no	94	74	79	< L1	< L1	12%	< 13%	7%	7%	1	3	1
LCO Dry Creek (LC_DC1)	8.4	8.4	no	2.5	1.6	1.8	< L1	< L1	1%	< 3%	3%	2%	1	1	1
Greenhills Creek (GH_GC1)	2.4	2.4	no	185	101	127	L1-L2	< L1	20%	< 17%	8%	8%	2	3	1
Chauncey Creek	0.4	8.3	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
Ewin Creek	3.9	5.6	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
Ewin Side Draw	2.9	3.0	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
McQuarrie Creek	0.69	0.75	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
Moore Creek	0	0.17	no	0.5	0.5	0.5	< WQG	< WQG	-	-	3%	1%	0	-	0
Todhunter Creek	2.0	2.0	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
Other reference tributaries	3.8	3.8	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
Off-channel Habitats															
FRus - off-channel	0	0.01	no	1.1	1.1	1.1	< WQG	< WQG	-	-	3%	1%	0	-	0
FR1 - off-channel, mainstem WQ	0.96	0.98	no	20	5.6	10	< L1	< L1	4%	< 7%	4%	3%	1	1	1
FR2 - off-channel, mainstem WQ	0.17	1.1	no	40	12	20	< L1	< L1	6%	< 9%	4%	4%	1	1	1
FR3 - off-channel, mainstem WQ	0.037	0.057	no	64	33	41	< L1	< L1	9%	< 11%	6%	5%	1	1	1
FR3b - off-channel, mainstem WQ	0.33	1.2	no	90	52	62	< L1	< L1	12%	< 13%	6%	6%	1	3	1
FR4 - off-channel, mainstem WQ	1.6	6.4	no	58	38	47	< L1	< L1	9%	< 11%	6%	6%	1	1	1
FR1 - off-channel, intermediate WQ	0.96	0.98	no	10	2.8	5.0	< L1	< L1	2%	< 5%	3%	2%	1	1	1
FR2 - off-channel, intermediate WQ	0.17	1.1	no	20	6.2	9.8	< L1	< L1	3%	< 7%	4%	3%	1	1	1
FR3 - off-channel, intermediate WQ	0.037	0.057	no	32	16	21	< L1	< L1	5%	< 9%	4%	4%	1	1	1
FR3b - off-channel, intermediate WQ	0.33	1.2	no	45	26	31	< L1	< L1	7%	< 10%	5%	5%	1	1	1
FR4 - off-channel, intermediate WQ	1.6	6.4	no	29	19	23	< L1	< L1	5%	< 8%	5%	4%	1	1	1
FR1 - off-channel, reference WQ	0.96	0.98	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
FR2 - off-channel, reference WQ	0.17	1.1	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
FR3 - off-channel, reference WQ	0.037	0.057	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
FR3b - off-channel, reference WQ	0.33	1.2	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
FR4 - off-channel, reference WQ	1.6	6.4	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
Fording Oxbow (lotic)	3.3	3.3	no	58	38	47	< L1	< L1	9%	< 11%	6%	6%	1	1	1
Overall	128	160	-				-	-	7.4%	< 9%	5%	4%			
Overall 90th Quantile Reproductive Effects									10%		9%				

Assessment of potential effects related to selenium

Management unit 2
Time period 2016 - maximum projected monthly average concentrations under current conditions
Concentration at Order Station 46.5
EVWQP Benchmarks

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Loss of Majority of Flow	Peak Monthly Avg Selenium Concentration (µg/L)			Invertebrate Endpoints		Fish Endpoints		Bird Endpoints		Integrated Potential Effects		
				January to December	May and June (bird repro)	June to August (bird growth)	Sensitive Species	Community	Reproduction	Juvenile Growth	Reproduction	Juvenile Growth	Invertebrates	Fish	Birds
Fording River															
Upstream of Line Creek (LC_FRDSDC)	37	37	no	53	37	44	< L1	< L1	17%	11%	6%	5%	1	3	1
FR5 - Downstream of Line Creek (LC_LC5)	10	10	no	46	36	36	< L1	< L1	16%	10%	6%	5%	1	3	1
Tributaries															
Grace Creek	2.7	3.2	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Line Creek (LC_LC4)	8.4	8.4	no	56	42	42	< L1	< L1	18%	11%	6%	5%	1	3	1
South Line Creek (LC_SLC)	4.0	5.2	no	1.1	1.1	1.1	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Teepee Creek	1.5	1.5	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Unnamed tributaries	12	12	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Off-channel Habitats															
Fording River upstream of Line Creek - off-channel, mainstem WQ	0.36	1.3	no	53	37	44	< L1	< L1	17%	11%	6%	5%	1	3	1
Fording River downstream of Line Creek - off-channel, mainstem WQ	0	0													
Fording River upstream of Line Creek - off-channel, intermediate WQ	0.36	1.3	no	27	18	22	< L1	< L1	12%	8%	5%	4%	1	3	1
Fording River downstream of Line Creek - off-channel, intermediate WQ	0	0													
Fording River upstream of Line Creek - off-channel, reference WQ	0.36	1.3	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Fording River downstream of Line Creek - off-channel, reference WQ	0	0													
Overall	78	82	-	-			-	-	13%	8%	5%	4%			
Overall 90th Quantile Reproductive Effects									18%		10%				

Assessment of potential effects related to selenium

Management unit 3
Time period 2016 - maximum projected monthly average concentrations under current conditions
Concentration at Order Station 3.0
EVWQP Benchmarks

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Loss of Majority of Flow	Peak Monthly Avg Selenium Concentration (µg/L)			Invertebrate Endpoints		Fish Endpoints		Bird Endpoints		Integrated Potential Effects		
				January to December	May and June (bird repro)	June to August (bird growth)	Sensitive Species	Community	Reproduction	Juvenile Growth	Reproduction	Juvenile Growth	Invertebrates	Fish	Birds
Elk River															
Upstream of GHO	150	150	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
ER1 - Downstream of GHO (ER_ER1)	57	57	no	3.0	1.3	1.5	< L1	< L1	4%	3%	3%	1%	1	1	1
Tributaries															
Aldridge Creek	3.7	8.6	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Bingay Creek	7.6	8.2	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Bleasdell Creek	1.9	4.3	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Boivin Creek	12	12	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Brûlé Creek	19	19	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Cadorna Creek	11	11	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Crossing Creek	0.033	2.4	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Forsyth Creek	12	14	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Gardner Creek	0.15	1.6	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Hornickel Creek	1.0	1.3	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Leask Creek (GH_LC1)	0	0	no												
Lowe Creek	2.1	2.6	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Mickelson Creek (GH_MC1)	0	0.83	no	191	177	191	L1-L2	< L1	-	-	9%	10%	2	-	1
Osborne Creek	1.0	1.1	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Quarrie Creek	0.73	5.7	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Thompson Creek (GH_TC1)	1.3	1.3	no	181	143	164	L1-L2	< L1	30%	17%	8%	9%	2	4	1
Tobermory Creek	0	2.0	no	0.5	0.5	0.5	< WQG	< WQG	-	-	3%	1%	0	-	0
Weary Creek	0.7	1.2	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Weigert Creek	10.0	10.0	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Wolfram Creek (GH_WC1)	0	0	no												
Other named tribs	0.82	3.1	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Unnamed tribs	35	35	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Off-channel Habitats															
Elk River upstream of GHO - off-channel, mainstem WQ	0	0													
Elk River downstream of GHO - off-channel, mainstem WQ	0.77	2.9	no	3.0	1.3	1.5	< L1	< L1	4%	3%	3%	1%	1	1	1
Elk River upstream of GHO - off-channel, intermediate WQ	0	0													
Elk River downstream of GHO - off-channel, intermediate WQ	0.77	2.9	no	1.5	0.66	0.77	< WQG	< WQG	4%	3%	3%	1%	0	0	0
Elk River upstream of GHO - off-channel, reference WQ	0	0													
Elk River downstream of GHO - off-channel, reference WQ	0.77	2.9	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Overall	329	361	-	-			-	-	4%	2%	3%	1%			
Overall 90th Quantile Reproductive Effects									7%		7%				

Assessment of potential effects related to selenium

Management unit 4
Time period 2016 - maximum projected monthly average concentrations under current conditions
Concentration at Order Station 17.0
EVWQP Benchmarks

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Loss of Majority of Flow	Peak Monthly Avg Selenium Concentration (µg/L)			Invertebrate Endpoints		Fish Endpoints		Bird Endpoints		Integrated Potential Effects		
				January to December	May and June (bird repro)	June to August (bird growth)	Sensitive Species	Community	Reproduction	Juvenile Growth	Reproduction	Juvenile Growth	Invertebrates	Fish	Birds
Elk River															
ER2 - Downstream of the Fording River (EV_ER4)	41	41	no	17	12	12	< L1	< L1	9%	7%	4%	3%	1	1	1
Michel Creek															
MC5 - Downstream of CMO (CM_MC2)	5.4	5.4	no	13	7.7	13	< L1	< L1	8%	6%	4%	3%	1	1	1
MC4 - Downstream of CMO PII	24	24	no	2.7	1.8	2.7	< L1	< L1	4%	3%	3%	2%	1	1	1
MC3 - Upstream of EVO (EV_MC3)	19	19	no	2.7	1.9	2.7	< L1	< L1	4%	3%	3%	2%	1	1	1
MC1 - Mouth (EV_MC1)	28	28	no	28	6.7	26	< L1	< L1	12%	8%	4%	4%	1	3	1
Tributaries															
Alexander Creek	39	41	no	1.06	1.06	1.06	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Bodie Creek (EV_BC1)	0	0.52	no	186	166	172	L1-L2	< L1	-	-	9%	10%	2	-	1
Bray Creek	0.14	1.3	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Carbon Creek	1.6	2.5	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Cummings Creek	18	18	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Dalzell Creek	1.0	1.0	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Erickson Creek (EV_EC1)	0.77	3.7	no	128	113	125	L1-L2	< L1	26%	15%	8%	8%	2	4	1
EVO Dry Creek (EV_DC1)	0	1.9	no	134	98	134	L1-L2	< L1	-	-	8%	9%	2	-	1
Fir Creek	0.92	1.1	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Gate Creek (EV_GC1)	0	0	yes												
Grave Creek - Reference reach	0	3.7	no	0.5	0.5	0.5	< WQG	< WQG	-	-	3%	1%	0	-	0
Grave Creek - Mine influenced reach (GV2)	1.5	5.1	no	28	16	24	< L1	< L1	12%	8%	4%	4%	1	3	1
Harmer Creek - Reference reach	0	1.1	no	0.5	0.5	0.5	< WQG	< WQG	-	-	3%	1%	0	-	0
Harmer Creek -Mine influenced reach (EV_HC1)	0	6.6	no	44	26	39	< L1	< L1	-	-	5%	5%	1	-	1
Leach Creek	21	22	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Littlemoor Creek	1.0	1.1	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Marten Creek	2.4	3.7	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Nordstrum Creek	2.9	3.1	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Saw Mill Creek	0.6	0.6	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Six Mile Creek (EV_SM1)	0.7	0.7	no	4.0	4.0	4.0	< L1	< L1	5%	4%	4%	2%	1	1	1
Snowslide Creek	0.45	0.45	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Telford Creek	0.57	2.0	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Wheeler Creek	5.1	6.7	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Other named tributaries	2.1	6.9	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Unnamed tributaries	23	23	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Off-channel Habitats															
Elk River downstream of the Fording River - off-channel, mainstem WQ	1.5	4.7	no	17	12	12	< L1	< L1	9%	7%	4%	3%	1	1	1
Elk River downstream of the Fording River - off-channel, intermediate WQ	1.5	4.7	no	8.5	5.8	5.8	< L1	< L1	6%	5%	4%	2%	1	1	1
Elk River downstream of the Fording River - off-channel, reference WQ	1.5	4.7	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Overall	245	290	-	-			-	-	6%	4%	4%	2%			
Overall 90th Quantile Reproductive Effects									9.4%		7%				

Assessment of potential effects related to selenium

Management unit 5
Time period 2016 - maximum projected monthly average concentrations under current conditions
Concentration at Order Station 13.7
EVWQP Benchmarks

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Loss of Majority of Flow	Peak Monthly Avg Selenium Concentration (µg/L)			Invertebrate Endpoints		Fish Endpoints		Bird Endpoints		Integrated Potential Effects		
				January to December	May and June (bird repro)	June to August (bird growth)	Sensitive Species	Community	Reproduction	Juvenile Growth	Reproduction	Juvenile Growth	Invertebrates	Fish	Birds
Elk River															
Between Michel Creek and ER3 (EV_ER2)	22	22	no	14	10	10	< L1	< L1	8%	6%	4%	3%	1	1	1
ER3 to Elko (EV_ER1)	115	115	no	14	9.5	11	< L1	< L1	8%	6%	4%	3%	1	1	1
ER4 - Elko to Mouth (RG_ELKORES)	37	37	no	10	7.8	9.2	< L1	< L1	7%	5%	4%	3%	1	1	1
Tributaries															
Named tributaries	205	245	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Unnamed tributaries	33	33	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Off-channel Habitats															
Elk River between Michel Creek and ER3 - off-channel, mainstem WQ	0.32	3.5	no	14	10	10	< L1	< L1	8%	6%	4%	3%	1	1	1
Elk River between ER3 and Elko - off-channel, mainstem WQ	8.4	20	no	14	9.5	11	< L1	< L1	8%	6%	4%	3%	1	1	1
Elk River downstream of Elko - off-channel, mainstem WQ	0.18	0.18	no	10	7.8	9.2	< L1	< L1	7%	5%	4%	3%	1	1	1
Elk River between Michel Creek and ER3 - off-channel, intermediate WQ	0.32	3.5	no	7.2	5.2	5.2	< L1	< L1	6%	5%	4%	2%	1	1	1
Elk River between ER3 and Elko - off-channel, intermediate WQ	8.4	20	no	6.8	4.7	5.6	< L1	< L1	5%	5%	4%	2%	1	1	1
Elk River downstream of Elko - off-channel, intermediate WQ	0.18	0.18	no	5.2	3.9	4.6	< L1	< L1	5%	4%	4%	2%	1	1	1
Elk River between Michel Creek and ER3 - off-channel, reference WQ	0.32	3.5	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Elk River between ER3 and Elko - off-channel, reference WQ	8.4	20	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Elk River downstream of Elko - off-channel, reference WQ	0.18	0.18	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Overall	439	522	-	-			-	-	6%	4%	3%	2%			
Overall 90th Quantile Reproductive Effects									9%		7%				

Assessment of potential effects related to selenium

Management unit 6
Time period 2016 - maximum projected monthly average concentrations under current conditions
Concentration at Order Station 1.9
EVWQP Benchmarks

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Loss of Majority of Flow	Peak Monthly Avg Selenium Concentration (µg/L)			Invertebrate Endpoints		Fish Endpoints		Bird Endpoints		Integrated Potential Effects		
				January to December	May and June (bird repro)	June to August (bird growth)	Sensitive Species	Community	Reproduction	Juvenile Growth	Reproduction	Juvenile Growth	Invertebrates	Fish	Birds
Lotic Bioaccumulation Model															
Lake Koocanusa															
Koocanusa Reservoir (RG_DSELK_Inflow)	22	22	no	2.0	1.0	0.97	< WQG	< WQG	4%	3%	3%	1%	0	0	0
Overall	22	22	-	-			-	-	4%	3%	3%	1%			
Overall 90th Quantile Reproductive Effects									7%		7%				
Lentic Bioaccumulation Model															
Lake Koocanusa															
Koocanusa Reservoir (RG_DSELK_Inflow)	22	22	no	1.9	1.0	0.96	< WQG	< WQG	6%	7%	2%	2%	0	0	0
Overall	22	22	-	-			-	-	6%	7%	2%	2%			
Overall 90th Quantile Reproductive Effects									9%		5%				

Assessment of potential effects related to selenium

Management unit 1
Time period 2017 to 2022 - maximum projected monthly average concentrations
Concentration at Order Station 57
EVWQP Benchmarks

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Loss of Majority of Flow	Peak Monthly Avg Selenium Concentration (µg/L)			Invert Tissue Conc (inv UCL)			Invertebrate Endpoints		Fish Endpoints						Bird Endpoints				Integrated Potential Effects		
				January to December	May and June (bird repro)	June to August (bird growth)	Jan to Dec	May and June	June to August	Sensitive Species	Community	Reproduction (Brown trout)	Reproduction (WCT)	Reproduction	Juv Growth Calculation	Juvenile Growth	higher, coded	Repro Calc	Reproduction	Juvenile Growth	higher, coded	Invertebrates	Fish	Birds
Fording River																								
FRus - Upstream of FRO (FR_UFR1)	5.9	5.9	no	1.1	1.1	1.1	5.4	5.4	5.4	< WQG	< WQG	4%	1%	1%	2%	< 2%	< WQG	3%	3%	1%	< WQG	0	0	0
FR1 - Downstream of Henretta Creek (FR_FR1)	10	10	no	29	11	11	10.0	8.3	8.3	< L1	< L1	12%	5%	5%	8%	< 8%	<10%	4%	4%	3%	<10%	1	1	1
FR2 - Downstream of Clode Creek and upstream of Kilmarnock Creek (FI	4.4	4.4	no	59	43	40	11.6	10.8	10.7	< L1	< L1	18%	9%	9%	11%	< 11%	<10%	6%	6%	5%	<10%	1	1	1
FR3 - Between Swift and Cataract creeks (FR_FR4)	9.8	9.8	no	116	93	83	13.3	12.7	12.4	L1-L2	< L1	25%	14%	14%	14%	< 14%	10-20%	7%	7%	7%	<10%	2	3	1
FR3b - Downstream of Porter Creek (GH_PC2)	47	47	no	122	105	88	13.5	13.0	12.6	L1-L2	< L1	25%	15%	15%	15%	< 15%	10-20%	8%	8%	7%	<10%	2	3	1
FR4 - Downstream of Greenhills Creek (GH_FR1)	9.1	9.1	no	78	52	61	12.2	11.3	11.6	< L1	< L1	20%	11%	11%	12%	< 12%	10-20%	6%	6%	6%	<10%	1	3	1
Tributaries																								
Henretta Creek upstream of FRO	1.8	1.9	no	0.5	0.5	0.5	4.7	4.7	4.7	< WQG	< WQG	4%	1%	1%	2%	< 2%	< WQG	3%	3%	1%	< WQG	0	0	0
Henretta Creek downstream of FRO (FR_HC1)	2.7	2.7	no	48	18	17	11.1	9.1	9.0	< L1	< L1	16%	7%	7%	10%	< 10%	<10%	5%	5%	4%	<10%	1	1	1
Clode Creek (FR_CC1)	0.027	0.027	no	242	218	212	15.6	15.2	15.1	L1-L2	< L1	34%	24%	24%	19%	< 19%	>20%	10%	10%	10%	10-20%	2	4	3
Lake Mountain Creek (FR_LMP1)	0	0	yes																					
Kilmarnock Creek (FR_KC1)	0	1.3	no	327	216	144	16.6	15.2	13.9	L1-L2	< L1	38%	28%	-	-	-	>20%	10%	10%	9%	<10%	2	-	1
Swift Creek (GH_SC1)	0.0072	0.31	no	840	527	723	20.6	18.5	19.9	> L2	< L1	54%	46%	46%	30%	< 30%	>20%	12%	12%	17%	10-20%	3	4	3
Cataract Creek (GH_CC1)	0	0	yes																					
Porter Creek (GH_PC1)	0.28	0.28	no	138	138	123	13.8	13.8	13.5	L1-L2	< L1	27%	16%	16%	15%	< 15%	10-20%	8%	8%	8%	<10%	2	3	1
LCO Dry Creek (LC_DC1)	8.4	8.4	no	6.8	2.3	3.3	7.5	6.2	6.6	< L1	< L1	5%	1%	1%	5%	< 5%	<10%	3%	3%	2%	<10%	1	1	1
Greenhills Creek (GH_GC1)	2.4	2.4	no	218	112	122	15.2	13.2	13.5	L1-L2	< L1	32%	22%	22%	18%	< 18%	>20%	8%	8%	8%	<10%	2	4	1
Chauncey Creek	0.4	8.3	no	0.5	0.5	0.5	4.7	4.7	4.7	< WQG	< WQG	4%	1%	1%	2%	< 2%	< WQG	3%	3%	1%	< WQG	0	0	0
Ewin Creek	3.9	5.6	no	0.5	0.5	0.5	4.7	4.7	4.7	< WQG	< WQG	4%	1%	1%	2%	< 2%	< WQG	3%	3%	1%	< WQG	0	0	0
Ewin Side Draw	2.9	3.0	no	0.5	0.5	0.5	4.7	4.7	4.7	< WQG	< WQG	4%	1%	1%	2%	< 2%	< WQG	3%	3%	1%	< WQG	0	0	0
McQuarrie Creek	0.69	0.75	no	0.5	0.5	0.5	4.7	4.7	4.7	< WQG	< WQG	4%	1%	1%	2%	< 2%	< WQG	3%	3%	1%	< WQG	0	0	0
Moore Creek	0	0.17	no	0.5	0.5	0.5	4.7	4.7	4.7	< WQG	< WQG	4%	1%	-	-	-	< WQG	3%	3%	1%	< WQG	0	-	0
Todhunter Creek	2.0	2.0	no	0.5	0.5	0.5	4.7	4.7	4.7	< WQG	< WQG	4%	1%	1%	2%	< 2%	< WQG	3%	3%	1%	< WQG	0	0	0
Other reference tributaries	3.8	3.8	no	0.5	0.5	0.5	4.7	4.7	4.7	< WQG	< WQG	4%	1%	1%	2%	< 2%	< WQG	3%	3%	1%	< WQG	0	0	0
Off-channel Habitats																								
FRus - off-channel	0	0.01	no	1.1	1.1	1.1	5.4	5.4	5.4	< WQG	< WQG	4%	1%	-	-	-	< WQG	3%	3%	1%	< WQG	0	-	0
FR1 - off-channel, mainstem WQ	0.96	0.98	no	29	11	11	10.0	8.3	8.3	< L1	< L1	12%	5%	5%	8%	< 8%	<10%	4%	4%	3%	<10%	1	1	1
FR2 - off-channel, mainstem WQ	0.17	1.1	no	59	43	40	11.6	10.8	10.7	< L1	< L1	18%	9%	9%	11%	< 11%	<10%	6%	6%	5%	<10%	1	1	1
FR3 - off-channel, mainstem WQ	0.037	0.057	no	116	93	83	13.3	12.7	12.4	L1-L2	< L1	25%	14%	14%	14%	< 14%	10-20%	7%	7%	7%	<10%	2	3	1
FR3b - off-channel, mainstem WQ	0.33	1.2	no	122	105	88	13.5	13.0	12.6	L1-L2	< L1	25%	15%	15%	15%	< 15%	10-20%	8%	8%	7%	<10%	2	3	1
FR4 - off-channel, mainstem WQ	1.6	6.4	no	78	52	61	12.2	11.3	11.6	< L1	< L1	20%	11%	11%	12%	< 12%	10-20%	6%	6%	6%	<10%	1	3	1
FR1 - off-channel, intermediate WQ	0.96	0.98	no	14	5.6	5.5	8.7	7.3	7.2	< L1	< L1	8%	3%	3%	6%	< 6%	<10%	4%	4%	2%	<10%	1	1	1
FR2 - off-channel, intermediate WQ	0.17	1.1	no	30	21	20	10.0	9.4	9.3	< L1	< L1	13%	5%	5%	8%	< 8%	<10%	5%	5%	4%	<10%	1	1	1
FR3 - off-channel, intermediate WQ	0.037	0.057	no	58	47	42	11.5	11.0	10.8	< L1	< L1	18%	9%	9%	11%	< 11%	<10%	6%	6%	5%	<10%	1	1	1
FR3b - off-channel, intermediate WQ	0.33	1.2	no	61	53	44	11.6	11.3	10.9	< L1	< L1	18%	9%	9%	11%	< 11%	<10%	6%	6%	5%	<10%	1	1	1
FR4 - off-channel, intermediate WQ	1.6	6.4	no	39	26	31	10.6	9.8	10.1	< L1	< L1	15%	6%	6%	9%	< 9%	<10%	5%	5%	5%	<10%	1	1	1
FR1 - off-channel, reference WQ	0.96	0.98	no	0.5	0.5	0.5	4.7	4.7	4.7	< WQG	< WQG	4%	1%	1%	2%	< 2%	< WQG	3%	3%	1%	< WQG	0	0	0
FR2 - off-channel, reference WQ	0.17	1.1	no	0.5	0.5	0.5	4.7	4.7	4.7	< WQG	< WQG	4%	1%	1%	2%	< 2%	< WQG	3%	3%	1%	< WQG	0	0	0
FR3 - off-channel, reference WQ	0.037	0.057	no	0.5	0.5	0.5	4.7	4.7	4.7	< WQG	< WQG	4%	1%	1%	2%	< 2%	< WQG	3%	3%	1%	< WQG	0	0	0
FR3b - off-channel, reference WQ	0.33	1.2	no	0.5	0.5	0.5	4.7	4.7	4.7	< WQG	< WQG	4%	1%	1%	2%	< 2%	< WQG	3%	3%	1%	< WQG	0	0	0
FR4 - off-channel, reference WQ	1.6	6.4	no	0.5	0.5	0.5	4.7	4.7	4.7	< WQG	< WQG	4%	1%	1%	2%	< 2%	< WQG	3%	3%	1%	< WQG	0	0	0
Fording Oxbow (lotic)	3.3	3.3	no	78	52	61	12.2	11.3	11.6	< L1	< L1	20%	11%	11%	12%	< 12%	10-20%	6%	6%	6%	<10%	1	3	1
Overall	128	159	-							-	-			9.5%	10%	< 10%			6%	5%				
Overall 90th Quantile Reproductive Effects														12%					10%					

Assessment of potential effects related to selenium

Management unit 2
Time period 2017 to 2022 - maximum projected monthly average concentrations
Concentration at Order Station 60
EVWQP Benchmarks

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Loss of Majority of Flow	Peak Monthly Avg Selenium Concentration (µg/L)			Invertebrate Endpoints		Fish Endpoints		Bird Endpoints		Integrated Potential Effects		
				January to December	May and June (bird repro)	June to August (bird growth)	Sensitive Species	Community	Reproduction	Juvenile Growth	Reproduction	Juvenile Growth	Invertebrates	Fish	Birds
Fording River															
Upstream of Line Creek (LC_FRDSDC)	37	37	no	71	51	59	< L1	< L1	20%	12%	6%	6%	1	3	1
FR5 - Downstream of Line Creek (LC_LC5)	10	10	no	60	47	48	< L1	< L1	18%	11%	6%	6%	1	3	1
Tributaries															
Grace Creek	2.7	3.2	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Line Creek (LC_LC4)	8.4	8.4	no	73	44	39	< L1	< L1	20%	12%	6%	5%	1	3	1
South Line Creek (LC_SLC)	4.0	5.2	no	1.1	1.1	1.1	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Teepee Creek	1.5	1.5	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Unnamed tributaries	12	12	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Off-channel Habitats															
Fording River upstream of Line Creek - off-channel, mainstem WQ	0.36	1.3	no	71	51	59	< L1	< L1	20%	12%	6%	6%	1	3	1
Fording River downstream of Line Creek - off-channel, mainstem WQ	0	0													
Fording River upstream of Line Creek - off-channel, intermediate WQ	0.36	1.3	no	36	25	30	< L1	< L1	14%	9%	5%	5%	1	3	1
Fording River downstream of Line Creek - off-channel, intermediate WQ	0	0													
Fording River upstream of Line Creek - off-channel, reference WQ	0.36	1.3	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Fording River downstream of Line Creek - off-channel, reference WQ	0	0													
Overall	78	82	-	-			-	-	15%	9%	5%	4%			
Overall 90th Quantile Reproductive Effects									20%		10%				

Assessment of potential effects related to selenium

Management unit 3
Time period 2017 to 2022 - maximum projected monthly average concentrations
Concentration at Order Station 5.1
EVWQP Benchmarks

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Loss of Majority of Flow	Peak Monthly Avg Selenium Concentration (µg/L)			Invertebrate Endpoints		Fish Endpoints		Bird Endpoints		Integrated Potential Effects		
				January to December	May and June (bird repro)	June to August (bird growth)	Sensitive Species	Community	Reproduction	Juvenile Growth	Reproduction	Juvenile Growth	Invertebrates	Fish	Birds
Elk River															
Upstream of GHO	150	150	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
ER1 - Downstream of GHO (ER_ER1)	57	57	no	5.1	1.9	1.9	< L1	< L1	4%	4%	3%	2%	1	1	1
Tributaries															
Aldridge Creek	3.7	8.6	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Bingay Creek	7.6	8.2	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Bleasdell Creek	1.9	4.3	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Boivin Creek	12	12	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Brûlé Creek	19	19	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Cadorna Creek	11	11	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Crossing Creek	0.033	2.4	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Forsyth Creek	12	14	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Gardner Creek	0.15	1.6	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Hornickel Creek	1.0	1.3	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Leask Creek (GH_LC1)	0	0	no												
Lowe Creek	2.1	2.6	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Mickelson Creek (GH_MC1)	0	0.83	no	152	145	145	L1-L2	< L1	-	-	9%	9%	2	-	1
Osborne Creek	1.0	1.1	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Quarrie Creek	0.73	5.7	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Thompson Creek (GH_TC1)	1.3	1.3	no	215	138	168	L1-L2	< L1	32%	18%	8%	9%	2	4	1
Tobermory Creek	0	2.0	no	0.5	0.5	0.5	< WQG	< WQG	-	-	3%	1%	0	-	0
Weary Creek	0.7	1.2	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Weigert Creek	10.0	10.0	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Wolfram Creek (GH_WC1)	0	0	no												
Other named tribs	0.82	3.1	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Unnamed tribs	35	35	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Off-channel Habitats															
Elk River upstream of GHO - off-channel, mainstem WQ	0	0													
Elk River downstream of GHO - off-channel, mainstem WQ	0.77	2.9	no	5.1	1.9	1.9	< L1	< L1	4%	4%	3%	2%	1	1	1
Elk River upstream of GHO - off-channel, intermediate WQ	0	0													
Elk River downstream of GHO - off-channel, intermediate WQ	0.77	2.9	no	2.5	0.94	0.97	< L1	< L1	4%	3%	3%	1%	1	1	1
Elk River upstream of GHO - off-channel, reference WQ	0	0													
Elk River downstream of GHO - off-channel, reference WQ	0.77	2.9	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Overall	329	361	-	-			-	-	4%	2%	3%	1%			
Overall 90th Quantile Reproductive Effects									7%		7%				

Assessment of potential effects related to selenium

Management unit 4
Time period 2017 to 2022 - maximum projected monthly average concentrations
Concentration at Order Station 26
EVWQP Benchmarks

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Loss of Majority of Flow	Peak Monthly Avg Selenium Concentration (µg/L)			Invertebrate Endpoints		Fish Endpoints		Bird Endpoints		Integrated Potential Effects		
				January to December	May and June (bird repro)	June to August (bird growth)	Sensitive Species	Community	Reproduction	Juvenile Growth	Reproduction	Juvenile Growth	Invertebrates	Fish	Birds
Elk River															
ER2 - Downstream of the Fording River (EV_ER4)	41	41	no	26	17	14	< L1	< L1	12%	8%	5%	3%	1	3	1
Michel Creek															
MC5 - Downstream of CMO (CM_MC2)	5.4	5.4	no	9.7	7.2	9.7	< L1	< L1	7%	5%	4%	3%	1	1	1
MC4 - Downstream of CMO PII	24	24	no	2.2	1.7	2.2	< L1	< L1	4%	3%	3%	2%	1	1	1
MC3 - Upstream of EVO (EV_MC3)	19	19	no	2.4	1.9	2.4	< L1	< L1	4%	3%	3%	2%	1	1	1
MC1 - Mouth (EV_MC1)	28	28	no	31	9.6	30	< L1	< L1	13%	9%	4%	5%	1	3	1
Tributaries															
Alexander Creek	39	41	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Bodie Creek (EV_BC1)	0	0.52	no	1347	365	311	> L2	< L1	-	-	11%	12%	3	-	3
Bray Creek	0.14	1.3	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Carbon Creek	1.6	2.5	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Cummings Creek	18	18	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Dalzell Creek	1.0	1.0	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Erickson Creek (EV_EC1)	0.77	3.7	no	193	183	193	L1-L2	< L1	31%	18%	9%	10%	2	4	3
EVO Dry Creek (EV_DC1)	0	1.9	no	165	111	145	L1-L2	< L1	-	-	8%	9%	2	-	1
Fir Creek	0.92	1.1	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Gate Creek (EV_GC1)	0	0	yes												
Grave Creek - Reference reach	0	3.7	no	0.5	0.5	0.5	< WQG	< WQG	-	-	3%	1%	0	-	0
Grave Creek - Mine influenced reach (GV2)	1.5	5.1	no	30	26	23	< L1	< L1	13%	8%	5%	4%	1	3	1
Harmer Creek - Reference reach	0	1.1	no	0.5	0.5	0.5	< WQG	< WQG	-	-	3%	1%	0	-	0
Harmer Creek -Mine influenced reach (EV_HC1)	0	6.6	no	48	43	38	< L1	< L1	-	-	6%	5%	1	-	1
Leach Creek	21	22	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Littlemoor Creek	1.0	1.1	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Marten Creek	2.4	3.7	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Nordstrum Creek	2.9	3.1	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Saw Mill Creek	0.6	0.6	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Six Mile Creek (EV_SM1)	0.7	0.7	no	3.9	3.9	3.9	< L1	< L1	5%	4%	4%	2%	1	1	1
Snowslide Creek	0.45	0.45	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Telford Creek	0.57	2.0	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Wheeler Creek	5.1	6.7	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Other named tributaries	2.1	6.9	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Unnamed tributaries	23	23	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Off-channel Habitats															
Elk River downstream of the Fording River - off-channel, mainstem WQ	1.5	4.7	no	26	17	14	< L1	< L1	12%	8%	5%	3%	1	3	1
Elk River downstream of the Fording River - off-channel, intermediate WQ	1.5	4.7	no	13	8.7	6.8	< L1	< L1	8%	6%	4%	3%	1	1	1
Elk River downstream of the Fording River - off-channel, reference WQ	1.5	4.7	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Overall	245	290	-	-			-	-	7%	4%	4%	2%			
Overall 90th Quantile Reproductive Effects									10%		8%				

Assessment of potential effects related to selenium

Management unit 5
Time period 2017 to 2022 - maximum projected monthly average concentrations
Concentration at Order Station 17
EVWQP Benchmarks

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Loss of Majority of Flow	Peak Monthly Avg Selenium Concentration (µg/L)			Invertebrate Endpoints		Fish Endpoints		Bird Endpoints		Integrated Potential Effects		
				January to December	May and June (bird repro)	June to August (bird growth)	Sensitive Species	Community	Reproduction	Juvenile Growth	Reproduction	Juvenile Growth	Invertebrates	Fish	Birds
Elk River															
Between Michel Creek and ER3 (EV_ER2)	22	22	no	21	16	12	< L1	< L1	11%	7%	4%	3%	1	3	1
ER3 to Elko (EV_ER1)	115	115	no	17	13	14	< L1	< L1	9%	7%	4%	3%	1	1	1
ER4 - Elko to Mouth (RG_ELKORES)	37	37	no	11	8.8	10	< L1	< L1	7%	6%	4%	3%	1	1	1
Tributaries															
Named tributaries	205	245	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Unnamed tributaries	33	33	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Off-channel Habitats															
Elk River between Michel Creek and ER3 - off-channel, mainstem WQ	0.32	3.5	no	21	16	12	< L1	< L1	11%	7%	4%	3%	1	3	1
Elk River between ER3 and Elko - off-channel, mainstem WQ	8.4	20	no	17	13	14	< L1	< L1	9%	7%	4%	3%	1	1	1
Elk River downstream of Elko - off-channel, mainstem WQ	0.18	0.18	no	11	8.8	10	< L1	< L1	7%	6%	4%	3%	1	1	1
Elk River between Michel Creek and ER3 - off-channel, intermediate WQ	0.32	3.5	no	11	8.0	6.1	< L1	< L1	7%	6%	4%	2%	1	1	1
Elk River between ER3 and Elko - off-channel, intermediate WQ	8.4	20	no	8.4	6.4	6.8	< L1	< L1	6%	5%	4%	3%	1	1	1
Elk River downstream of Elko - off-channel, intermediate WQ	0.18	0.18	no	5.7	4.4	5.1	< L1	< L1	5%	4%	4%	2%	1	1	1
Elk River between Michel Creek and ER3 - off-channel, reference WQ	0.32	3.5	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Elk River between ER3 and Elko - off-channel, reference WQ	8.4	20	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Elk River downstream of Elko - off-channel, reference WQ	0.18	0.18	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Overall	439	522	-	-			-	-	6%	4%	3%	2%			
Overall 90th Quantile Reproductive Effects									9%		7%				

Assessment of potential effects related to selenium

Management unit 6
Time period 2017 to 2022 - maximum projected monthly average concentrations under current conditions
Concentration at Order Station 2.7
EVWQP Benchmarks

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Loss of Majority of Flow	Peak Monthly Avg Selenium Concentration (µg/L)			Invertebrate Endpoints		Fish Endpoints		Bird Endpoints		Integrated Potential Effects		
				January to December	May and June (bird repro)	June to August (bird growth)	Sensitive Species	Community	Reproduction	Juvenile Growth	Reproduction	Juvenile Growth	Invertebrates	Fish	Birds
Lotic Bioaccumulation Model															
Lake Koocanusa															
Koocanusa Reservoir (RG_DSELK_Inflow)	22	22	no	2.6	1.8	1.3	< L1	< L1	4%	3%	3%	1%	1	1	1
Overall															
Overall 90th Quantile Reproductive Effects									7%		7%				
Lentic Bioaccumulation Model															
Lake Koocanusa															
Koocanusa Reservoir (RG_DSELK_Inflow)	22	22	no	2.7	1.8	1.3	< L1	< L1	11%	9%	3%	3%	1	3	1

Assessment of potential effects related to selenium

Management unit 1
Time period 2023 to 2037 - maximum projected monthly average concentrations
Concentration at Order Station 57
EVWQP Benchmarks

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Loss of Majority of Flow	Peak Monthly Avg Selenium Concentration (µg/L)			Invertebrate Endpoints		Fish Endpoints		Bird Endpoints		Integrated Potential Effects		
				January to December	May and June (bird repro)	June to August (bird growth)	Sensitive Species	Community	Reproduction	Juvenile Growth	Reproduction	Juvenile Growth	Invertebrates	Fish	Birds
Fording River															
FRus - Upstream of FRO (FR_UFR1)	5.9	5.9	no	1.1	1.1	1.1	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
FR1 - Downstream of Henretta Creek (FR_FR1)	10	10	no	31	16	19	< L1	< L1	5%	< 8%	4%	4%	1	1	1
FR2 - Downstream of Clode Creek and upstream of Kilmarnock Creek (F	4.4	4.4	no	55	34	37	< L1	< L1	8%	< 11%	6%	5%	1	1	1
FR3 - Between Swift and Cataract creeks (FR_FR4)	9.8	9.8	no	58	48	49	< L1	< L1	9%	< 11%	6%	6%	1	1	1
FR3b - Downstream of Porter Creek (GH_PC2)	47	47	no	69	62	59	< L1	< L1	10%	< 12%	7%	6%	1	1	1
FR4 - Downstream of Greenhills Creek (GH_FR1)	9.1	9.1	no	54	31	45	< L1	< L1	8%	< 11%	5%	5%	1	1	1
Tributaries															
Henretta Creek upstream of FRO	1.8	1.9	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
Henretta Creek downstream of FRO (FR_HC1)	2.7	2.7	no	59	25	22	< L1	< L1	9%	< 11%	5%	4%	1	1	1
Clode Creek (FR_CC1)	0.027	0.027	no	440	408	384	L1-L2	< L1	33%	< 24%	11%	13%	2	4	3
Lake Mountain Creek (FR_LMP1)	0	0	yes												
Kilmarnock Creek (FR_KC1)	0	1.3	no	265	208	155	L1-L2	< L1	-	-	9%	9%	2	-	1
Swift Creek (GH_SC1)	0.0072	0.31	no	1620	1209	1395	> L2	< L1	62%	< 38%	15%	22%	3	4	4
Cataract Creek (GH_CC1)	0	0	yes												
Porter Creek (GH_PC1)	0.28	0.28	no	139	139	124	L1-L2	< L1	16%	< 15%	8%	8%	2	3	1
LCO Dry Creek (LC_DC1)	8.4	8.4	no	455	101	193	L1-L2	< L1	34%	< 24%	8%	10%	2	4	3
Greenhills Creek (GH_GC1)	2.4	2.4	no	270	141	165	L1-L2	< L1	25%	< 20%	8%	9%	2	4	1
Chauncey Creek	0.4	8.3	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
Ewin Creek	3.9	5.6	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
Ewin Side Draw	2.9	3.0	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
McQuarrie Creek	0.69	0.75	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
Moore Creek	0	0.17	no	0.5	0.5	0.5	< WQG	< WQG	-	-	3%	1%	0	-	0
Todhunter Creek	2.0	2.0	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
Other reference tributaries	3.8	3.8	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
Off-channel Habitats															
FRus - off-channel	0	0.01	no	1.1	1.1	1.1	< WQG	< WQG	-	-	3%	1%	0	-	0
FR1 - off-channel, mainstem WQ	0.96	0.98	no	31	16	19	< L1	< L1	5%	< 8%	4%	4%	1	1	1
FR2 - off-channel, mainstem WQ	0.17	1.1	no	55	34	37	< L1	< L1	8%	< 11%	6%	5%	1	1	1
FR3 - off-channel, mainstem WQ	0.037	0.057	no	58	48	49	< L1	< L1	9%	< 11%	6%	6%	1	1	1
FR3b - off-channel, mainstem WQ	0.33	1.2	no	69	62	59	< L1	< L1	10%	< 12%	7%	6%	1	1	1
FR4 - off-channel, mainstem WQ	1.6	6.4	no	54	31	45	< L1	< L1	8%	< 11%	5%	5%	1	1	1
FR1 - off-channel, intermediate WQ	0.96	0.98	no	15	8.0	9.7	< L1	< L1	3%	< 6%	4%	3%	1	1	1
FR2 - off-channel, intermediate WQ	0.17	1.1	no	28	17	18	< L1	< L1	5%	< 8%	5%	4%	1	1	1
FR3 - off-channel, intermediate WQ	0.037	0.057	no	29	24	24	< L1	< L1	5%	< 8%	5%	4%	1	1	1
FR3b - off-channel, intermediate WQ	0.33	1.2	no	35	31	29	< L1	< L1	6%	< 9%	5%	5%	1	1	1
FR4 - off-channel, intermediate WQ	1.6	6.4	no	27	16	23	< L1	< L1	5%	< 8%	4%	4%	1	1	1
FR1 - off-channel, reference WQ	0.96	0.98	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
FR2 - off-channel, reference WQ	0.17	1.1	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
FR3 - off-channel, reference WQ	0.037	0.057	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
FR3b - off-channel, reference WQ	0.33	1.2	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
FR4 - off-channel, reference WQ	1.6	6.4	no	0.5	0.5	0.5	< WQG	< WQG	1%	< 2%	3%	1%	0	0	0
Fording Oxbow (lotic)	3.3	3.3	no	54	31	45	< L1	< L1	8%	< 11%	5%	5%	1	1	1
Overall	128	159	-				-	-	9%	< 10%	5%	5%			
Overall 90th Quantile Reproductive Effects									12%		10%				

Assessment of potential effects related to selenium

Management unit 2
Time period 2023 to 2037 - maximum projected monthly average concentrations
Concentration at Order Station 42
EVWQP Benchmarks

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Loss of Majority of Flow	Peak Monthly Avg Selenium Concentration (µg/L)			Invertebrate Endpoints		Fish Endpoints		Bird Endpoints		Integrated Potential Effects		
				January to December	May and June (bird repro)	June to August (bird growth)	Sensitive Species	Community	Reproduction	Juvenile Growth	Reproduction	Juvenile Growth	Invertebrates	Fish	Birds
Fording River															
Upstream of Line Creek (LC_FRDSDC)	37	37	no	44	30	42	< L1	< L1	15%	10%	5%	5%	1	3	1
FR5 - Downstream of Line Creek (LC_LC5)	10	10	no	42	32	37	< L1	< L1	15%	10%	5%	5%	1	3	1
Tributaries															
Grace Creek	2.7	3.2	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Line Creek (LC_LC4)	8.4	8.4	no	60	47	39	< L1	< L1	18%	11%	6%	5%	1	3	1
South Line Creek (LC_SLC)	4.0	5.2	no	1.1	1.1	1.1	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Teepee Creek	1.5	1.5	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Unnamed tributaries	12	12	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Off-channel Habitats															
Fording River upstream of Line Creek - off-channel, mainstem WQ	0.36	1.3	no	44	30	42	< L1	< L1	15%	10%	5%	5%	1	3	1
Fording River downstream of Line Creek - off-channel, mainstem WQ	0	0													
Fording River upstream of Line Creek - off-channel, intermediate WQ	0.36	1.3	no	22	15	21	< L1	< L1	11%	7%	4%	4%	1	3	1
Fording River downstream of Line Creek - off-channel, intermediate WQ	0	0													
Fording River upstream of Line Creek - off-channel, reference WQ	0.36	1.3	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Fording River downstream of Line Creek - off-channel, reference WQ	0	0													
Overall	78	82	-	-			-	-	13%	8%	5%	4%			
Overall 90th Quantile Reproductive Effects									17%		9%				

Assessment of potential effects related to selenium

Management unit 3
Time period 2023 to 2037 - maximum projected monthly average concentrations
Concentration at Order Station 8.4
EVWQP Benchmarks

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Loss of Majority of Flow	Peak Monthly Avg Selenium Concentration (µg/L)			Invertebrate Endpoints		Fish Endpoints		Bird Endpoints		Integrated Potential Effects		
				January to December	May and June (bird repro)	June to August (bird growth)	Sensitive Species	Community	Reproduction	Juvenile Growth	Reproduction	Juvenile Growth	Invertebrates	Fish	Birds
Elk River															
Upstream of GHO	150	150	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
ER1 - Downstream of GHO (ER_ER1)	57	57	no	8.4	2.6	3.0	< L1	< L1	6%	5%	3%	2%	1	1	1
Tributaries															
Aldridge Creek	3.7	8.6	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Bingay Creek	7.6	8.2	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Bleasdell Creek	1.9	4.3	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Boivin Creek	12	12	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Brûlé Creek	19	19	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Cadorna Creek	11	11	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Crossing Creek	0.033	2.4	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Forsyth Creek	12	14	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Gardner Creek	0.15	1.6	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Hornickel Creek	1.0	1.3	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Leask Creek (GH_LC1)	0	0	no												
Lowe Creek	2.1	2.6	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Mickelson Creek (GH_MC1)	0	0.83	no	500	390	439	L1-L2	< L1	-	-	11%	14%	2	-	3
Osborne Creek	1.0	1.1	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Quarrie Creek	0.73	5.7	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Thompson Creek (GH_TC1)	1.3	1.3	no	216	141	172	L1-L2	< L1	32%	18%	8%	10%	2	4	1
Tobermory Creek	0	2.0	no	0.5	0.5	0.5	< WQG	< WQG	-	-	3%	1%	0	-	0
Weary Creek	0.7	1.2	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Weigert Creek	10.0	10.0	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Wolfram Creek (GH_WC1)	0	0	no												
Other named tribs	0.82	3.1	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Unnamed tribs	35	35	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Off-channel Habitats															
Elk River upstream of GHO - off-channel, mainstem WQ	0	0													
Elk River downstream of GHO - off-channel, mainstem WQ	0.77	2.9	no	8.4	2.6	3.0	< L1	< L1	6%	5%	3%	2%	1	1	1
Elk River upstream of GHO - off-channel, intermediate WQ	0	0													
Elk River downstream of GHO - off-channel, intermediate WQ	0.77	2.9	no	4.2	1.3	1.5	< L1	< L1	5%	4%	3%	1%	1	1	1
Elk River upstream of GHO - off-channel, reference WQ	0	0													
Elk River downstream of GHO - off-channel, reference WQ	0.77	2.9	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Overall	329	361	-	-			-	-	5%	2%	3%	1%			
Overall 90th Quantile Reproductive Effects									7%		7%				

Assessment of potential effects related to selenium

Management unit 4
Time period 2023 to 2037 - maximum projected monthly average concentrations
Concentration at Order Station 19
EVWQP Benchmarks

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Loss of Majority of Flow	Peak Monthly Avg Selenium Concentration (µg/L)			Invertebrate Endpoints		Fish Endpoints		Bird Endpoints		Integrated Potential Effects		
				January to December	May and June (bird repro)	June to August (bird growth)	Sensitive Species	Community	Reproduction	Juvenile Growth	Reproduction	Juvenile Growth	Invertebrates	Fish	Birds
Elk River															
ER2 - Downstream of the Fording River (EV_ER4)	41	41	no	19	12	11	< L1	< L1	10%	7%	4%	3%	1	1	1
Michel Creek															
MC5 - Downstream of CMO (CM_MC2)	5.4	5.4	no	9.7	7.3	9.7	< L1	< L1	7%	5%	4%	3%	1	1	1
MC4 - Downstream of CMO PII	24	24	no	2.2	1.7	2.2	< L1	< L1	4%	3%	3%	2%	1	1	1
MC3 - Upstream of EVO (EV_MC3)	19	19	no	2.4	1.9	2.4	< L1	< L1	4%	3%	3%	2%	1	1	1
MC1 - Mouth (EV_MC1)	28	28	no	20	5.8	20	< L1	< L1	10%	7%	4%	4%	1	3	1
Tributaries															
Alexander Creek	39	41	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Bodie Creek (EV_BC1)	0	0.52	no	558	412	457	L1-L2	< L1	-	-	11%	14%	2	-	3
Bray Creek	0.14	1.3	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Carbon Creek	1.6	2.5	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Cummings Creek	18	18	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Dalzell Creek	1.0	1.0	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Erickson Creek (EV_EC1)	0.77	3.7	no	306	306	306	L1-L2	< L1	37%	21%	11%	12%	2	4	3
EVO Dry Creek (EV_DC1)	0	1.9	no	287	208	253	L1-L2	< L1	-	-	9%	11%	2	-	3
Fir Creek	0.92	1.1	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Gate Creek (EV_GC1)	0	0	yes												
Grave Creek - Reference reach	0	3.7	no	0.5	0.5	0.5	< WQG	< WQG	-	-	3%	1%	0	-	0
Grave Creek - Mine influenced reach (GV2)	1.5	5.1	no	46	41	37	< L1	< L1	16%	10%	6%	5%	1	3	1
Harmer Creek - Reference reach	0	1.1	no	0.5	0.5	0.5	< WQG	< WQG	-	-	3%	1%	0	-	0
Harmer Creek -Mine influenced reach (EV_HC1)	0	6.6	no	75	70	60	< L1	< L1	-	-	7%	6%	1	-	1
Leach Creek	21	22	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Littlemoor Creek	1.0	1.1	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Marten Creek	2.4	3.7	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Nordstrum Creek	2.9	3.1	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Saw Mill Creek	0.6	0.6	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Six Mile Creek (EV_SM1)	0.7	0.7	no	3.7	3.7	3.7	< L1	< L1	5%	4%	4%	2%	1	1	1
Snowslide Creek	0.45	0.45	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Telford Creek	0.57	2.0	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Wheeler Creek	5.1	6.7	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Other named tributaries	2.1	6.9	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Unnamed tributaries	23	23	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Off-channel Habitats															
Elk River downstream of the Fording River - off-channel, mainstem WQ	1.5	4.7	no	19	12	11	< L1	< L1	10%	7%	4%	3%	1	1	1
Elk River downstream of the Fording River - off-channel, intermediate WQ	1.5	4.7	no	9.5	5.9	5.6	< L1	< L1	7%	5%	4%	2%	1	1	1
Elk River downstream of the Fording River - off-channel, reference WQ	1.5	4.7	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Overall	245	290	-	-			-	-	6%	4%	4%	2%			
Overall 90th Quantile Reproductive Effects									9%		8%				

Assessment of potential effects related to selenium

Management unit 5
Time period 2023 to 2037 - maximum projected monthly average concentrations
Concentration at Order Station 12
EVWQP Benchmarks

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Loss of Majority of Flow	Peak Monthly Avg Selenium Concentration (µg/L)			Invertebrate Endpoints		Fish Endpoints		Bird Endpoints		Integrated Potential Effects		
				January to December	May and June (bird repro)	June to August (bird growth)	Sensitive Species	Community	Reproduction	Juvenile Growth	Reproduction	Juvenile Growth	Invertebrates	Fish	Birds
Elk River															
Between Michel Creek and ER3 (EV_ER2)	22	22	no	17	12	10	< L1	< L1	9%	7%	4%	3%	1	1	1
ER3 to Elko (EV_ER1)	115	115	no	12	8.9	11	< L1	< L1	8%	6%	4%	3%	1	1	1
ER4 - Elko to Mouth (RG_ELKORES)	37	37	no	8.7	7.0	8.5	< L1	< L1	6%	5%	4%	3%	1	1	1
Tributaries															
Named tributaries	205	245	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Unnamed tributaries	33	33	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Off-channel Habitats															
Elk River between Michel Creek and ER3 - off-channel, mainstem WQ	0.32	3.5	no	17	12	10	< L1	< L1	9%	7%	4%	3%	1	1	1
Elk River between ER3 and Elko - off-channel, mainstem WQ	8.4	20	no	12	8.9	11	< L1	< L1	8%	6%	4%	3%	1	1	1
Elk River downstream of Elko - off-channel, mainstem WQ	0.18	0.18	no	8.7	7.0	8.5	< L1	< L1	6%	5%	4%	3%	1	1	1
Elk River between Michel Creek and ER3 - off-channel, intermediate WQ	0.32	3.5	no	8.3	5.8	5.2	< L1	< L1	6%	5%	4%	2%	1	1	1
Elk River between ER3 and Elko - off-channel, intermediate WQ	8.4	20	no	6.0	4.4	5.6	< L1	< L1	5%	4%	4%	2%	1	1	1
Elk River downstream of Elko - off-channel, intermediate WQ	0.18	0.18	no	4.3	3.5	4.2	< L1	< L1	5%	4%	4%	2%	1	1	1
Elk River between Michel Creek and ER3 - off-channel, reference WQ	0.32	3.5	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Elk River between ER3 and Elko - off-channel, reference WQ	8.4	20	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Elk River downstream of Elko - off-channel, reference WQ	0.18	0.18	no	0.5	0.5	0.5	< WQG	< WQG	4%	2%	3%	1%	0	0	0
Overall	439	522	-	-			-	-	6%	3%	3%	2%			
Overall 90th Quantile Reproductive Effects									9%		7%				

Assessment of potential effects related to selenium

Management unit 6
Time period 2016 - maximum projected monthly average concentrations under current conditions
Concentration at Order Station 1.9
EVWQP Benchmarks

Habitat Sub-unit	Fish Accessible Habitat (ha)	Total Habitat (ha)	Loss of Majority of Flow	Peak Monthly Avg Selenium Concentration (µg/L)			Invertebrate Endpoints		Fish Endpoints		Bird Endpoints		Integrated Potential Effects		
				January to December	May and June (bird repro)	June to August (bird growth)	Sensitive Species	Community	Reproduction	Juvenile Growth	Reproduction	Juvenile Growth	Invertebrates	Fish	Birds
Lotic Bioaccumulation Model															
Lake Koocanusa															
Koocanusa Reservoir (RG_DSELK_Inflow)	22	22	no	1.8	1.4	1.1	< WQG	< WQG	4.45%	3%	3%	1%	0	0	0
Overall	22	22	-	-			-	-	4%	3%	3%	1%			
Overall 90th Quantile Reproductive Effects									7%		7%				
Lentic Bioaccumulation Model															
Lake Koocanusa															
Koocanusa Reservoir (RG_DSELK_Inflow)	22	22	no	1.9	1.5	1.1	< WQG	< WQG	6%	7%	3%	2%	0	0	0

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