Proposed Approach for Coal Mining Effluent Regulations

Discussion Document

January, 2022

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Introduction

The purpose of this document is for Environment and Climate Change Canada (ECCC) to inform interested parties and solicit feedback to inform the proposed *Coal Mining Effluent Regulations* (CMER).

The revised approach in this document has been developed by ECCC and is for the sole purpose of engagement to inform regulatory development.

Part 1 of this document describes an approach for all coal mines, other than current coal mines located in the Elk Valley, British Columbia. Part 2 proposes an alternative approach for current coal mines in the Elk Valley. Part 3 outlines the proposed environmental effects monitoring requirements, and Part 4 outlines other general provisions. Part 5 proposes requirements for public availability of information and regulatory review. Finally, Part 6 outlines next steps.

Interested parties may submit comments in writing by e-mail to ermc-cmrd@ec.gc.ca by **March 1, 2022**.

Background

Canadian coal mines produce effluent containing deleterious substances including selenium, nitrate and suspended solids, that pose a risk to fish and fish habitat. The deposit of coal mining effluent is subject to the general prohibition under the *Fisheries Act*, which prohibits the deposit of deleterious substances in waters frequented by fish, unless authorized by regulation.

ECCC is developing regulations under the *Fisheries Act* to authorize specified deposits of effluent from coal mines that are otherwise subject to the general prohibition. The Regulations would impose conditions related to this authorization that would reduce the risks to the aquatic environment posed by deleterious substances in coal mining effluent.

The proposed Regulations have undergone four rounds of engagement since 2017 with industry, Indigenous groups, Environmental Non-Governmental Organizations (ENGOs), provinces and other interested parties. The documents presented during previous engagement are available on the *Coal Mining Effluent Regulations* website at: https://www.canada.ca/en/environment-climate-change/services/managing-pollution/sources-industry/proposed-coal-mining-effluent-regulations.html**.**

Definitions

The definitions contained herein are for the sole purpose of clarifying terms used throughout this document for discussion.

Coal mine: any work or undertaking, as well as any cleared or disturbed area that is adjacent to such a work or undertaking, that is designed or is used, or has been used, in connection with coal production. It would include any work or undertaking related to the surface or subsurface extraction, coal processing facilities, coal storage facilities, waste storage facilities such as tailings ponds and waste rock piles, effluent management infrastructure such as sedimentation ponds, effluent collection

systems, effluent treatment facilities, water management infrastructure and supporting onsite transportation infrastructure such as roads, conveyor belts and rails.

Coal production: activities relating to the extraction or the processing of coal. Coal production includes blasting, screening and sizing as well as on-site transportation of coal or waste.

Coming into force of the Regulations (CIF): the date that coincides with the publication of the CMER in the *Canada Gazette*, Part 2.

Cross-section: a section perpendicular to the main direction of flow bounded by the free surface and wetted perimeter of a water body.

Effluent:

- all wastewater from a coal mine (other than from a sewage treatment facility);
- all seepage that flows over, through or out of the coal mine;
- all surface runoff that flows over, through or out of the coal mine, other than precipitation or snow melt captured through a work or undertaking designed to prevent it from coming into contact with effluent or other parts of the coal mine; and
- groundwater brought to the surface by a work or undertaking.

Existing mine: for the purpose of the general approach, a coal mine that produced coal anytime between 1 January 2012, and the date that is three years after CIF.

Exposure area: all fish habitat and waters frequented by fish that are exposed to the coal mine's effluent.

Final Discharge Point (FDP): an identifiable discharge point of a mine beyond which the owner or operator of the mine no longer exercises control over the quality of the effluent.

New mine: for the purpose of the general approach, a coal mine that is not an existing mine.

Non-point source effluent or diffuse effluent: effluent that is not collected and deposited through a FDP.

Operator: the person who operates, has control or custody of or is in charge of a coal mine.

Qualified professional: an applied scientist or technologist specializing in an applied science or technology applicable to the duty or function, including, if applicable and without limiting this, engineering, geology or hydrogeology and who is registered with the appropriate professional organization.

Reference area: water frequented by fish that is not exposed to effluent and that has fish habitat that, as far as practicable, is most similar to that of the exposure area.

Reference Method EPA/600/R-95-136: *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms.* First edition, published in 1995 by the United States Environmental Protection Agency. Cincinnati (OH):

Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency. Method incorporated as amended from time to time.

Reference Method EPA/821/R-02/014: *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms.* Third edition. Published in October 2002 by the United States Environmental Protection Agency. Cincinnati (OH): Environmental Monitoring Systems Laboratory. Method incorporated as amended from time to time.

Reference Method EPS 1/RM/10: *Biological Test Method — Reference Method for Determining Acute Lethality Using Threespine Stickleback*. Second edition. Published in December 2017 by the Department of the Environment, as amended from time to time.

Reference Method EPS 1/RM/13: *Biological Test Method — Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout*. Second edition. Published in February 2016 by the Department of the Environment, as amended from time to time.

Reference Method EPS 1/RM/14: *Biological Test Method — Reference Method for Determining Acute Lethality of Effluents to Daphnia Magna*. Second edition. Published in February 2016 by the Department of the Environment, as amended from time to time.

Reference Method EPS 1/RM/21: *Biological Test method — Test of Reproduction and Survival Using the Cladoceran* Ceriodaphnia dubia. Second edition. Published in February 2007 by the Department of Environment, as amended from time to time.

Reference Method EPS 1/RM/22: *Biological Test Method — Test of Larval Growth and Survival Using Fathead Minnows.* Second edition. Published in February 2011 by the Department of Environment, as amended from time to time.

Reference Method EPS 1/RM/25: *Biological Test Method — Growth Inhibition Test using a Freshwater Alga*. Second edition. Published in March 2007 by the Department of Environment, as amended from time to time.

Reference Method EPS 1/RM/27: *Biological Test method — Fertilization Assay using Echinoids (Sea Urchins and Sand Dollars).* Second edition. Published in February 2011 by the Department of Environment, as amended from time to time.

Reference Method EPS 1/RM/28: *Biological Test Method — Toxicity Tests Using Early Life Stages of Salmonid Fish (Rainbow Trout)*. Second edition. Published in July 1998 by the Department of Environment, as amended from time to time.

Reference Method EPS 1/RM/37: *Biological Test Method —Test for Measuring the Inhibition of Growth Using the Freshwater Macrophyte,* Lemna minor. Second edition. Published in January 2007 by the Department of Environment, as amended from time to time.

Reference Method MA. 500 – P.sub 1: *Détermination de la toxicité : inhibition de la croissance chez l'algue* Pseudokirchneriella subcapitata MA. 500 – P.sub. 1.0, Rév. 3. Centre d'expertise en analyse environnementale du Québec, Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques du Québec, 2015, 21 p. Method incorporated as amended from time to time.

Reference Method STB 1/RM/60: *Biological Test Method — Reference Method for Determining Acute Lethality Using Acartia tonsa*, published in June 2019 by the Department of the Environment, as amended from time to time.

Specified waterbody: for the purpose of the alternative approach, specified waterbodies include Fording River, Elk River, Michel Creek and Harmer Creek.

Acronyms

Acronym	Full title
BIC	Benthic Invertebrate Community
CES	Critical Effect Size
CIF	Coming into Force of the Regulations
CMER	*Coal Mining Effluent Regulations*
ECCC	Environment and Climate Change Canada
ECP	Environmental Compliance Point
EC_{25}	25% effect concentration
EEM	Environmental Effects Monitoring
FDP	Final Discharge Point
IC_{25}	25% inhibition concentration
MDL	Method Detection Limit
MDMER	*Metal and Diamond Mining Effluent Regulations*
QA/QC	Quality Assurance and Quality Control
SD	Standard Deviation
SDRIDF	Short-duration Rainfall Intensity-Duration-Frequency
SLT	Sublethal Toxicity
TSS	Total Suspended Solids
WQM	Water Quality Monitoring

Deleterious Substances

ECCC proposes to prescribe the following deleterious substances in the Regulations: selenium, nitrate, and suspended solids.

Part 1 General Approach

1.1 Application

The general approach would apply to coal mines that deposit effluent in a fish frequented water body, or in a place that may enter a fish frequented water on or after the date of the Coming into Force of the Regulations (CIF). This would include mines where the effluent is deposited to land, but may enter a water body after being deposited.

Current coal mines in the Elk Valley, British Columbia, namely Fording River Operations, Greenhills Operations, Elkview Operations, Line Creek Operations, and Coal Mountain Operations would be excluded from the general approach. These mines would be subject to the alternative approach presented in Part 2 of this document.

Additionally, it is proposed to exclude the following from the general approach:

- A coal mine that ceased coal production before January 1, 2012, unless coal production restarts after that date.
- Mines or areas of mines that are recognized as closed as per the proposed provisions described in section 1.7.
- Exploration projects where coal is produced solely for the purpose of evaluating the quantity or quality of the coal resources available or the economic or technical feasibility of a potential coal mine. To be considered an exploration project, the amount of coal extracted cannot exceed 100,000 tonnes and it cannot be used for any commercial purpose.

1.2 Effluent Quality Standards

It is proposed that the authorization with respect to effluent would apply three years after CIF. At that time, all effluent originating from a mine would be required to be collected and deposited through a final discharge point (FDP). The limits for deleterious substances and requirements relating to pH and non-acute lethality would start applying to effluent that is deposited from all FDPs at that time. ECCC would not impose any requirements on the number of FDPs at a mine. Therefore, a mine may have multiple FDPs.

1.2.1 Total Suspended Solids (TSS)

The following effluent limits are proposed for TSS. Once these limits would apply they would be required to be met at all times other than during exceptional rainfall events as described in section 1.2.2.

Table 1-1: Proposed Total Suspended Solids Limits

		Existing Mines		***New Mines***	
Deleterious Substance	**Unit**	**Maximum Authorized Monthly Mean Concentration**	**Maximum Authorized Concentration in a Grab Sample**	**Maximum Authorized Monthly Mean Concentration**	**Maximum Authorized Concentration in a Grab Sample**
Total Suspended Solids	mg/L	50	100	35	70

Changes since 2020 proposal and rationale:

Proposed existing mine limits are less stringent than previously proposed limits of 35 mg/L (monthly) and 70 mg/L (maximum never to exceed).

Comments received from industry and provinces indicated that some existing mines face constraints with respect to settling pond design and capacity and would be challenged to meet the previously proposed levels, especially during storm events. In these cases, additional chemical flocculants and coagulants would be needed to manage TSS, which could have toxic effects to fish in the receiving waters. The proposed monthly mean limit of 50 mg/L aligns with existing requirements in Alberta and Saskatchewan.

New mines do not face the same constraints as existing mines, and can be designed from the start to meet more stringent limits. The new mine limits align with the U.S. national standards.

1.2.2 Exception - Exceptional Rainfall Events

It is proposed that grab sample limits for TSS would not apply during and within 48 hours after an exceptional rainfall event. TSS concentration measurements taken during such a period would not be included in the monthly mean calculations.

For an existing mine, an exceptional rainfall event would correspond to a rainfall event that, in a 24-hour period, produces an amount of rain that has a 10% chance of occurring at a given location in any year (10-year, 24-hour return period rainfall amount).

For a new mine, it is proposed to have a stricter application where an exceptional rainfall event would correspond to a rainfall event that, in a 24-hour period, produces an amount of rain that has a 4% chance of occurring at a given location in any year (25-year, 24-hour return period rainfall amount).

The start of the exceptional rainfall event would be the hour at which the amount of rainfall over the preceding 24 hours is equal to or greater than that corresponding to a 10-year or 25-year, 24-hour return period rainfall amount, as applicable. The event would end at the end of the hour after which the amount of rainfall over the preceding 24 hours is less than the 10-year or 25-year, 24-hour return period rainfall amount, as applicable.

To determine if an event is exceptional, the amount of rainfall would need to be measured continuously using one or more on-site precipitation gauges and compared to a reference value for an amount of rainfall that corresponds to an exceptional rainfall event at the mine's location.

The reference value could either be:

- Determined by Meteorological Services of Canada, upon request, for the coal mine location; or
- Taken from the Short-duration Rainfall Intensity-Duration-Frequency (SDRIDF) data, published by ECCC for the closest weather observation station to the coal mine that is representative of the climate at the coal mine. Depth, Duration and Frequency of Rainfall data could also be used where SDRIDF data is not available at the relevant weather observation station. This data is published on the following website: https://climatedata.ca/explore/variable/?var=idf.

During an exceptional rainfall event, effluent quality standards for selenium and nitrate as well as non-acute lethality and pH requirements would continue to apply. Additional monitoring provisions would apply during and following the TSS exception to ensure that requirements are met. This includes sampling and testing for total selenium, total nitrate, pH and acute lethality within 24 hours of the start of the event. Sampling and testing for TSS between 48 and 72 hours of the end of the event would also be required unless another event occurred within 72 hours of the event in question.

Changes since 2020 proposal and rationale:

- Added an option to allow for an assessment by Meteorological Services of Canada to determine the reference value for the amount of rainfall that corresponds to an exceptional rainfall event at the coal mine location. This would allow for a more site-specific determination.
- Removed the TSS limit of 2000 mg/L during an exceptional rainfall event, given the uncertainty around concentrations during an exceptional event and levels at which an acute impact from TSS would be felt. Instead, additional monitoring requirements, which include acute lethality testing would apply.
- Extended the duration of the exception to 48 hours after the event to better align with provincial requirements.

1.2.3 Total Nitrate

The following effluent limits are proposed for total nitrate.

Table 1-2: Proposed Total Nitrate Limits

		Existing Mines		***New Mines***	
Deleterious Substance	**Unit**	**Maximum Authorized Monthly Mean Concentration**	**Maximum Authorized Concentration in a Grab Sample**	**Maximum Authorized Monthly Mean Concentration**	**Maximum Authorized Concentration in a Grab Sample**
Total Nitrate	mg/L, expressed as nitrogen (N)	10	20	5	10

Changes since 2020 proposal and rationale:

The proposed total nitrate limits are the same as in the 2020 proposal.

The Canadian Water Quality Guidelines for the Protection of Aquatic Life sets a value of 3 mg-N/L for long-term exposure of nitrate in the receiving environment. The proposed end-of-pipe limits are set at levels intended to limit impacts to receiving water quality while considering technical and economic factors.

The major source of nitrate in effluent at coal mines is explosives used in the mining process. The amount of nitrate entering the environment can be limited through explosives selection as well as best handling, management and detonation practices. Where pollution prevention is insufficient, nitrate can be removed from effluent through proven treatment technologies such as ion exchange and biological denitrification.

Technology for nitrate removal applied at mines in Canada is capable of achieving removal rates of 95-99% (see Annex C for further details). The maximum concentration of nitrate recorded at a FDP at mines that would be subject to the general approach is around 175 mg/L. The proposed limits are expected to be achievable with a combination of best practices for pollution prevention and treatment where needed.

Limits for new mines are proposed to be more stringent than those for existing mines as new mines do not have pre-existing nitrate issues and have the advantage of being designed from the start to meet more stringent limits.

1.2.4 Total Selenium

The following effluent limits are proposed for total selenium for new and existing mines.

Table 1-3: Proposed Total Selenium Limits

		New and Existing Mines	
Deleterious Substance	**Unit**	**Maximum Authorized Monthly Mean Concentration**	**Maximum Authorized Concentration in a Grab Sample**
Total Selenium	µg/L	10	20

Changes since 2020 proposal and rationale:

Proposed new mine limits are less stringent than previously proposed limits of 5 µg/L (monthly mean) and 10 µg/L (maximum never to exceed).

Science indicates that low levels of selenium can be harmful to aquatic life and that selenium deposits from all coal mines have the potential to cause harm. The *Canadian Guidelines for the Protection of Aquatic Life* sets a value of 1 µg/L for the long-term exposure of selenium in the receiving environment. The proposed end-of-pipe limits are set at levels intended to limit impacts to receiving water quality while considering technical and economic factors.

Selenium is found naturally in and around coal deposits. When exposed to water and air, selenium leaches out of the waste rock generated by coal mines into the environment. The amount of selenium released is dependent on several factors including the geology of the site, the volume of the waste

rock produced and measures put in place to prevent the oxidization of selenium and the contact of water with leachable forms of selenium.

Several treatment technologies have been proven effective in removing selenium. The main categories of selenium treatment technologies include physical, chemical and biological. Examples of physical treatment include membrane filtration (e.g., reverse osmosis, nanofiltration), and ion exchange treatment. Examples of chemical treatment include co-precipitation, and electrocoagulation. Biological treatment ranges from active to passive, and from tank-based to *in-situ* (e.g. pit lakes and saturated rock fills).

Existing technologies for selenium removal applied at mines in Canada are capable of achieving over 95% removal rate of selenium (see Annex C for further details). Outside of current mines in the Elk Valley, the maximum concentration of selenium recorded at a FDP is around 280 µg/L. The proposed limits of 10 µg/L (monthly mean) and 20 µg/L (maximum, never to exceed) are expected to be achievable with a combination of mitigation measures to prevent the mobilization of selenium and the application of existing proven technologies currently applied in Canada.

Although new mines do not have pre-existing selenium issues and can be designed from the start to achieve low levels of selenium, concerns were raised by industry and provinces over the achievability of previously proposed new mine limits of 5 µg/L (monthly mean). ECCC is proposing to decrease the stringency of the regulatory standard for new mines to 10 µg/L.

It is also proposed to include in the Regulations a requirement to provide a 5-year status report on the selenium requirements proposed in this section, and a requirement for a 10-year review of the Regulations as a whole. The reviews will take into account the results provided by EEM studies and advances in selenium removal technologies. The goal will be to consider the results of those reviews in the context of any future amendments to the Regulations. (See sections 5.2 for further details).

In addition to the proposed Regulations, new coal mines or expansions of existing coal mines that enter the planning process under the *Impact Assessment Act* would continue to be subject to a review that includes an assessment of potential impacts of selenium deposits on the specific receiving environment in question.

1.2.5 Non-Acute Lethality Requirements

It is proposed that acute lethality be determined by conducting an acute lethality test on fish and invertebrate species. Reference methods for Acute Lethality Tests are specified in section 1.3.5.

Acutely lethal would mean that the effluent at 100% concentration kills:

- during a 96-hour period, more than 50% of test fish species subjected to it; or
- during a 48-hour period, more than 50% of the test invertebrates species subjected to it.

Acute lethality tests are conducted on laboratory test organisms. Test organisms would not be taken from the vicinity of a mine to meet this requirement.

1.2.6 pH

The pH of the effluent would be required to be equal to or greater than 6.0 but not greater than 9.5.

1.3 Sampling and Testing Requirements

1.3.1 Total Suspended Solids

It is proposed that, from the time of CIF until one year after CIF, a grab sample would be required to be collected and tested for TSS on a quarterly basis to align with the frequency of EEM effluent characterization requirements described under section 3.4.1.

It is proposed that mines that are low deposit mines as described in section 1.6 could continue to perform quarterly sampling and testing for TSS after the first year. In all other cases, it is proposed that TSS sampling and testing be required once per week during deposit at all FDPs starting one year after CIF. No sampling and testing would be required at a given FDP during weeks where there is no deposit at that FDP for the entire week. Only samples collected when there is a deposit are to be included in monthly mean calculations as described in section 4.1. Additional details on testing frequencies for mines subject to the general approach can be found in Annex A. There are no reduced frequency provisions for the testing for TSS in effluent.

Changes since 2020 proposal and rationale

In the case of mines that are not low deposit mines, weekly testing for TSS would start one year after CIF rather than 3 years after CIF as previously proposed to enable the assessment of recognized closed area and closed mine criteria proposed in section 1.7, where needed.

1.3.2 Total Nitrate

It is proposed that, from the time of CIF until one year after CIF, a grab sample would be required to be collected and tested for total nitrate on a quarterly basis to align with the frequency of EEM effluent characterization requirements described under section 3.4.1.

It is proposed that mines that have not used explosives in the preceding five years or that are low deposit mines, as described in section 1.6, could continue to perform quarterly sampling and testing for total nitrate after the first year.

In all other cases, it is proposed that sampling and testing for total nitrate in effluent be required once per week during deposit at all FDPs starting one year after CIF. No sampling and testing would be required at a given FDP during weeks where there is no deposit at that FDP for the entire week. Only samples collected when there is a deposit are to be included in monthly mean calculations as described in section 4.1.

It is proposed to allow for the frequency of testing to be reduced to once per calendar quarter at FDPs where monthly mean effluent concentrations were less than 3 mg-N/L for the previous 12 consecutive months. To be on reduced frequency, no explosives could have been used in the preceding 12 months and, for a given FDP, no treatment for the removal of nitrate from the effluent deposited through that FDP could have occurred in the preceding 12 months.

The sampling and testing frequency for total nitrate at a given FDP on reduced frequency would return to weekly in the case where either: the concentration of total nitrate measured in a grab sample collected at that FDP is equal to or greater than 3 mg-N/L, an explosion is carried out at the mine, or treatment for the removal of nitrate from effluent deposited through that FDP is used.

Additional details on testing frequencies for mines subject to the general approach can be found in Annex A.

Changes since the 2020 proposal and rationale:

- Less stringent monitoring requirements for mines that do not use explosives in recognition that these mines pose a lower risk of exceeding nitrate limits. Previously, nitrate monitoring was the same for all mines regardless of explosives usage.
- Less stringent threshold for going on reduced frequency. Previous threshold of 10% of monthly mean, which equates to 1 mg-N/L (existing mines) and 0.5 mg-N/L (new mines) may not be practical to meet.
- Nitrate treatment cannot occur at a given FDP in order to be on reduced frequency. This is to allow for monitoring of any potential malfunctions, start-ups or shutdowns of the treatment system.
- In the case of mines that are not low deposit mines and that have used explosives in the preceding five years, weekly testing for total nitrate would start one year after CIF rather than 3 years after CIF as previously proposed to enable the assessment of recognized closed area and closed mine criteria proposed in section 1.7, where needed.

1.3.3 Total Selenium

It is proposed that, from the time of CIF until one year after CIF, a grab sample would be required to be collected and tested for total selenium on a quarterly basis to align with the frequency of EEM effluent characterization requirements described under section 3.4.1.

It is proposed that low deposit mines, as described in section 1.6, could continue to perform quarterly sampling and testing for total selenium after the first year.

In all other cases, it is proposed that sampling and testing for total selenium in effluent be required once per week during deposit at all FDPs starting one year after CIF. No sampling and testing would be required at a given FDP during weeks where there is no deposit at that FDP for the entire week. Only samples collected when there is a deposit are to be included in monthly mean calculations as described in section 4.1.

It is proposed that the frequency of testing be reduced to once per calendar quarter at FDPs where effluent monthly mean concentrations were less than 3 µg/L for the previous 12 consecutive months. Mines that used treatment for the removal of selenium prior to deposit through a given FDP in the preceding 12 months would not be eligible for reduced frequency at that FDP.

The sampling and testing frequency for total selenium at a given FDP on reduced frequency would return to weekly in the case where either: the concentration of total selenium measured in a grab sample collected at that FDP is equal to or greater than 3 µg/L or treatment for the removal of selenium from effluent deposited through that FDP is used.

Additional details on testing frequencies for mines subject to the general approach can be found in Annex A.

Changes since the 2020 proposal:

- Decreased the stringency of the threshold for having access to reduced frequency as previous threshold of 10% of monthly mean, which equated to 1 µg/L, may not be practical to meet.

- Selenium treatment cannot occur at a given FDP in order to be on reduced frequency. This is to allow for monitoring of any potential malfunctions, start-ups or shutdowns of the treatment system.
- For mines that are not low deposit mines, weekly testing for total selenium would start one year after CIF rather than 3 years after CIF as previously proposed to enable the assessment of recognized closed area and closed mine criteria proposed in section 1.7, where needed.

1.3.4 Selenium Speciation

Selenium toxicity is complex, and influenced by many factors including selenium concentration and speciation. Selenium exists in different states, depending on oxidation and reduction conditions. Selenate and selenite are the major dissolved forms found in water, and are the main species released by industrial discharges. Both selenate and selenite are taken up by primary producers in the food web (e.g., algae), but selenite is taken up more readily. Selenomethionine is an organic selenium species that can have negative impacts, even at low concentrations.

Effluent treatment may be needed to reduce total selenium concentrations. This treatment could unintentionally result in the production of undesirable more bioavailable species. Selenium speciation has started to be integrated into monitoring as part of provincial coal mine permit requirements where there is selenium treatment.

It is proposed to require testing for total dissolved selenium, selenate, selenite and selenomethionine:

- once a month on effluent samples collected from FDPs where the effluent is treated to reduce its concentration of selenium or nitrate; and
- quarterly, at the FDP that deposits from the settling pond with the longest residence time within the coal mine, on the same sample on which effluent characterization described in section 3.4.1 is performed.

Information on speciation would be used to inform bioaccumulation risks. Where EEM studies show an effect from selenium in fish tissues or exceedance of selenium fish health or fish consumption guidelines, selenium speciation measurements could help identify the cause(s) of these effects or exceedances.

1.3.5 Acute Lethality

It is proposed that acute lethality testing requirements start one year after CIF. Testing for acute lethality on both fish and invertebrate species in accordance with specified reference methods would be required at all FDPs.

It is proposed that low deposit mines, described in section 1.6, be required to conduct acute lethality testing on aliquots of a grab sample once per quarter. In all other cases, testing would be required once per month.

In the case of mines that are not low deposit mines, for either species, the frequency of sampling and testing could be reduced to once per calendar quarter at FDPs where effluent was deposited and was not acutely lethal to that species for each of the previous 12 consecutive months until such time as there is an acute lethality failure of that species.

In any case, a failed test would require an immediate effluent characterization described in section 3.4.1 as well as testing for the concentrations of deleterious substances and pH on an aliquot of the

sample that was acutely lethal. The sampling and testing frequency for acute lethality at the FDP where effluent was determined to be acutely lethal would be increased to once every 14 days, with tests at least seven days apart, until three consecutive tests demonstrate that effluent is not acutely lethal. The increased testing would only apply to the species for which the effluent was determined to be acutely lethal. Additional details on general approach testing frequencies can be found in Annex A.

Reference Methods – Fish Species

It is proposed that, unless the salinity value of the effluent is equal to or greater than 10 parts per thousand and the effluent is deposited into marine waters, whether effluent is acutely lethal be determined by conducting an acute lethality test on rainbow trout in accordance with Reference Method EPS 1/RM/13.

Where the salinity of the effluent is equal to or greater than 10 parts per thousand and the effluent is deposited into marine waters, it is proposed that acute lethality be determined by conducting an acute lethality test on threespine stickleback in accordance with Reference Method EPS 1/RM/10.

Reference Methods – Invertebrate Species

It is proposed that, unless the salinity of the effluent is greater than or equal to four parts per thousand and the effluent is deposited into marine waters, acute lethality be determined by conducting an acute lethality test on *Daphnia magna* in accordance with Reference Method EPS 1/RM/14.

Where the salinity of the effluent is greater than or equal to four parts per thousand and the effluent is deposited into marine waters, it is proposed that acute lethality be determined by conducting an acute lethality test on *Acartia tonsa* in accordance with Reference Method STB 1/RM/60.

Changes since 2020 proposal and rationale:

Acute lethality testing would occur at one year after CIF rather than 3 years after CIF as previously proposed to enable the assessment of recognized closed area and closed mine criteria proposed in section 1.7.

1.3.6 pH

It is proposed that the pH of effluent be determined on all samples collected for the determination of any deleterious substance concentration at the time of sample collection.

1.4 Prohibition on Dilution

It is proposed that effluent from a mine may not be diluted, other than with other effluent, before it is deposited. Surface water, including snow melt and runoff, which is not in contact with effluent or parts of the mine other than clean water diversion infrastructure, would not be effluent and could not be mixed with effluent.

Wastewater from a sewage treatment facility would not be considered effluent and could not be mixed with effluent from the mine.

1.5 Volume of Effluent

It is proposed that at the time of CIF, the owner or operator of a mine would be required to record the total weekly volume of effluent deposited from each FDP. The total weekly volume of effluent could either be:

- estimated based on weekly flow rate measurements; or
- by using a monitoring system that provides a continuous measure of the volume of effluent deposited.

The annual average daily volume of effluent deposited from a coal mine would be calculated by adding the total weekly volumes of effluent deposited from each FDP for each week in the calendar year and dividing by the number of days in the calendar year.

It is proposed that the measure of the flow rate or volume of effluent deposited would need to be determined using a monitoring system that is accurate to within 15% of the measured flow rate or volume. The monitoring system would need to be maintained, verified for accuracy, and, if needed, calibrated in accordance with manufacturer's specifications.

1.6 Special Provisions for Low Deposit Mines

Where a coal mine had an annual average daily volume of effluent less than 50 m^3 in the previous calendar year, ECCC proposes to reduce the testing frequency for total selenium, total nitrate, TSS and acute lethality to once per quarter. Monthly mean and grab sample limits would continue to apply (see Section 4.1 for further details on the calculation of the monthly mean).

Where there is a failed acute lethality test for a species from a low deposit mine, an immediate effluent characterization described in section 3.4.1 as well as testing for the concentrations of deleterious substances and pH on an aliquot of the sample that was acutely lethal would still be required. The sampling and testing frequency for acute lethality at the FDP where effluent was determined to be acutely lethal would be increased to every 14 days, until three consecutive tests show effluent is not acutely lethal. The increased testing would only apply to the species for which the effluent was determined to be acutely lethal.

1.7 Recognized Closed Areas and Closed Mines

It is proposed that if a mine or an area of a mine meets specified criteria it would be recognized as closed and the CMER would not apply to it unless it started coal production.

The criteria would be different depending on whether an entire mine or an area of a mine is seeking to be recognized as closed. There are also simplified criteria if a province has recognized a mine or area as reclaimed at the time of CIF.

Criteria for a Mine or Area of a Mine That Is Reclaimed at CIF

At CIF, if a mine or an area of a mine has been recognized as reclaimed by the relevant provincial authority, the CMER would not apply to that mine or area, unless coal production restarts. There would be no application process in this situation.

Criteria for an Area of a Mine That Is Not Reclaimed at CIF

For an area of a mine that is not recognized as reclaimed by the relevant provincial authority at the time of CIF, it is proposed that the following criteria apply to be recognized as closed under the CMER:

- No coal production and no coal storage occurred in the area for the last three years
- The appropriate provincial or territorial authority recognized the area as reclaimed
- Effluent from other parts of the coal mine do not contact this area
- Where a FDP existed within the area in the previous two years:
    - Any effluent testing conducted under the CMER at that FDP over the past two years met the limits for total selenium, total nitrate, TSS as well as the pH and non-acute lethality requirements proposed in section 1.2.
    - No effluent treatment to reduce the concentration of selenium or nitrate was used for the last two years
- Data and information from effluent, water and selenium monitoring (section 3.4) that was conducted 6 months or more prior to the date of application in respect of this area has been submitted.

The owner or operator would be required to submit an application to the Minister of the Environment along with supporting information to demonstrate that the criteria have been met. Once the Minister approves the application, the Regulations would no longer apply to that area.

Criteria for a Mine That Is Not Reclaimed at CIF

For a mine that is not recognized as reclaimed by the relevant provincial authority at the time of CIF, it is proposed that the following criteria apply to be recognized as closed under the CMER:

- No coal production and no coal storage occurred in the last three years
- At all FDPs, for the last two years, any effluent testing conducted under the CMER met the limits for total selenium, total nitrate, TSS as well as the pH and non-acute lethality requirements proposed in section 1.2.
- No effluent treatment to reduce the concentration of selenium or nitrate was used for the last two years
- Data and information from effluent, water and selenium monitoring (section 3.4) that was conducted 6 months or more prior to the date of application has been submitted.
- Biological monitoring studies that began 6 months or more prior to the date of application have been completed and the interpretative report required in relation to these studies has been submitted[1].

The owner or operator would be require to submit an application to the Minister of the Environment along with supporting information to demonstrate that the criteria have been met. Once the Minister approves the application, the CMER, other than recordkeeping requirements, would no longer apply to the mine. An application for an entire mine to be recognized as closed could only be

[1] For example, if biological monitoring studies began 10 months before their application, the owner or operator would have to complete these studies (e.g. conduct all of the sampling of fish indicated in their study design) and submit the interpretative report required in relation to these studies (sections 3.5 and 3.6).

submitted starting 3 years after CIF to ensure that sufficient effluent data is collected under the CMER to demonstrate that the criteria are met.

Changes since the 2020 proposal and rationale

The 2020 proposal required a mine or area of a mine to be recognized as reclaimed by ECCC in order for the Regulations to no longer apply. The specific criteria set out in the proposal were:

- Coal production and storage ceased at least 6 years prior to the application
- Effluent from other parts of the mine does not contact the area
- All provincial/territorial/federal requirements for establishing the area as reclaimed have been met
- Reclamation activities to prevent the weathering and mobilization of deleterious substances within the area were completed at least 3 years prior to application
- Effluent quality standards at FDPs within the area were met for 3 consecutive years prior to the application, where applicable
- If applicable, an EEM biological monitoring study following reclamation was conducted

Comments received from provinces and industry indicated that the proposal conflicted with provincial requirements and led to impractical monitoring requirements for mines undergoing reclamation. The revised proposed requirements are intended to address these concerns.

Part 2 Alternative Approach – Elk Valley Mines

2.1 Introduction

Mining has occurred in the Elk Valley in southeastern British Columbia for more than a century with mining operations spanning over a 100-kilometre stretch. The five current mines in the Elk Valley have very large volumes of waste rock located in valleys immediately adjacent to and, in some cases, on top of waterbodies. Effluent is generated from these waste rock piles as water from precipitation and runoff, and in some cases, natural waterbodies, flows and percolates through them, leaching selenium, nitrate and other contaminants. The volume and location of the existing waste rock piles limits the ability to collect all effluent from these mines and to deposit it through FDPs prior to releases to water frequented by fish. Concentrations of selenium and nitrate within the Elk River watershed significantly exceed water quality guidelines. These current mines have already undertaken a number of actions and mitigations measures, and are planning additional measures to reduce these concentrations. These measures are heavily focussed on treating mine impacted receiving waterbodies and clean water diversions.

Given the constraints in collecting all effluent from these mines, it is proposed to authorize non-point source effluent. Moreover, because of the high levels of selenium and nitrate in the Elk River watershed, it is proposed to set conditions related to decreasing selenium and nitrate concentrations over time in the receiving environment where both non-point source effluent and effluent from FPDs from a given mine would be accounted for. The proposed approach would require significant action.

2.2 Application

This approach would apply to the five current mines located in the Elk Valley, British Columbia: Fording River Operations, Greenhills Operations, Elkview Operations, Line Creek Operations, and Coal Mountain Operations.

2.3 Overview of Authorization to Deposit

It is proposed that the authorization with respect to effluent from mines subject to the alternative approach would apply at CIF. Conditions of authorization that would apply include:

- Meeting specified concentrations of deleterious substances as well as pH requirements at environmental compliance points (ECPs) in the receiving environment.
- Collecting and depositing effluent through one or more FDPs where:
    - such collection and deposit is already occurring;
    - effluent is from an expansion; or
    - effluent is deposited downstream of an ECP for the mine in question.
- Meeting limits for TSS as well as requirements with respect to pH and non-acute lethality where effluent is deposited through FDPs.
- Meeting requirements with respect to pH and non-acute lethality in the case of diffuse/non-point source effluent.

Starting 3 years after CIF, effluent from expansions or effluent that is deposited downstream of an ECP for a given mine would also have to meet limits for total selenium and total nitrate.

The concentrations of deleterious substances at ECPs would be required to decrease over time with step-downs in selenium and nitrate concentrations required 5 and 15 years after CIF.

2.4 Siting of Environmental Compliance Points (ECPs)

ECCC proposes to set the locations for ECPs as identified in Table 2-1 directly in the Regulations.

ECPs would be located downstream of where each mine deposits into the following specified waterbodies: Fording River, Elk River, Michel Creek and Harmer Creek. Each ECP would be associated with a specific mine.

The locations were selected based on a review of the existing water monitoring stations located within the Elk Valley. The proposed locations coincide with either Order Stations or Compliance Points set out in the provincial Permit 107517 (as amended July 22, 2021) issued under the provisions of the *Environmental Management Act*. The locations are expected to meet the intent of accounting for all or most of the effluent deposited from a mine into the specified waterbodies as close as feasible to where the effluent is accounted for.

This proposal would ensure the ability to sample at ECP locations, provide additional regulatory clarity and eliminate the need for a lengthy application process for determining ECP locations. Maps identifying the proposed locations are found in Annex E.

Table 2-1 Proposed ECP Locations

Associated Mine/Specified Waterbody	Description	BC EMS Code[1]	Latitude	Longitude
Fording River Operations/Fording River	Fording River, 100m Upstream of Chauncey Creek	E223753	50.108 N	114.828 W
Greenhills Operations /Fording River	Fording River, 200 m Downstream of Greenhills Creek	200378	50.042 N	114.862 W
Greenhills Operations/Elk River	Elk River, 220 m Downstream of Thompson Creek	E300090	50.073 N	114.919 W
Line Creek Operations/Fording River	Fording River, Downstream of Line Creek	200028	49.893 N	114.870 W
Coal Mountain Operations/Michel Creek	Michel Creek, 50 m Upstream of Andy Goode Creek	E258937	49.523 N	114.689 W
Elkview Operations/Michel Creek	Michel Creek, HWY 3 Bridge	E30091	49.730 N	114.859 W
Elkview Operations/Harmer Creek	Harmer Creek, Spillway	E102682	49.830 N	114.815 W
Elkview Operations/Elk River	Elk River, Downstream Michel Creek	200393	49.733 N	114.900 W

[1]Refers to the identifier for the monitoring station as set out in British Columbia's Ministry of Environment and Climate Change Strategy's Environmental Monitoring System.

Changes since 2020 proposal and rationale:

During the February 2020 Technical Information Sessions, it was proposed to require mines to apply to the Minister of the Environment within four months of CIF for the approval of ECP locations. An application would include supporting information that demonstrates that the ECP locations met criteria set out in the Regulations. If the criteria were met, a notice of acceptance would have been issued within one year of CIF.

Proposed criteria for siting ECPs were:

- The combination of all of a mine's ECPs accounts for all effluent from that mine in each of the specified waterbodies, to which that mine deposits effluent.
- An ECP is within 200m downstream from the mine's last effluent entry point into the noted waterbody (FDP or non-point source).
- ECP locations allow for year-round sampling and flow measurement.

Including the locations of the ECPs in the Regulations provides more regulatory clarity and transparency. Including the locations would also eliminate the need for an application process.

2.5 Siting Background Points

For each mine, background points would be required in each specified waterbody into which that mine deposits (i.e. Fording River, Elk River, Michel Creek and Harmer Creek). The background points would be required to be as close as feasible upstream of where the mine first deposits effluent into a specified waterbody. In the case where a mine deposits effluent upstream of another mine's ECP, the other mine's ECP may be used as that mine's background point. The background point locations would be required to allow for year-round sampling.

ECCC proposes that background point locations be submitted as part of a mine's identifying information within 60 days of CIF along with information to demonstrate that the background point criteria are met.

If the location where effluent is first deposited into a specified waterbody is expected to change in a way that the background point would no longer meet the criteria, a new background point would need to be identified. In such a case, a notification to ECCC would be required for the movement of the background point that would include the rationale for the change in background point along with information to demonstrate that the background point criteria will be met. This notification would be required 60 days before the background point is proposed to change.

Changes since 2020 proposal and rationale:

During the February 2020 Technical Information Sessions, it was proposed that background points be established through an application process where the following criteria would be required to be met:

- be within 200 m upstream of where effluent from a mine is first deposited in the designated waterbody
- allow for year-round sampling and flow measurement

Concerns were raised by industry that the 200 m distance threshold could be challenging to meet, particularly in the case where there are braided channels or where safety concerns prevent access year-round. As such, this requirement was replaced by a requirement to be as close as feasible.

The revised approach also now includes provisions to allow for changes to background point locations to account for changes to the mine.

2.6 Requirements at ECPs

2.6.1 Total Selenium and Total Nitrate

It is proposed that requirements with respect to concentrations of total selenium and total nitrate at ECPs be set directly in the Regulations as described in Table 2-2 and Table 2-3 respectively.

In establishing the proposed concentration values to be required, ECCC reviewed:

- Concentrations of total selenium and total nitrate from British Columbia's Environmental Monitoring System (EMS) for monitoring stations that coincide with the proposed ECP locations from the period of January 1, 2015 to December 31, 2018 where available – hereafter referred to as the **baseline period**.
    - Note: the proposed ECP for Fording River Operations/Fording River only has selenium and nitrate concentration information in the EMS dating back to March 2021. Therefore, data from March 16, 2021 to September 28, 2021 were considered in establishing the proposed concentration values for that location. The proposed values for this ECP may be updated as more data becomes available prior to pre-publication of the proposed Regulations in *Canada Gazette*, Part 1.

- Existing site performance objectives and compliance limits for selenium and nitrate at monitoring locations that coincide with the proposed ECP locations under the provincial Permit 107517 (as amended July 22, 2021) issued under the provisions of the *Environmental Management Act* – hereafter referred to as **provincial targets**.

Monthly Mean Requirements at CIF:

Proposed monthly mean concentration requirements at ECPs for total selenium and total nitrate at CIF would reflect "status quo". The values proposed are equal to the lower of:

- the highest monthly mean concentration determined using baseline period concentrations for a given ECP; and
- the monthly average provincial target that applies by December 31, 2023, at the location of that ECP.

The intention behind setting status quo concentration requirements at CIF is to provide time to implement mitigation measures.

Monthly Mean Requirements at 5 Years After CIF:

It is proposed that a first step-down in selenium and nitrate concentrations would be required starting 5 years after CIF.

The values proposed for selenium are equal to the lower of:

- 50 µg/L;
- a 20% reduction in concentration from the mean of the monthly mean concentrations determined over the baseline period (hereafter referred to as the **baseline average**); and
- the monthly average provincial target that applies by December 31, 2023.

The values proposed for nitrate are equal to the lower of:

- 16 mg-N/L;
- a 20% reduction in concentration from the baseline average; and
- the monthly average provincial target that applies by December 31, 2023.

Monthly Mean Requirements at 15 Years After CIF

Starting 15 years after CIF, a second step-down in selenium and nitrate concentrations is proposed.

The values proposed for selenium are equal to the lower of:

- 40 µg/L;
- a 36% reduction in concentration from the baseline average at that location; and
- the monthly average provincial target that applies by December 31, 2033.

The values proposed for nitrate are equal to the lower of:

- 12.8 mg-N/L;
- a 36% reduction in concentration from the baseline average; and
- the monthly average provincial target that applies by December 31, 2033.

In all cases, the monthly mean concentration limits for total selenium and total nitrate at ECPs would have a floor of 2 µg/L and 3 mg-N/L, respectively.

Maximum Grab Sample Concentrations

In all cases, it is proposed that the maximum grab sample concentrations at ECPs could not exceed the lower of:

- twice the authorized monthly mean; and
- the provincial daily maximum target, where applicable, that applies by December 31, 2023, for requirements at CIF and at five years after CIF, and by December 31, 2033, for requirements at 15 years after CIF.

Further step-downs in concentrations would be examined as part of the 5- and 10-year regulatory reviews.

Table 2-2 Comparison of Total Selenium Concentrations During the Baseline Period, Provincial Targets and Proposed Monthly Mean and Maximum Grab Sample Concentration Requirements at ECPs

ECP Location	Reference Values (µg/L)			Proposed Monthly Mean/Maximum Grab Sample Concentration Requirements (µg/L) (Monthly Mean/Maximum Grab)		
Associated Mine/Specified Waterbody	**Prov. Targets in Place by Dec. 31, 2023 (Monthly Average /Daily Maximum)**	**Baseline Average (2015-2018)***	**Highest Monthly Mean During Baseline Period (2015-2018)***	**At CIF**	**5 Years After CIF**	**15 Years After CIF**
Fording River/Fording River	58/67	82	109	58/67	50/67	40/67
Greenhills /Fording River	57/62	46	73	57/62	37/62	29/58
Greenhills/Elk River	15	2	4	4/7	2/4	2/4
Line Creek/Fording River	51	35	57	51/102	28/56	23/45
Elkview/Harmer Creek	57	35	48	48/96	28/56	23/45
Elkview/Michel Creek	19	16	25	19/38	13/25	10/20
Elkview/Elk River	19	10	17	17/33	8/16	6/13
Coal Mountain/ Michel Creek	19	7	11	11/22	5/11	4/8

* For the Fording River/Fording River ECP, data from March 16, 2021 to September 28, 2021 was used as no prior data is available in EMS.

Table 2-3 Comparison of Total Nitrate Concentrations During the Baseline Period, Provincial Targets and Proposed Monthly Mean and Maximum Grab Sample Concentration Requirements at ECPs

ECP Location	Reference Values (mg-N/L)			Proposed Monthly Mean/Maximum Grab Sample Concentration Requirements (mg-N/L) (Monthly Mean/Maximum Grab)		
Associated Mine/Specified Waterbody	Prov. Targets in Place by Dec. 31, 2023 (Monthly Average /Daily Maximum)	Baseline Average (2015-2018) *	Highest Monthly Mean During Baseline Period (2015-2018) *	At CIF	5 Years after CIF	15 Years after CIF
Fording River/Fording River *	12/14	23	29	12/14	12/14	12/14
Greenhills /Fording River	11/15	10	16	11/15	8/15	6/13
Greenhills/Elk River	3	0.4	1	3/6	3/6	3/6
Line Creek/Fording River	10	9	13	10/20	7/14	3/4 **
Elkview/Harmer Creek	6	1	1	3/6	3/6	3/6
Elkview/Michel Creek	8	3	6	6/12	3/6	3/6
Elkview/Elk River	3	2	4	3/6	3/6	3/6
Coal Mountain/ Michel Creek	5	3	6	5/10	3/6	3/6

* For the Fording River/Fording River ECP, data from March 16, 2021 to September 28, 2021 was used as no prior data is available in EMS.
** Equal to provincial target in place by December 31, 2033

Changes since 2020 proposal and rationale:

During the February 2020 Technical Information Sessions, it was proposed that, once ECPs were established through an application process, 2 years of baseline concentration information would be

gathered at the ECP locations. A similar approach to establishing status quo concentration requirements and step-down concentration requirements based on baseline data would have applied.

Given that ECP locations are now proposed to be set directly in the Regulations and coincide with existing monitoring stations where provincial targets apply, the revised approach proposes to use historical information and take into account the provincial targets. The revised approach also adjusts timelines to reflect that baseline information would no longer be required to be collected after CIF.

Setting concentration requirements directly in the Regulations provides more regulatory clarity and transparency.

2.6.2 Total Suspended Solids

Starting 6 months after CIF, it is proposed that the TSS concentration in a grab sample taken at a given ECP could not be more than 25% above the TSS concentration at the background point associated with the ECP.

Starting 5 years after CIF, it is proposed that the TSS concentration in a grab sample taken at a given ECP could not be more than 10% above the TSS at the background point associated with the ECP.

The samples collected at an ECP and its associated background point would have to be taken within 4 hours of each other.

2.6.3 pH

Starting at the time of CIF, it is proposed that the pH at each ECP would be required to be equal to or greater than 6.0 but less than or equal to 9.5.

2.7 Sampling and Testing at ECPs and Background Points

Starting at the time of CIF, it is proposed to require the collection of weekly grab samples at ECPs for the determination of total selenium, total nitrate and TSS concentrations as well as pH levels.

Starting 6 months after CIF, weekly grab samples would need to be collected at background point locations for the determination of total selenium, total nitrate and TSS concentrations as well as pH levels.

The samples collected at an ECP and its associated background point would be required to be taken within 4 hours of each other.

Samples would need to be taken at a location within 25% of the centre of the width of the waterbody and within a metre of the cross-section where the ECP or background point is located.

See Annex B for further information on sampling and testing frequencies.

2.8 Volume of Water at ECPs and Background Points

Starting at the time of CIF, mines would be required to estimate the weekly volume of water passing through each ECP based on weekly or continuous flow rate measurements. The same requirement would apply to background points starting 6 months after CIF.

The flow rate could either be determined by:

- Taking discrete streamflow measurements based on generally accepted hydrometric practices; or
- In the absence of ice, measuring the stage of the waterbody and applying a stage-flow rate relationship.

There would be an exemption to the requirement to take flow rate measurements when unforeseen circumstances or ice coverage cause safety concerns or access problems and render flow rate determination impracticable.

Where discrete streamflow measurements are taken, equipment would be required to be maintained, verified, and, where needed, calibrated in accordance with manufacturer's specifications.

Where a stage flow-rate relationship is used:

- the stage measurement would need to be within an accuracy of 5 mm and referenced to a minimum of three benchmarks.
- the stage-flow relationship would need to be determined based on generally accepted hydrometric practices and accurate to within 15% of measured flow, as verified by taking 3 or more discrete flow measurements per year over an adequate range of stream flows.

Changes since 2020 proposal and rationale:

Added an exemption to flow rate measurements when unforeseen circumstances or ice coverage cause safety concerns of access problems and render flow rate determination impracticable.

2.9 Non-point Source Effluent

Starting at the time of CIF, the authorization for all effluent deposited from a mine, including non-point source effluent, would require the effluent to be non-acutely lethal as described in section 1.2.5 and within the pH range described in section 1.2.6.

It is proposed that an annual estimate of the volume of non-point source effluent deposited into each waterbody along with estimated total selenium and total nitrate loading from the non-point source effluent be submitted to ECCC (See section 4.5.5 for further details).

Changes since 2020 proposal and rationale:

The requirement to submit an annual report on non-point source effluent was added to obtain additional information on deposits at that mine and to inform the 5- and 10-year reviews of the Regulations.

2.10 Requirement to Continue to Collect Effluent

Effluent collected and deposited through FDPs at the time of CIF would be required to continue to be deposited through FDPs. The FDP location could change but the effluent collected through that FDP would have to continue to be collected and deposited through one or more FDPs.

2.11 Effluent Deposited through FDPs

It is proposed that the requirements described in this section apply at FDPs through which effluent, other than effluent from an expansion, is deposited and that are depositing upstream of any ECP for the mine. See sections 2.12 and 2.13 respectively for requirements for effluent from expansions and effluent deposited downstream of ECPs.

It is proposed that the authorization for effluent deposited through these FDPs include TSS limits equivalent to those for existing mines subject to the general approach as described in sections 1.2.1 and 1.2.2, non-acute lethality as described in section 1.2.5 and pH as described in section 1.2.6. These conditions of authorization would apply starting at the time of CIF.

It is proposed that sampling and testing requirements would be the same as those for FDPs at mines subject to the general approach as described in section 1.3, with the following exceptions:

- Total selenium, total nitrate, and TSS sampling and testing would be required weekly starting at the time of CIF;
- Reduced testing frequency provisions described in sections 1.3.2, 1.3.3, and 1.3.5 for total nitrate, total selenium, and acute lethality would not apply;
- Acute lethality sampling and testing would start at the time of CIF; and
- Selenium speciation sampling and testing as described in section 1.3.4 would be required at the time of CIF.

Requirements to determine the volume of effluent deposited through FDPs would be the same as described in section 1.5.

See Annex B for further information.

2.12 Expansions

It is proposed that expansions encompass:

- all newly permitted areas of a coal mine; and
- new works or undertakings within an existing area other than:
    - effluent management infrastructure,
    - effluent treatment facilities,
    - water management infrastructure; and
    - on-site transportation infrastructure.

A newly permitted area is an area that is outside of the mine boundary as set out in the latest mine permit issued under section 10 of BC's *Mines Act*, 1996 at the time of pre-publication of the Regulations in the *Canada Gazette*, Part 1.

New works or undertakings are those that are created after the date of CIF and that are not part of existing works or undertakings. These could include new surface or subsurface extraction areas, new coal storage facilities, and new waste storage facilities such as tailings ponds and waste rock piles. Backfilling existing pits with new waste rock would not be considered an expansion.

2.12.1 Expansion Notification

It is proposed that the owner or operator of a coal mine would be required to provide ECCC with 60 days notice before the commencement of an expansion and include the following information:

- A description of the intended expansion and of how the effluent from the expansion is to be collected, treated and deposited; and
- A site plan, with geographic coordinates, showing the location of the expansion, the effluent management infrastructure associated with the expansion and the location of the final discharge point(s) from which the effluent from the expansion is to be deposited.

2.12.2 Authorization for Effluent from an Expansion

Starting at the time of CIF, it is proposed that the conditions of authorization for the deposit of effluent from an expansion would include that:

- effluent be collected and deposited through a FDP;
- TSS limits for existing mines described in section 1.2.1 apply at FDPs; and
- requirements with respect to non-acute lethality and pH described in sections 1.2.5 and 1.2.6 apply at FDPs.

Starting 3 years after the time of CIF, it is proposed that conditions of authorization that apply at FDPs include total nitrate and total selenium limits for existing mines described in sections 1.2.3 and 1.2.4 in addition to those that apply at CIF.

If effluent from an expansion is mixed with other effluent, the combined effluent would need to meet the above-mentioned requirements.

It is proposed that sampling and testing as well as effluent volume measurement requirements be the same as those described in section 2.11.

2.13 Effluent Deposited Downstream of ECPs

The locations of ECPs are intended to capture all or most of the effluent deposited from a mine at the time of CIF. Should effluent from a given mine be deposited downstream of any the mine's ECPs, it is proposed that such effluent be subject to the same conditions as described in section 2.12.2.

2.14 Recognized Closed Areas and Mines

It is proposed that mines subject to the alternative approach would not be eligible to be recognized as closed.

Newly permitted areas as described in section 2.9 would be eligible to be recognized as closed and have the Regulations no longer apply to them provided they meet the criteria described in section 1.7. This is because newly permitted areas would be collecting all effluent and would be subject to the same requirements as mines subject to the general approach.

2.15 Prohibition on Dilution

It is proposed that effluent from a mine may not be diluted, other than with other effluent, before it is deposited through a final discharge point. Surface water, including precipitation or snow melt captured through a work or undertaking designed to prevent it from coming into contact with effluent or other parts of the coal mine, would not be considered effluent and may not be mixed with effluent prior to discharge.

In the case where treatment facilities are treating water from the receiving environment that contains effluent, it would be permitted to mix waters containing effluent from the environment with effluent from the mine for the expressed purpose of treating said waters to lower their selenium or nitrate concentrations.

Wastewater from a sewage treatment facility is not considered effluent and could not be mixed with effluent from the mine.

Part 3 Environmental Effects Monitoring

3.1. Overview

It is proposed that all coal mines subject to the proposed Regulations would be required to conduct Environmental Effects Monitoring (EEM) studies as of CIF, with monitoring requirements staggered over time. This includes both mines subject to the general approach and those subject to the alternative approach. Where the requirements for each of these mines differs in this Part, it will be specified.

The EEM studies proposed for the CMER would include effluent, water and selenium monitoring (section 3.4) and biological monitoring studies of fish populations, benthic invertebrate communities (BIC) and fish tissue (selenium and mercury) (section 3.5). The purpose of EEM studies is to determine the effects, if any, of effluent on fish, fish habitat and use of fish by humans. If an effect is occurring, the owner or operator could be required to investigate the cause of the effect and identify a possible solution to eliminate it.

EEM studies would have to be conducted, and their results interpreted and reported on, in accordance with generally accepted standards of good scientific practices, including using documented and validated methods where applicable.

The results of EEM studies would be used to assess the effectiveness of the CMER at protecting fish, fish habitat and the use of fish by humans and inform future policy development with respect to deleterious substances deposited from coal mines and their management. They would inform the 5-year status report on selenium requirements and the 10-year review of the Regulations (section 5.2).

An overview of proposed EEM requirements with associated frequency and sampling locations for mines subject to the general approach and mines subject to the alternative approach is provided in Table 3-1 and Table 3-2, respectively. These requirements are described in more detail in the following sections in chronological order of when they would have to start.

Table 3-1 Proposed EEM Requirements (Frequency and Locations) for Mines Subject to the General Approach

Study Component	Frequency	General Approach Sampling Locations		
		FDP	Exposure Area	Reference Area
Site Characterization				
Highest concentration of effluent	Each year	N/A	✓ (100 m and 250 m from where effluent enters the exposure area from each FDP)	N/A
Calcite monitoring[1]	Every 3 years	N/A	✓	✓
Effluent, Water and Selenium Monitoring				
Effluent characterization	Quarterly (≥ 1 month apart)	✓ (all FDPs)	N/A	N/A
Water quality monitoring	4x/year (≥ 1 month apart) at all WQM locations and during biological monitoring, at the fish and BIC sampling locations	N/A	✓ (each effluent plume)	✓
Sublethal toxicity testing	Twice a year on all test species or quarterly on the most sensitive test species	✓ (Highest risk FDP[2])	N/A	N/A
Selenium monitoring (benthic invertebrate tissue / sediment)	Annually at the locations selected for the BIC study and during the fish tissue selenium study, at the fish sampling locations	N/A	✓	✓
Biological Monitoring				
Fish population	Every 3 years, unless not required (see Table 3-6 in section 3.5.4)	N/A	✓	✓
BIC		N/A	✓	✓
Fish tissue mercury		N/A	✓	✓
Fish tissue selenium		N/A	✓	✓

[1] See Table F-3 in Annex F for the proposed calcite metrics.
[2] The highest risk FDP is the FDP that has potentially the most adverse impact on the environment.

Table 3-2 Proposed EEM Requirements (Frequency and Locations) for Mines Subject to the Alternative Approach

Study Component	Frequency	Alternative Approach Sampling Locations				
		FDPs	Exposure Area			Reference Area
			ECP	Upstream of ECP	Down-stream of ECP	
Site Characterization						
Highest concentrations of selenium and nitrates	Each year	N/A	✓ (at each location effluent enters the exposure area from any FDP and from any non-point source)			N/A
Calcite monitoring[1]	Every 3 years	N/A	✓			✓
Effluent, Water and Selenium Monitoring						
Effluent characterization	Quarterly (≥ 1 month apart)	✓ (all FDPs)	N/A	N/A	N/A	N/A
Water quality monitoring	Monthly (≥ 15 days apart) at all WQM locations and during biological monitoring, at the fish and BIC sampling locations	N/A	✓ [each of the mine's ECP(s)]	✓	✓	✓
Sublethal toxicity testing	Twice a year on all test species or quarterly on the two most sensitive test species	✓ (Highest risk FDP[2])	✓ [each of the mine's ECP(s)]	N/A	N/A	N/A
Selenium monitoring (benthic invertebrate tissue / sediment)	Annually at the locations selected for the BIC study and during the fish tissue selenium study, at the fish sampling locations	N/A	N/A	✓	✓	✓
Biological Monitoring						
Fish population	Every 3 years, unless not required (see Table 3-6 in section 3.5.4)	N/A	N/A	✓	✓	✓
BIC		N/A	N/A	✓	✓	✓
Fish tissue mercury		N/A	N/A	✓	✓	✓
Fish tissue selenium		N/A	N/A	✓	✓	✓

[1] See Table F-3 in Annex F for the proposed calcite metrics.

[2] The highest risk FDP is the FDP that has potentially the most adverse impact on the environment.

3.2 Indigenous Knowledge

The consideration of Indigenous knowledge in the design of EEM studies is proposed for the CMER.

Within the first six months of CIF[2], the owner or operator of a coal mine would be required to identify the Indigenous peoples who use the waters where effluent from their mine is deposited and invite them to share their Indigenous knowledge for the purpose of informing the design of any required biological monitoring studies on fish populations, BIC and fish tissues (selenium and mercury) (section 3.5). This is proposed as a one-time requirement in the Regulations.

Where Indigenous knowledge is provided to an owner or operator, the owner or operator would be required to describe how this Indigenous knowledge was taken into account in the design of EEM studies and, if the Indigenous knowledge was not taken into account, to explain why. Once Indigenous knowledge has been made available, the owner or operator of the mine will have to continue to take it into account in the design of any subsequent EEM studies.

Only Indigenous knowledge that is available at the time of preparing a given EEM study design would have to be considered in that study design. The intent is that this proposal will not impact timelines for the submission of study design (section 3.6.2).

3.3 Site Characterization

The owner or operator of each coal mine would be required to determine certain characteristics of the receiving environment, including how the effluent deposited from their mine mixes with the receiving waters. This site characterization information would be used for various purposes, such as for delineating the exposure area(s) and identifying suitable reference area(s) for conducting EEM studies, including for establishing the sampling locations for water quality monitoring (WQM) (section 3.4.3), and for mines subject to the general approach[3] only, for determining if certain biological monitoring studies are required.

The site characterization information would have to be determined prior to the submission of every study design (section 3.6.2), except for the information that would inform where WQM must be conducted, which would have to be determined within the first year of CIF[4] so that it is available when WQM must start. In some cases, the owner or operator would have information available from previous studies conducted before the CMER that they would be able to use in their site characterization.

The type of site characterization information that would be required and when it would have to be determined is detailed below.

First, within the first year of CIF, the owner or operator of each coal mine would be required to determine the manner in which their effluent mixes with the receiving waters[5]. This information would

[2] For a new mine subject to the general approach, this would be within the first six months the mine becomes subject to the CMER.
[3] When “mines subject to the general approach” is used, it refers to both existing and new mines subject to the general approach.
[4] For a new mine subject to the general approach, this would be within the first year the mine becomes subject to the CMER.
[5] The manner in which the effluent mixes with the waters and the effluent plume(s) would have to be determined in conditions that would generally result in the highest concentrations of effluent in a year.

be used to delineate each exposure area of a mine and, based on the characteristics of each exposure area (e.g., geological, hydrological, chemical and biological features), to identify each related reference area (see the Definitions section for the meanings of exposure and reference areas). There is generally only one exposure area at a mine but there could be more than one, especially if effluent is deposited to more than one distinct water body.

For each exposure area, the owner or operator of a mine subject to the general approach would also be required to delineate each effluent plume, consisting of each subarea within an exposure area where, at every point in that subarea, the highest concentrations of effluent exceed 1%. An effluent plume may result from the combination of effluent deposited from more than one FDP and would represent the subarea (or subareas, if more than one effluent plume can be determined in an exposure area) of highest effluent concentrations within an exposure area. If more than one effluent plume is delineated at a mine, the owner or operator would be further required to identify the plume with the highest concentrations of deleterious substances. Each time a new FDP is established or identified at the mine or the location of an existing FDP changes, the owner or operator of a mine subject to the general approach would have to verify if this has an impact on the effluent plumes they delineated and, if so, to update that information in the subsequent study design.

Within the same timeframe, i.e. still during the first year following CIF, the owner or operator of a mine would have to identify the locations where the potential for effects on the BIC is the highest, taking into account, among other factors, the effluent concentrations to which the BIC is exposed and the diversity of the BIC. For a mine subject to the general approach, these locations would have to be identified in each effluent plume(s). For a mine subject to the alternative approach, these locations would have to be identified upstream and downstream of each of the mine's ECP(s). These locations would be used to determine where to sample for WQM (see section 3.4.3) and where to conduct the BIC study (see section 3.5), if required, for all mines.

Prior to the submission of every study design (section 3.6.2), additional site characterization information would have to be determined, as described below.

The owner or operator of a mine subject to the general approach would be required to estimate the highest concentration of effluent in a calendar year at 100 m and 250 m from every point at which the effluent enters each exposure area from a FDP. These estimates, updated every year, would be used to determine if a study of the fish population (250 m) and a study of the BIC (100 m) are required at mines subject to the general approach (section 3.5.4).

The owner or operator of a mine subject to the alternative approach would be required to estimate the highest concentrations of selenium and nitrates, in a calendar year, at each location from which effluent enters the exposure area from a FDP or a non-point source at the mine. These estimates would need to be updated every year and would be used to inform where the EEM studies are to be conducted.

Finally, as part of the site characterization, the owner or operator of a mine would be required to visually assess and provide estimates of the percentage of bottom substrate covered with calcite precipitate and provide a description of the degree of calcite concretion of that substrate for the exposure and reference areas. The proposed calcite metrics are described in Annex F, Table F-3. These metrics, along with results from a calcium carbonate saturation index, also included in Table F-3, would be used to help understand how calcite formation may be related to the mine's effluent and receiving environment water quality.

3.4. Effluent, Water and Selenium Monitoring

The EEM studies proposed for the CMER would include effluent, water and selenium monitoring studies consisting of:

- effluent characterization;
- sublethal toxicity testing;
- water quality monitoring; and,
- selenium monitoring (benthic invertebrate tissue and sediment).

Data generated from effluent, water, and selenium monitoring would support the identification of the causes of any effects or exceedances of selenium guidelines determined during biological monitoring (section 3.5) and provide information about the occurrence of other contaminants of potential concern in effluent.

3.4.1 Effluent Characterization

The owner or operator of each coal mine would be required to start effluent characterization within the first calendar quarter after CIF[6]. Effluent characterization would have to be conducted at each FDP by analyzing a sample of effluent and recording the parameters and substances listed in Annex F, Table F-1. The effluent characterization would be required quarterly and not less than one month apart.

For a mine subject to the general approach, the requirement to record the concentration of total mercury in effluent from all FDPs would be suspended if the concentration of total mercury measured in the 12 most recent samples of effluent collected from each FDPs is less than 0.10 µg/L. This exemption does not apply to a mine subject to the alternative approach, which would always be required to measure total mercury in effluent samples.

New proposal:

The exemption to record the concentration of total mercury in effluent from all FDPs at a mine subject to the general approach would cease to apply where a new FDP is established or identified at the mine or the location of an existing FDP is changed. A new FDP, or the relocation of an existing FDP, may signal a change in the coal seam being exploited which would trigger the need to verify that mercury concentrations discharged from the mine remain low.

QA/QC measures would have to be implemented to ensure data accuracy. Mines would also be required to comply with specified analytical requirements, including method detection limits (MDLs) (section 4.3 and Annex D, Table D-1).

New proposal:

An exemption for meeting the MDLs is proposed for effluent characterization under certain conditions (see section 4.3).

[6] For a new mine subject to the general approach, this would be within the first calendar quarter the mine becomes subject to the CMER.

3.4.2 Sublethal Toxicity Testing

Sublethal Toxicity (SLT) tests are proposed in order to monitor effluent or receiving water quality by measuring survival, growth and/or reproduction indicators in marine or freshwater organisms in a controlled laboratory environment. SLT tests would have to be conducted according to the same reference methods as required in the MDMER (Annex F, Table F-2).

All coal mines would be required to conduct SLT tests on effluent samples used for effluent characterization and collected from the mine's FDP that has potentially the most adverse impact on the environment, referred to as the highest-risk FDP. The highest-risk FDP would be determined, prior to each SLT test, by taking into account the loading of the deleterious substances in the effluent and how the effluent mixes within the exposure area. For a mine subject to the alternative approach, SLT tests would also have to be conducted on water samples collected for WQM at each of the mine's ECP(s).

The owner or operator of each coal mine would be required to start SLT testing not later than twelve months after CIF[7].

SLT testing at the highest-risk FDP and each ECP, if any, would be required on a fish, invertebrate and algal species in addition to, for mines depositing to freshwater environments, a plant species (Annex F, Table F-2). All coal mines would be required to conduct tests using all SLT test species twice[8] per calendar year until six SLT tests on each species have been conducted at the highest-risk FDP and each ECP. These test results (i.e. IC_{25} or EC_{25}, as applicable depending on the test) would be used to determine the sensitive SLT test species on which quarterly testing would be required moving forward. For a mine subject to the general approach, quarterly testing would be required on the most sensitive test species characterized by the lowest geometric mean of IC_{25} or EC_{25} results. For a mine subject to the alternative approach, quarterly testing would be required on the two most sensitive test species, i.e. the two species with the lower geometric means of IC_{25} or EC_{25} results.

This proposed approach would include provisions to account for changes in the FDP determined to be the highest-risk one over time (see New proposal below).

New proposal:

If another FDP is determined to be the highest-risk one when SLT tests are required twice per year, then SLT testing would have to continue on this new highest-risk FDP using all applicable test species (Annex F, Table F4) twice per year. Testing requirements for SLT (e.g., frequency) would not change before six SLT tests on each species have been conducted at the same FDP.

If the change in the highest-risk FDP happens when SLT testing is required quarterly, then the owner or operator would be required to resume SLT testing twice per year on all applicable test species (Annex F, Table F4), unless six SLT tests on each test species have been conducted already at this new highest-risk FDP over the last 60 months. If this is the case, then these results would be used to determine the most (mine subject to the general approach) or the two most (mine subject to the

[7] For a new mine subject to the general approach, this would be not later than twelve months after the mine becomes subject to the CMER.

[8] Similar to the MDMER, SLT testing would be required only once a year instead of twice a year at a mine subject to the general approach that would have deposited effluent for 31 consecutive days or less during that year from all FDPs (i.e. considering all FDPs together in determining the 31 consecutive days or less).

alternative approach) sensitive SLT test species for this new FDP on which quarterly testing would be conducted.

Change since 2020 proposal:

For a mine subject to the alternative approach, it is proposed that quarterly SLT testing at the highest-risk FDP and each of the mine's ECP(s) would be required on the two most sensitive SLT test species determined for the FDP and each ECP respectively. Initially, the proposal was the same as for mines subject to the general approach, i.e. quarterly SLT testing on only the most sensitive test species and not the two most sensitive test species. This change is proposed to address concerns that more SLT testing should be conducted at the current mines in the Elk Valley to improve the ability to identify substances of concern at these mines.

3.4.3 Water Quality Monitoring

The owner or operator of each coal mine would be required to start WQM not later than twelve months after CIF[9]. Samples of water would have to be collected and analyzed, and measures taken *in situ* to determine the value or concentration of the water quality parameters and substances listed in Annex F, Table F-1. For a mine subject to the general approach, if the conditions to suspend the recording of the concentration of total mercury in effluent are met (see section 3.4.1), then the recording of total mercury may also be suspended in water. Similarly, if the recording of total mercury must resume in effluent (see New proposal, section 3.4.1), then it would also have to resume in water. As indicated previously, this exemption would not apply to a mine subject to the alternative approach, which would always have to measure total mercury in effluent and water samples.

Different WQM locations and frequency are proposed for a mine subject to the general approach and a mine subject to the alternative approach (see Tables 3-1 and 3-2 in section 3.1).

For a mine subject to the general approach, WQM would have to be conducted in each effluent plume delineated during site characterization (section 3.3), at a location, within each plume, where the potential for effects on the BIC is the highest. WQM would also be required within the related reference area(s). If no effluent plume can be established at a mine (i.e. the highest effluent concentration within the exposure area(s) is equal to or lower than 1%), then WQM would be required within 100 m of the highest-risk FDP and in the related reference area. WQM for a mine subject to the general approach would be required four times per year while the mine is depositing effluent and not less than one month apart.

For a mine subject to the alternative approach, WQM would be required at each of the mine's ECP(s) and, within the exposure area, at a location upstream and a location downstream of each ECP where the potential for effects on the BIC is the highest. The downstream location would have to be characterized by concentrations of deleterious substances similar to those measured at the ECP. In addition to these locations within the exposure area, WQM would also be required within the related reference area(s). For a mine subject to the alternative approach, WQM would be required monthly and not less than 15 days apart.

[9] For a new mine subject to the general approach, this would be not later than twelve months after the mine becomes subject to the CMER.

At all coal mines, WQM would also be required during biological monitoring, at the sampling areas that are selected for any required BIC, fish population and fish tissue (selenium and mercury) studies (section 3.5).

QA/QC measures would have to be implemented to ensure the accuracy of WQM data. Similar to effluent characterization, the owner or operator of each coal mine would have to comply with specified analytical requirements, including MDLs (section 4.3 and Annex D, table D-1).

New proposal:

An exemption for meeting the MDLs is proposed for WQM under certain conditions (see section 4.3).

3.4.4 Selenium Monitoring

The owner or operator of each coal mine would be required to start selenium monitoring not later than twelve months after CIF by measuring the concentration of total selenium in benthic invertebrate tissues and in surficial sediment, if sediment occurs in the sampling area. Selenium monitoring would be required once per year at the locations selected for the BIC study[10] and, during biological monitoring, at all areas where fish are collected for the selenium in fish tissue study, if such a study is required.

Results from this selenium monitoring, along with at least one set of results from the selenium in fish tissue study (section 3.5) and selenium speciation data, if applicable, (section 1.3.4), would be examined by ECCC in preparing the 5-year status report on the selenium requirements (section 5.2). This selenium monitoring would also provide supporting data to interpret the results of the fish tissue selenium studies and assist in identifying potential cause(s) of measured effects or exceedances of selenium guidelines.

Changes since 2020 proposal:

An increase in frequency for the selenium monitoring is proposed to inform the 5-year status report on selenium requirements (section 5.2). Initially proposed only during the selenium in fish tissue study, the measurement of total selenium in benthic invertebrate tissues and surficial sediment (if any) would also be required once per year at all the locations selected for the BIC study[11]. Benthic invertebrate tissues may respond more quickly to the proposed selenium requirements compared to fish, due to their generally shorter life cycle. At the same time, the presence of selenium in sediments in certain receiving environments may interfere with the short-term performance of these selenium requirements at protecting fish.

[10] The BIC study would have to be conducted at the locations selected for WQM at all coal mines (except at the ECP(s) for mines subject to the alternative approach). At mines subject to the general approach, if more than one effluent plume is delineated during site characterization, then the BIC study would only have to be conducted at the WQM location established in the effluent plume characterized by the highest concentrations of deleterious substances, and at the WQM location established in the related reference area. The intent of this proposal is to align – in space - the sampling locations for WQM, selenium monitoring and the BIC study.

3.5 Biological Monitoring

3.5.1 Proposed Studies

Different types of biological monitoring studies are proposed for the CMER (see Table 3-1 and 3-2). The conditions under which the owner or operator of a coal mine would be required to conduct a given type of study (i.e. monitoring or investigative) on a given study component (e.g. fish population), and the frequency at which required studies would have to be conducted, are described in section 3.5.4.

The proposed biological monitoring studies would be conducted to determine if the effluent is having effects on:

- Fish populations (survival, reproduction, condition and growth);
- BIC (taxon richness, evenness index, density and similarity index);
- Mercury concentrations in fish tissues; and,
- Selenium concentrations in fish tissues.

The study on selenium in fish tissues would also be conducted to determine if the concentrations of total selenium in exposed fish are above the levels that pose a risk to fish health (ECCC and Health Canada, 2017), and levels recommended by British Columbia for human consumption (BCMOE, 2014) (see Table 3-3).

For each study component (e.g. fish population), a definition of what constitutes an “effect”, and, for the selenium in fish tissue study, of what constitutes an “exceedance of selenium guidelines”, would be included in the Regulations. The proposed definitions are presented in Table 3-3 for the purposes of engagement.

In addition to the above, biological monitoring studies would also be required to investigate the cause of an effect or the cause of an exceedance of selenium guidelines, and, if the effect or exceedance is related to the mine’s effluent, to identify a possible solution to eliminate the effect or exceedance during the same three-year study period.

Changes since 2020 proposal:

Due to concerns with the 2020 proposal, the CMER would clarify that the identification of a possible solution is not required if the cause of the effect or exceedance is determined to not be related to the mine’s effluent. In this case, the owner or operator would be required to explain why the cause was determined to not be related to the mine’s effluent and provide a description of changes which would be made in their next study design so that the effect(s) or exceedance(s), if any, of their effluent can be assessed.

The fish population, BIC and fish tissue mercury studies would be modelled after the MDMER. The CMER would include the additional requirement to conduct the BIC study at the locations selected for WQM (excluding ECPs) in the exposure and reference areas in order to align – in space – the sampling locations for WQM, selenium monitoring and the BIC study. For a mine subject to the general approach, if more than one effluent plume is delineated during site characterization, the BIC study would only have to be conducted at the WQM locations established in the effluent plume characterized

by the highest concentrations of deleterious substances and the related reference area. In the CMER, the selenium in fish tissue study would include the additional requirements to determine the presence of an effect from selenium in fish tissue and of exceedance of selenium guidelines. The edible portions of fish taken from the exposure area would be used to determine the presence of any exceedance of the selenium fish consumption guidelines. The ovaries or eggs, or if not practicable, the muscle or whole-body, of fish taken from the exposure area would be used to determine the presence of any exceedance of the selenium fish health guidelines (see Table 3-3). In addition, as indicated in section 3.4.4, the measurement of total selenium in benthic invertebrate tissue and surficial sediment (if any), at all areas where fish are caught for the selenium in fish tissue study, would be required when sampling is conducted.

New proposal:

MDLs are proposed for total selenium and total mercury measurements in fish tissues (see Annex D, Table D-2).

3.5.2 Effects and Exceedance of Selenium Guidelines

How an effect or exceedance of selenium guidelines would be determined for the CMER is described in Table 3-3. For the fish population and BIC studies, four indicators of effect would have to be assessed, similar to the MDMER (see Table 3-4). These effects would need to be assessed from data collected from at least one reference area and one exposure area where the potential for effects is the highest in respect of each study component being monitored (e.g., fish population). If a suitable reference area cannot be established at the mine, data would need to be collected within an exposure area where there are gradually decreasing effluent concentrations, i.e. at increasing distances from where the effluent is deposited. For mines subject to the alternative approach, the determination of the presence of effects or exceedances of selenium guidelines would have to be done separately upstream and downstream of each of the mine’s ECP.

Table 3-3 Proposed Definitions of Effects and Selenium Guideline Exceedances for Biological Monitoring Studies for the Purposes of Discussion.

Study Component	Definition
Fish population	statistical difference between data collected in exposure and reference areas, or in sampling areas within an exposure area where there are gradually decreasing effluent concentrations (i.e. at increasing distances from where the effluent is deposited)
BIC	
Fish tissue mercury	a concentration of total mercury that exceeds 0.5 µg/g wet weight[1] in fish tissue taken from an exposure area and is statistically different from and higher than the total mercury concentration in fish tissue that is taken from the related reference area
Fish tissue selenium	a concentration of total selenium (in dry weight) in fish tissue taken in an exposure area that is statistically different from and higher than the concentration of total selenium (dry weight) in fish tissue taken in the related reference area
Exceedance of selenium guidelines	an exceedance of the selenium fish consumption guidelines would occur if the concentration of total selenium exceeds 1.8 µg/g (wet weight) or 7.3 µg/g (dry weight) in edible portions of fish taken from the exposure area[2] an exceedance of the selenium fish health guidelines would occur if the concentration of total selenium exceeds 14.7 µg/g (dry weight) in the ovaries or eggs or 6.7 µg/g (dry weight) in the muscle or whole-body of fish taken from the exposure area[3]

[1] The Health Canada (2007) mercury in fish tissue consumption guideline (0.5 µg/g wet weight) for humans is the proposed mercury concentration which would be used to indicate an effect on fish tissue from mercury, which is the same as the MDMER.

[2]The proposed selenium fish consumption guideline values are from the Ambient Water Quality Guidelines for Selenium Technical Report (BCMOE, 2014). These values are based on edible portions of fish and on high fish intake. Wet weight to dry weight conversion is based on 75% moisture content.

[3] The proposed selenium fish health guidelines is the predicted no-effect concentration for fish egg/ovary and fish whole-body tissues from the Screening Assessment Selenium and its compounds (ECCC and Health Canada, 2017).

Table 3-4 Proposed Fish Population and BIC Effect Indicators and Endpoints

Study Component	Effect Indicators	Effect Endpoints
Fish Population[1]	Growth	Size-at-age (body weight relative to age)
	Reproduction	Relative gonad size (gonad weight to body weight)
	Condition	Condition (body weight to length) Relative liver size (liver weight to body weight)
	Survival	Age
BIC[2]	Total density	Number of animals per unit area
	Evenness index	Simpson's evenness index
	Taxon richness	Number of taxa
	Similarity index	Bray-Curtis index

[1] In addition to the fish effect indicators, mines would be required to identify the presence of any lesions, tumors, parasites or other abnormalities present.
[2] In addition to the BIC effect indicators, sediment would have to be sampled (if possible to sample sediment) and the total organic carbon content and particle size distribution of the sediment be determined.

New proposal:

Exemption for fish effect indicator or exceedance of selenium guidelines
An exemption is proposed for situations where a fish effect indicator (e.g. reproduction) or the exceedance of selenium guidelines cannot be determined at a mine. In order to be exempt from the requirement to determine a specific effect indicator or exceedance of selenium guidelines, the owner or operator would have to provide, as part of the study design (section 3.6.2), evidence demonstrating that:

- They were denied a license or permit, from provincial or federal authorities, to conduct field monitoring of any fish present in the exposure area, and
- A comprehensive assessment of field and lab methodologies has been conducted and there is no practicable alternative to the field monitoring of fish to determine the specific effect indicator or exceedance of selenium guidelines.

3.5.3 Critical Effect Sizes

To focus investigative efforts on the effects that may potentially pose the greatest risk to the environment, critical effect sizes (CES) have been assigned for some fish population and BIC endpoints (Table 3-5). The proposed CES's are the same as the CES's assigned in the MDMER. These CES thresholds would be used to determine when the owner or operator are required to investigate the cause and identify a possible solution for an effect and when they can decrease monitoring effort, as described in Table 3-6.

Table 3-5 Proposed Critical Effect Sizes (CES)

Fish Effect Endpoints	CES[1]	BIC Endpoints	CES[1]
Weight-at-age	± 25%	Density	± 2 SD
Relative fish gonad size	± 25%	Simpson's Evenness index	± 2 SD
Relative liver size	± 25%	Taxon Richness	± 2 SD
Condition	± 10%		
Age	± 25%		

[1] Differences in fish population effect endpoints are expressed as percentage (%) of reference mean, while differences in BIC endpoints are expressed as multiples of within-reference-area standard deviations (SDs).

3.5.4 Conditions Determining the Type and Frequency of Studies

Table 3-6 describes the conditions under which a given biological monitoring study would be required at a mine subject to the general approach and a mine subject to the alternative approach. Certain conditions, when met, would trigger the requirement to conduct a certain type of study (monitoring or investigative) while others would reduce the frequency at which a monitoring study would have to be conducted, by exempting the owner or operator from having to conduct the study during a given study period. These conditions would apply to each study component independently (e.g. fish population or BIC). Because of this, at any given time, the owner or operator of a mine could be required to conduct biological monitoring of the fish population and selenium in fish tissues, while investigating an effect on the BIC and being under reduced monitoring frequency for the mercury in fish tissue study. If an investigative study is required on a study component (e.g. fish population), a monitoring study on this component would not be required at the same time.

Change since 2020 proposal:

To address concerns that there may be an exceedance of selenium guidelines while mines are under reduced monitoring frequency, the following conditions have been added to the set of initially proposed reduced monitoring conditions for the fish tissue selenium study:

- Results of the previous two studies indicate no statistically significant increase in total selenium concentrations in exposed fish tissues taken from the exposure area over time; and
- In the most recent study, the average total selenium concentration in the tissues of fish taken from the exposure area is at least 50% lower than the selenium guideline concentrations.

The complete set of conditions can be found in Table 3-6.

It is important to note that the conditions triggering monitoring studies would only apply to a mine subject to the general approach. The owner or operator of a mine subject to the alternative approach would be required to monitor all study components, unless, as explained above and in Table 3-6, the conditions that trigger an investigative study or reduced monitoring frequency are met.

Table 3-6 Proposed Conditions Under which a Given Biological Monitoring Study would be Required for Mines Subject to the General or Alternative Approaches.

Study Component	Conditions Triggering Monitoring Study		Reduced Monitoring Conditions	Conditions triggering Investigative Study[1]
	General Approach	Alternative Approach		
Fish Population	If highest effluent concentration[2] > 1% 250 m from where effluent enters the exposure area from any FDP, unless reduced monitoring or investigative study conditions are met	Always required, unless reduced monitoring or investigative study conditions are met	a) two previous studies[3] indicate no effect for all effect indicators without an assigned CES, and b) two previous studies indicate no effect for effect indicators with an assigned CES, or an effect whose magnitude is less than the assigned CES	a) two previous studies[4] show a similar type of effect[5] for an effect indicator without an assigned CES, or b) two previous studies[4] show a similar type of effect[5] for an effect indicator with an assigned CES, and the magnitude of the effect is equal to or greater than the CES in either of the two studies
BIC	If highest effluent concentration[2] > 1% 100 m from where effluent enters the exposure area from any FDP, unless reduced monitoring or investigative study conditions are met			
Mercury Fish Tissue	a) If annual mean concentration of total mercury in effluent ≥ 0.10 µg/L, unless reduced monitoring or investigative study conditions are met or b) If the MDL for analysing mercury in any effluent samples > 0.01 µg/L, unless reduced monitoring or investigative study conditions are met		Two previous studies[3] indicate no effect	Two previous studies[4] show an effect[5]

Study Component	Conditions Triggering Monitoring Study		Reduced Monitoring Conditions	Conditions triggering Investigative Study[1]
	General Approach	Alternative Approach		
Selenium Fish Tissue	Always required, unless reduced monitoring or investigative study conditions are met		a) two previous studies[3] show no effect and there is no exceedance of selenium guidelines, and b) two previous studies indicate no statistically significant increase in total selenium concentrations over time in exposed fish tissues, and c) in the most recent study, the average total selenium concentration in exposed fish tissue is at least 50% lower than the selenium guideline concentrations	a) two previous studies[4] show an effect[5], or b) results of any of the two previous studies[3] indicate an exceedance of selenium guidelines

[1] If an investigative study is required, a biological monitoring study on the same component (e.g., fish population) would not be required at the same time.
[2] The timeframe that would have to be considered for determining the highest effluent concentration for the first biological monitoring studies would start at CIF and end the last day of the year preceding the year the first study design has to be submitted. For subsequent studies, the timeframe would start the first day of the year the previous study design was submitted and end the last day of the year preceding the year the subsequent study design has to be submitted.
[3] If a coal mine uses the results of the previous two biological monitoring studies to trigger reduced monitoring, the earlier of those two studies can not be used to trigger reduced monitoring for the subsequent study.
[4] The Regulations would not allow results from the first biological monitoring study to be taken into account when determining if the mine is triggered to investigative studies if, for mines subject to the general approach, sampling for the first study occurred before the effluent quality standards apply, or, for mines subject to the alternative approach, sampling occurred before the first step down applies.
[5] A similar type of effect is an effect in the same effect indicator in the same direction from zero relative to reference levels.

The conditions in Table 3-6 would need to be assessed every three years during the design phase of biological monitoring studies, during which the owner or operator of each coal mine would be required to prepare and submit a study design (section 3.6.2). The first study design would have to be submitted not later than 18 months after CIF and at least 6 months before the start of the biological monitoring studies. Subsequent study designs would generally have to be submitted every three years and at least 6 months before the start of the biological monitoring studies, unless different timelines apply (section 3.6.2). The conditions under Table 3-6 would have to be assessed based on information gathered during a certain timeframe, usually the previous three years for subsequent study designs.

Other conditions, i.e. those for reduced monitoring frequency or investigative study, would have to be assessed taking into account results from the previous two biological monitoring studies. A first interpretative report containing the first biological monitoring study results would have to be submitted to the Minister of the Environment not later than 42 months after CIF, with the subsequent reports, if required, every three years thereafter, unless different timelines apply (section 3.6.3). Since results for

the second biological monitoring studies would not be submitted before 6.5 years after CIF, mines would not be eligible for reduced monitoring before that time.

For the application of the investigative study conditions, and contrary to the reduced monitoring conditions, the Regulations would not always allow the use of the first biological monitoring study results in determining whether or not an investigative study is required. This would be the case, for a mine subject to the general approach, if sampling for the first study occurred before the effluent quality standards proposed in section 1.2 apply. For a mine subject to the alternative approach, this would happen if sampling occurred before the first step down for selenium and nitrate limits at ECPs applies as described in sections 2.5.2 and 2.5.3. This is proposed in order to limit the investigation effort on effects or exceedances of selenium guidelines to times where initial reductions in selenium deposits are expected to occur. As a result of this proposal, in most cases, investigative study results would not be submitted to the Minister of the Environment before 12.5 years after CIF.

3.6 Reporting

3.6.1 Annual Reporting of Effluent, Water and Selenium Monitoring

The owner or operator of each coal mine would have to submit their effluent characterization, SLT, WQM and selenium monitoring information electronically to the Minister of the Environment no later than 45 days after the first day of the following year.

The annual reporting information would include:

- The dates on which samples were collected;
- The latitude and longitude of the FDPs from which effluent characterization sample were collected;
- The latitude and longitude of the FDP and ECP(s) (if applicable) from which samples were collected for SLT, an explanation of how the FDP was determined to have potentially the most adverse impact on the environment, and any supporting information;
- The latitude and longitude of the WQM and selenium monitoring locations and a description sufficient to identify these locations in the field;
- The results of effluent characterization, SLT, WQM, and selenium monitoring, and, where applicable, MDLs and MDL exemption information (if applicable);
- The effluent characterization, WQM and selenium monitoring methodologies, and a description of the QA/QC measures implemented and the data related to the implementation of those measures;
- The calcite saturation index calculated for each sample of water collected in the exposure area and at each ECP (if applicable), and each sample of effluent (see Table F-3);
- The annual mean concentration of total mercury at each FDP (mine subject to the general approach only); and,
- In the case of a new FDP, a description of changes to effluent plumes and WQM locations since the most recent study design (mine subject to the general approach only).

3.6.2 Study Design

The Regulations would set specific timelines around the design of biological monitoring studies, requiring the owner or operator of each coal mine to prepare and submit biological monitoring study designs to the Minister of the Environment.

The first study design would have to be submitted not later than 18 months after CIF and at least 6 months before the start of the biological monitoring studies. Subsequent study designs would have to be submitted for every three-year period. If a biological monitoring study is required at the mine, the subsequent study design would have to be submitted at least 6 months before the start of the study. If a mine is not required to conduct any biological monitoring studies, the subsequent study design would have to be submitted no later than 12 months after the day on which the previous interpretative report was required to be submitted or would have been required to be submitted. Other reporting timelines would apply to subsequent study designs for mines subject to the general approach that resume the deposit of effluent after a period of cessation (see section 3.8).

The study design would include:

- Site characterization information (section 3.3) (detailed for first study; subsequent studies in summary format, with new information updated in detail);
- An explanation of how the characteristics of each exposure area and related reference area demonstrate that the fish habitat of the reference area is most similar to the exposure area;
- An indication of which FDPs contribute to each effluent plume (mine subject to the general approach);
- An explanation of how the areas with highest potential for effects on the BIC were determined;
- Estimates for the highest concentrations of effluent (mine subject to the general approach), the highest concentrations of selenium and nitrates (mine subject to the alternative approach), and the calcite metrics (Table F-3), a description of the methodologies used to determine the estimates, supporting data, including any raw data, and a description of the implemented QA/QC measures;
- Description of the type of production process used by the mine and environmental protection practices at the mine;
- Description of anthropogenic, natural or any other factors not related to the effluent that may reasonably be expected to affect the results of any biological monitoring studies;
- Description of how any required biological monitoring studies will be conducted, including the scientific rationale for the selection of the fish species, sampling areas, sample size, sampling periods, and field and laboratory methodologies;
- An explanation as to how the studies will determine if the effluent has an effect on BIC, fish population, fish tissue selenium, fish tissue mercury or an exceedance of selenium guidelines and for mines subject to the alternative approach, how the studies will determine if there are effects or exceedances that occur upstream and downstream of the ECP and, if applicable, how the effects and exceedances upstream of the ECP compare with the effects and exceedances downstream from the ECP;

- The month which samples will be collected for each required biological monitoring study;
- A description of the QA/QC measures that will be implemented for each study and any additional information to determine if studies will be conducted in accordance with generally accepted standards of good scientific practice;
- A summary of the results from any studies to determine if the effluent has an effect on fish population, BIC, fish tissue or exceedance of selenium guidelines completed before the mine became subject to the Regulations;
- A summary of results of biological monitoring studies conducted after the mine becomes subject to the Regulations (subsequent study designs); and
- If an investigation study is required, a description of how the study will be conducted to determine the cause of the effect (subsequent study designs).

3.6.3 Interpretative Report

The Regulations would set specific timelines for reporting on the results of each biological monitoring studies, requiring the owner or operator of each coal mine to prepare and submit biological monitoring interpretative reports to the Minister of the Environment. The first interpretative report would have to be submitted no later than 42 months after CIF (see section 3.7 for an extension of this timeline under specific conditions) and subsequent interpretative reports no later than 36 months after the day on which the previous interpretative report was required to be submitted or would have been required to be submitted. If biological monitoring is not required in respect of a three-year period, an interpretative report would not be required in respect of that period. Other reporting timelines would apply to subsequent interpretative reports for a mine subject to the general approach that resume the deposit of effluent after a period of cessation (see section 3.8).

The content of interpretative reports depend on the type of study being conducted. Generally, the interpretative reports would include:

- A description of any deviation from the study design;
- The dates and times when samples were collected and the latitude and longitude of sampling area and a description sufficient to identify the location of the sampling areas;
- Sample sizes;
- Descriptive statistics of the effect indicators (e.g., mean, median, SD, standard error, minimum and maximum values), the calculation of the similarity index effect indicator and a comparison of total selenium concentrations of fish taken in the exposure area with selenium guidelines and supporting data;
- The identification of the sex of the fish sampled and presence of any lesions, tumours, parasites or other abnormalities;
- For the selenium in fish tissue study, the type of fish tissue studies and the scientific rationale for the selection of that tissue and the percentage moisture content;
- A determination of whether there is a statistically significant difference between sampling areas, the statistical analysis of the results and the statistical analysis that indicates the probability of correctly detecting an effect of a pre-defined size and the degree of confidence that can be placed in the calculations and the supporting data;

- For an effect indicator with a CES, a comparison of the magnitude of the effect to its CES and a statement of whether the magnitude of the effect is equal to or greater than the CES.
- Description of any QA/QC measures implemented and the data related to the implementation of those measures;
- The identification of any effect on the fish population, BIC, fish tissue mercury, fish tissue selenium and any exceedance of selenium guidelines;
- A summary of the results of effluent characterization, WQM, selenium monitoring, and SLT testing;
- Conclusions of biological monitoring studies and a description of how those conclusions will impact the subsequent study design; and
- The month in which the next biological monitoring studies will start, and the date when the next interpretative report is required to be submitted, if required.

If an investigative study is required, the interpretative report would contain an explanation of the cause of the effect or the exceedance of selenium guidelines and supporting data, including raw data. If the cause of the effect or exceedance is related to the mine's effluent, the interpretative report would include the solution that would assist in eliminating that cause, including a description of how the study was conducted to determine the potential solution, along with an analysis of the cost and technical feasibility and environmental factors considered in determining the potential solution. If the effect is not related to the mine's effluent, the report would include an explanation of why the cause of the effect or exceedance was determined to not be related to the mine's effluent, and a description of changes that would be made to the subsequent study design to avoid this cause from affecting the results of subsequent studies.

3.7 Provincial or Territorial Monitoring

A timeline extension of up to 18 months for submitting the first interpretative report is proposed as a mechanism to allow for the use of the same fish or BIC sampling campaign(s) to fulfill both EEM and provincial or territorial monitoring requirements.

In order to be eligible for this timeline extension, the owner or operator would have to provide, as part of the first study design, evidence demonstrating that:

- At CIF, monitoring of fish or BIC was already required by the province or territory for their coal mine;
- The timing of the submission of the first interpretative report is the only factor precluding them from using their provincial or territorial sampling campaigns to fulfill part or all of their EEM biological monitoring requirements; and
- An extension of up to 18 months for the submission of the first interpretative report would allow them to fulfill both EEM and provincial or territorial requirements with the same fish or BIC sampling campaign.

In addition, the owner or operator would need to provide, as part of the submission of their first study design, a copy of the provincial or territorial permit where the fish or BIC monitoring timeline or frequency is prescribed, in addition to indicate the date at which their first interpretative report will be submitted (not to exceed 60 months following CIF).

If the conditions described above are met, the first interpretative report would have to be submitted no later than 60 months following CIF instead of 42 months. This timeline extension would only be available to existing mines subject to the general approach and mines subject to the alternative approach.

3.8 Cessation of Deposit

Similar to the MDMER, the owner or operator of a mine subject to the general approach would no longer be required to conduct EEM studies if no effluent has been deposited from their mine for a period of at least 36 consecutive months. However, if sampling or testing for a biological monitoring study happened during the 36-month period, the owner or operator would be required to complete the study and submit the interpretative report required for this study before being exempted from EEM requirements.

This exemption would apply to the conduct of all EEM studies, i.e. effluent characterization, SLT testing, WQM, selenium monitoring as well as biological monitoring studies and would last as long as no effluent is deposited from the mine. As soon as the deposit of effluent resumes at the mine, the exemption would cease to apply and the owner or operator would have to resume conducting all EEM studies as per the applicable timelines. Note that a study design would have to be submitted at least 6 months before the start of the biological monitoring studies, and an interpretative report, if biological monitoring studies are required at the mine, not later than 36 months after the day the deposit of effluent resumes. If no biological monitoring studies are required the study design would have to be submitted not later than 12 months following the day the deposit of effluent resumes.

This cessation of deposit exemption is only proposed for a mine subject to the general approach.

3.9 Extension of Time to Meet EEM Requirements

New proposal:

The COVID-19 pandemic highlighted a potential need for greater regulatory clarity for regulatees when the EEM requirements for collection and analysis of samples cannot be met due to unforeseen circumstances. As such, in addition to the proposal under section 4.2, extension-of-deadline provisions are being introduced in EEM. These new provisions aim to provide regulatory certainty for exceptional situations when EEM requirements cannot be met due to unforeseen circumstances.

These new extension-of-deadline provisions would apply to all components of EEM (i.e., effluent characterization, SLT testing, WQM, selenium monitoring and biological monitoring studies) and would not remove sampling or analysis requirements. Instead, the extension-of-deadline provisions would shift the deadline for when a report, sample or analysis must be submitted or conducted, to a later time when it is practicable to do so.

Part 4 Other General Provisions

4.1 Calculation of Monthly Mean

The monthly mean concentrations of deleterious substances would need to be calculated to determine whether maximum monthly mean concentrations are met at FDPs and ECPs. It is proposed that monthly mean concentrations are to be determined by:

1) Calculating the weekly mean concentration of a given deleterious substance by adding the concentration measurements taken during a given week and dividing by the number of concentration measurements taken. For weeks where there is no effluent deposited through a given FDP, there would be no weekly mean at that FDP; and
2) Adding the weekly mean concentrations determined during a given month and dividing by the number of weeks for which means were determined.

A week would mean a calendar week (from Sunday to Saturday), and a week would be included in whichever month the majority of the days in that week are found.

If sampling and testing beyond the minimum frequency under the CMER is conducted, the results of this testing would need to be reported and included in the monthly mean calculations provided the samples were collected during a deposit.

4.2 Extension of Time to Collect Samples

It is proposed to allow for the extension of deadlines for collecting samples when unforeseen circumstances cause safety concerns or access problems that render the collection of samples impractical. Conditions related to the extension would include notifying an inspector, without delay, of the circumstances, and when they expect to be able to collect the samples. Samples would have to be collected as soon as circumstances permit. Similar extension of deadline provisions are being proposed for EEM, as described in section 3.9.

4.3 Analytical Requirements

Laboratory Accreditation

It is proposed that total suspended solids, total selenium, total nitrate, total dissolved selenium, selenite, selenate, selenomethionine and acute lethality testing would need to be performed by a laboratory that meets the following conditions at the time of the analysis:

1. Is accredited
    - under the International Organization for Standardization standard ISO/IEC 17025, entitled *General requirements for the competence of testing and calibration laboratories,* by an accredited body that is a signatory to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement, or
    - under the *Environment Quality Act*, CQLR, c. Q-2; and
2. The scope of its accreditation includes the analytical method used to make the determination

Other Analytical Requirements

Analytical requirements including MDLs, precision, and accuracy are proposed for the Regulations. The proposed requirements are found in Annex D.

New proposal:

An exemption from having to meet the MDL for a given substance or parameter recorded in a given sample of effluent or water is proposed to address situations where meeting the prescribed MDL would result in damage to analytical instruments or cause interference in analytical results.

In order to be exempt, the owner or operator would need to provide evidence that the following exemption conditions are met for each substance or parameter analyzed in every sample for which an exemption is sought:

- the dilution of the sample was necessary in order to avoid damage to the analytical instruments or interference in the analytical results
- the lowest possible dilution ratio was applied to the sample so that these problems could be avoided while obtaining an MDL as close as possible to the prescribed MDL

The value of the resulting MDL would also need to be provided in the annual reporting of effluent characterization and WQM data (section 3.7.1) or in the monitoring report (section 4.5.4), as the case may be.

4.4 Emergency Response Plans

An Emergency Response Plan (ERP) is a plan that describes the actions a mine would take in the event that there is, or may be, a deposit of a deleterious substance, within the meaning of subsection 34 (1) of the *Fisheries Act* to prevent any unauthorized deposit of such a substance or to counteract, mitigate or remedy the effects of such a deposit.

It is proposed that the owner or operator of a mine prepare an ERP within 60 days of being subject to the Regulations that includes the following elements:

- The identification of any unauthorized deposit that can reasonably be expected to occur at the mine and that can reasonably be expected to result in damage or danger to fish habitat or fish or the use of fish by humans, and the identification of the damage or danger;
- A description of the measures to be used to prevent, prepare for, respond to and recover from an unauthorized deposit;
- A list of the individuals who are to implement the plan in the event of an unauthorized deposit, and a description of their roles and responsibilities;
- The identification of the emergency response training required for each of the individuals who will implement the plan;

- A list of the emergency response equipment included as part of the plan, and the equipment's location; and
- Alerting and notification procedures including the measures to be taken to notify members of the public who may be adversely affected by an unauthorized deposit.

The ERP would need to be updated and tested on an annual basis. Information relating to the tests and modifications to the ERP would need to be recorded and kept.

The most recent version of the ERP would need to be readily available at the mine site so they are accessible to the individuals responsible for carrying out the plan in case of an emergency.

4.5 Reporting

Reporting requirements and frequency of reporting would be established for the Regulations as described in the following sub-sections. Additional reporting obligations for EEM are outlined in section 3.6.

4.5.1 Identifying Information

It is proposed that the owner or operator of a coal mine would be required to submit the following information within 60 days of becoming subject to the CMER:

- Identifying information about the owner and operator of the mine, including the name and address of the contact person, the owner and operator, and the parent company of the mine;
- A description of the coal mine, including maps or diagrams with geographical coordinates, which identify works or undertakings of the coal mine, permitted mine boundaries, final discharge points, environmental compliance points (if applicable), background points (if applicable), waterbodies located at and around the coal mine, and, if applicable, areas that are recognized as reclaimed by the province;
- Effluent treatment systems at the coal mine including their location, expected deleterious substance removal rate (if known), and the operational status of these systems;
- Whether coal production is occurring at the coal mine, and, if coal production is not occurring, the date on which coal production ceased to occur; and
- The amount of rainfall at the mine that consists of an exceptional rainfall amount along with supporting information.

Updates related to contact person information would need to be made within 14 days of the change. Updates related to all other identifying information would need to be made within 60 days of the change.

4.5.2 Final Discharge Points

It is proposed that the owner or operator of a coal mine would be required to identify each final discharge point and submit the following information within 60 days of becoming subject to the CMER:

- The name of the FDP;
- Plans, specifications and a general description of each final discharge point together with its location by latitude and longitude;

- A description of how the FDP is designed and maintained in respect of the deposit of deleterious substances;
- A description of the works or undertakings of the coal mine from which the effluent being deposited through that FDP point is generated, including, in the case of mines subject to the alternative approach, an indication as to whether any of those works or undertakings are expansions; and
- A description of each receiving body of water, including the name and the provincial identification number, if applicable, into which effluent is deposited from the final discharge point.

Updates with respect to new FDPs or changes to a FDP would be required 60 days prior to depositing effluent from a new FDP or making the change. A notification confirming the updates would be required within 30 days of depositing effluent from a new FDP or completing changes to a FDP.

Updates with respect to a FDP identified by an inspector, and that was not initially identified would need to be made within 30 days.

4.5.3 Background Points

For mines subject to the alternative approach, the owner or operator would be required to identify each background point and submit the following information within 60 days of becoming subject to the CMER:

- The name of the background point and ECP it is associated with;
- A general description including its location by latitude and longitude and the waterbody in which it is located; and
- Information to demonstrate that the background point is located as close as feasible to where the mine first deposits effluent or, where the background point coincides with another mine's ECP, information to demonstrate that the mine deposits effluent upstream of that ECP.

4.5.4 Monitoring Results

The owner or operator of a coal mine would be required to submit an effluent monitoring report on a quarterly basis. The report would include information for all tests and monitoring conducted during each quarter, at each FDP. In the case of mines subject to the alternative approach, it would also include information collected at ECPs and background points.

For each FDP, the quarterly report would include:

- The start and end date of each period that effluent was deposited during that period;
- The dates on which effluent samples were collected;
- The pH of the effluent samples;
- The concentrations and monthly mean concentrations of prescribed deleterious substances of the effluent samples, where applicable, MDLs and MDL exemption information;
- Acute lethality results, including the reference method used;
- Where there was an acute lethality failure, results of effluent characterization conducted;
- If any blasting was carried out during that calendar quarter, the dates on which the blasting occurred;

- The total weekly volume of effluent deposited; and
- If an exceptional rainfall event occurred:
    - a statement that the event occurred;
    - time and date the exceptional rainfall event started and ended;
    - the total amount of rain, in mm, in the 24 hours preceding the start of the exceptional rainfall event; and
    - a statement indicating whether another event occurred within 72 hrs.

If no effluent is deposited from a given FDP in the quarter, the report would only need to include a statement to that effect.

In the case of mines subject to the alternative approach, for each ECP and background point, the quarterly report would also include:

- The dates on which water samples were collected;
- The pH of the water samples;
- The concentrations and monthly mean concentrations of prescribed deleterious substances in the water samples, where applicable, MDLs and MDL exemption information; and
- The volume of water flowing through each ECP and background point during each week of that period;
    - For each weeks where the volume was not determined, the reason why the determination was not made.

4.5.5 Non-point Source Effluent

The owner or operator of a coal mine subject to the alternative approach would be required to submit a report with respect to non-point source effluent, each calendar year. This report would need to be prepared by one or more qualified professionals. It would include:

- A description of the sources of non-point source effluent and the manner in which non-point source effluent is deposited (e.g. groundwater, runoff, etc.);
- An estimate of the total volume of non-point source effluent deposited into each water body from the mine during that year; and
- An estimate of the total selenium and nitrate loading from non-point source effluent deposited into each water body during that year.

4.5.6 Unauthorized Deposits

It is proposed to specify in the Regulations information to include in a report required by subsection 38(7) of the *Fisheries Act* in respect of an unauthorized deposit of a deleterious substance. In addition, it is proposed that where an unauthorized deposit occurs (within the meaning of subsection 38 (5) of the *Fisheries Act*), that acute lethality testing for both fish and benthic species, pH testing as well as testing for total selenium, total nitrate and TSS concentrations be conducted.

The report would require information on:

- The nature and quantity of deleterious substance deposited and the location of the unauthorized deposit;
- The results from acute lethality, pH, total selenium, total nitrate and TSS testing;
- The circumstances of the deposit and the measures that were taken to mitigate the effects of the deposit and, if an emergency response plan was implemented, details concerning its implementation; and
- Measures that were taken, or that are intended to be taken, to prevent any similar occurrence of an unauthorized deposit.

4.6 Record Keeping

It is proposed that all records and documents to assess compliance with the Regulations be kept for a period of at least 5 years. These would include, but not be limited to, records relating to identifying information, final discharge points, background points, expansions, effluent and water sampling and testing, flow monitoring, including manufacturer's specifications, accuracy verification and calibration, rainfall measurements, recognized closed mine or area of mine provisions, emergency response plans, and unauthorized deposit reports required by subsection 38 (7) of the *Fisheries Act*.

Part 5 Public Availability of Information and Regulatory Review

5.1 Public Availability

ECCC proposes to make the data and information it collects, including EEM, publicly available to the extent possible[11].

5.2 Regulatory Review

It is proposed to include in the Regulations a requirement to undertake a 5-year status report on the selenium requirements under sections 1.2.4 and 2.6.1. The status report would take into account EEM study results related to selenium submitted over the first 5 years after CIF and advances in selenium removal technology. The results of the status report would be used to inform future policy development and possible amendments.

Furthermore, it is proposed to include in the Regulations a requirement to undertake a 10-year review of the Regulations as a whole. The review would take into account all EEM results submitted over the first 10 years after CIF and advances in selenium removal technology. The results of the review would be used to assess the effectiveness of the regulatory requirements, including selenium concentration requirements at ECPs, and inform future policy development and possible regulatory amendments.

Changes since 2020 proposal and rationale

The requirement to undertake a 5-year status report on the selenium requirements was added to account for any advances in selenium removal technology that could occur in the short-term and to take into account information provided further to the Regulations that could inform any needed changes in advance of the 10-year review.

[11] Legal or other restrictions may apply.

Part 6 Next Steps

The next steps for regulatory development are as follows:

- Interested parties submit comments on the *Proposed Approach for Coal Mining Effluent Regulations* to ECCC (ermc-cmrd@ec.gc.ca) by March 1, 2022.
- Pre-publication of the proposed Regulations in *Canada Gazette*, Part I for a 60 day comment period by the end of 2022.
- Publication of the final Regulations in *Canada Gazette,* Part II, by the end of 2023.

Annex A Proposed Monitoring and Testing Frequency – General Approach

The table below presents the testing and monitoring requirements that would apply to mines subject to the general approach. EEM requirements are presented separately in Table 3-1 (section 3.1).

Table A-1 Proposed Monitoring and Testing Frequency at FDPs for Mines Subject to the General Approach

Proposed Provision	From CIF until 1 year after CIF	Starting 1 year after CIF		
		Regular Frequency	Reduced Frequency	Increased Frequency
Total selenium	**Quarterly** [≥ 1 month apart]	**Weekly** [≥ 24 hours apart]	**Quarterly** [≥ 1 month apart] Applies where: • Low-deposit mine; or • Monthly mean concentration at FDP < 3 µg/L for previous 12 months and no selenium treatment	N/A
Selenium speciation (total dissolved selenium, selenate, selenite and selenomethionine)	**Quarterly** [≥ 1 month apart] at FDPs depositing effluent treated for the removal of selenium or nitrate	**Monthly** [≥ 15 days apart] at FDPs depositing effluent treated for the removal of selenium or nitrate	N/A	N/A
	Quarterly [≥ 1 month apart] at the FDP depositing effluent from the settling pond with the longest residence time	**Quarterly** [≥ 1 month apart] at the FDP depositing effluent from the settling pond with the longest residence time	N/A	N/A
Total nitrate	**Quarterly** [≥ 1 month apart]	**Weekly** [≥ 24 hours apart]	**Quarterly** [≥ 1 month apart] Applies where: • Low-deposit mine; or • No explosives used for previous five years; or • No explosives used for	N/A

			previous 12 months and monthly mean concentration at FDP < 3 mg-N/L for previous 12 months and no nitrate treatment	
TSS	**Quarterly** [≥ 1 month apart]	**Weekly** [≥ 24 hours apart]	**Quarterly** [≥ 1 month apart] Applies where low-deposit mine	N/A
pH	**Quarterly** [≥ 1 month apart]	**Weekly** [≥ 24 hours apart] Record pH at the time of collection of samples	**Quarterly** [≥ 1 month apart] Applies where low-deposit mine Record pH at the time of collection of samples	N/A
Acute lethality testing	N/A	**Monthly** [≥ 15 days apart]	**Quarterly** [≥ 45 days apart] Applies where: • Low-deposit mine; or • Not acutely lethal for 12 consecutive months	**Every 14 days** if effluent determined acutely lethal • Also conduct effluent characterization and determine the concentrations of total selenium, total nitrate and TSS as well as the pH of sample determined to be acutely lethal • Resume testing at regular frequency after 3 consecutive tests are passed
Flow Rate	**Weekly** [≥ 24 hours apart] or **continuous**	**Weekly** [≥ 24 hours apart] or **continuous**	N/A	N/A

Annex B Proposed Monitoring and Testing Frequency – Alternative Approach

Table B-1 presents the testing and monitoring requirements at ECPs and background points. For ECPs, the requirements would apply at CIF. For background points, requirements would apply 6 months after CIF.

Table B-1 Proposed Monitoring and Testing Frequency for ECPs and Background Points for Mines Subject to the Alternative Approach

Parameter	Frequency	Notes
Total selenium, total nitrate, and TSS	**Weekly** [≥ 24 hours apart]	Samples collected at an ECP and its associated background point would be required to be taken within 4 hours of each other
pH	**Weekly** [≥ 24 hours apart]	pH must be recorded at the time of collection
Flow Rate	**Weekly** [≥ 24 hours apart] or **continuous**	-

Table B-2 presents sampling and testing requirements at FDPs. The requirements would apply at CIF.

Table B-2 Proposed Monitoring and Testing Frequency at FDPs for Mines Subject to the Alternative Approach

Parameter	Regular Frequency	Increased Frequency	Notes
Total selenium	**Weekly** [≥ 24 hours apart]	N/A	-
Selenium speciation (selenite , selenate, total dissolved selenium and selenomethianine)	**Monthly** at FDPs depositing effluent treated for the removal of selenium or nitrate [≥ 15 days apart] **Quarterly** at the FDP depositing effluent from the settling pond with the longest residence time [≥ 1 month apart]	N/A	-

Parameter	Regular Frequency	Increased Frequency	Notes
Total nitrate	**Weekly** [≥ 24 hours apart]	N/A	-
TSS	**Weekly** [≥ 24 hours apart]	N/A	-
pH	**Weekly** [≥ 24 hours apart]	N/A	pH must recorded at the time of collection
Acute lethality testing	**Monthly** [≥ 15 days apart]	**Once every 14 day** period if effluent acutely lethal Resume testing at regular frequency after 3 consecutive tests are passed	On samples determined to be acutely lethal – Conduct effluent characterization and determine the concentrations of total selenium, total nitrate and TSS as well as the pH
Flow Rate	**Weekly** [≥ 24 hours apart] or **continuous**	N/A	-

EEM requirements are presented separately in in Table 3-2 (section 3.1).

Annex C Selenium and Nitrate Treatment Technology

The tables below present examples of technologies currently being used or at an advanced stage of development and available for Canadian coal mines. Performance results are included where available. These tables are not intended to be a comprehensive list.

Table C-1 Examples of Technologies for the Removal of Nitrate

Technology Type	Technology	Canadian Mine Application	Performance and Notes	Sources Listed in References section
Active Biological	Reactors	Teck Ltd., Line Creek Operations (coal mine), BC – West Line Creek treatment facility, full-scale fluidized bed reactor (Envirogen)	>99% removal of nitrates	[18]
	Moving bed biofilm reactor	-	<2.0 mg-N/L	[9]
In Situ	Saturated Backfill	Teck Ltd., Elkview Operations (coal mine), BC, full-scale	>99% removal of nitrates	[21]
Chemical	Ion exchange	-	90-98% removal of nitrates	[9]
Physical	Membranes / Nanofiltration	-	>99% removal of nitrates	[8]

Table C-2 Examples of Technologies for the Removal of Selenium

Technology Type	Technology	Canadian Mine Application	Performance and Notes	Sources
Active Biological	Reactors	Teck Ltd., Line Creek Operations (coal mine), BC West Line Creek Active Water Treatment Facility – full-scale fluidized bed reactor (Envirogen)	~95% removal of selenium	[18]
		Teck Ltd., Fording River Operations (coal mine), BC(Coal) – Fording South Active Water Treatment Facility, full-scale fluidized bed reactor (Envirogen)	Currently undergoing commissioning Performance expected to be similar to West Line Creek	[19]
		Anglo American plc./Peace River Coal Inc., Trend (coal mine) – demonstration project, packed bed reactor (ABMet® by GE), BC	Demonstration facility ~92% removal on average of 50 µg/L influent	[1]
		Glencore, Sukunka Project (coal mine), BC - bio-reactor (reviewing ABMet® and Envirogen), BC	EA phase Designing to meet at least 20µg/L	[6]

Technology Type	Technology	Canadian Mine Application	Performance and Notes	Sources
Passive Biological	Passive pond-like system with aeration	-	Used to meet regulated limit of 4.7µg/L in the U.S.	[8]
	Bioreactor Pond (Pass-through ponds specifically designed to treat selenium. Designed to encourage growth of natural microbes that breakdown selenium.)	Conuma Coal Ltd., Brule Mine Project (Coal), BC - Bio-chemical reactor pond	~50% removal, however, it can fluctuate greatly Effluent concentrations of 20-40µg/L for influent of 40-80µg/L	[14]
In Situ	Saturated Backfill	Teck Ltd., Elkview Operations (coal mine), BC, full-scale	>90% removal of selenium	[17]
Chemical	Ion Exchange / Electrochemical reduction	Centerra Gold, Kemess (gold mine), BC, Selen-IX™ (BQE), full-scale, BC	<2 µg/L	[16]

Technology Type	Technology	Canadian Mine Application	Performance and Notes	Sources
Physical	Reverse Osmosis / Nanofiltration	-	>99% removal to under 5µg/L Can be used to concentrate Selenium for further/more efficient treatment using other treatment technology	[4]

Annex D Proposed Analytical Requirements

For all mines, at minimum, the following analytical requirements with respect to Method Detection Limits (MDL), precision, and accuracy are proposed:

Table D-1 Proposed Analytical Requirements for Effluent and Water

Substance / pH	Analytical Requirements – Effluent and Water				
	Precision [1]	Accuracy[2]	MDL[3]		
			Unit	Water	Effluent
Nitrate	10%	100 ± 10%	µg/L (N)	≤ 20	≤ 200
pH	0.1 pH unit	0.1 pH unit	Not applicable		
Selenium	10%	100 ± 10%	µg/L	≤ 0.1	≤ 0.5
TSS	15%	100 ± 15%	µg/L	≤ 2,000	
Aluminum	10%	100 ± 10%	µg/L	≤ 2.5	≤ 10
Ammonia	10%	100 ± 10%	µg/L (N)	≤ 10	≤ 50
Arsenic	10%	100 ± 10%	µg/L	≤ 0.5	≤ 5
Cadmium	10%	100 ± 10%	µg/L	≤ 0.05	≤ 0.5
Calcium	10%	100 ± 10%	µg/L	≤ 10	≤ 100
Chromium	10%	100 ± 10%	µg/L	≤ 1	≤ 10
Cobalt	10%	100 ± 10%	µg/L	≤ 0.5	≤ 5
Copper	10%	100 ± 10%	µg/L	≤ 0.5	≤ 5
Iron	10%	100 ± 10%	µg/L	≤ 30	≤ 150
Lead	10%	100 ± 10%	µg/L	≤ 0.1	≤ 1
Manganese	10%	100 ± 10%	µg/L	≤ 5	≤ 5
Mercury	10%	100 ± 10%	µg/L	≤ 0.01	
Nickel	10%	100 ± 10%	µg/L	≤ 2.5	≤ 25
Nitrite	10%	100 ± 10%	µg/L (N)	≤ 20	≤ 200
Nitrogen	10%	100 ± 10%	µg/L (N)	≤ 150	≤ 200
Phosphorus	10%	100 ± 10%	µg/L	≤ 5	≤ 50
Sulphate	10%	100 ± 10%	µg/L	≤ 600	≤ 3,000
Dissolved Solids	10%	100 ± 10%	µg/L	≤ 10,000	
Uranium	10%	100 ± 10%	µg/L	≤ 1	≤ 7.5
Zinc	10%	100 ± 10%	µg/L	≤ 3.5	≤ 10
Alkalinity	10%	100 ± 10%	µg/L	≤ 2,000	≤ 3,000
Electrical Conductivity	10%	100 ± 10%	µS/cm	≤ 1	≤ 2
Hardness	10%	100 ± 10%	µg/L	≤ 1,000	

1. Relative standard deviation at concentrations 10 times above the MDL.
2. Analyte recovery at concentrations above 10 times the MDL.
3. Lowest concentration that can be distinguished from zero at the 99% confidence interval.

Table D-2 Proposed Method Detection Limits for Fish Tissue Selenium and Fish Tissue Mercury

Fish Tissue Study	Method Detection Limits
Fish Tissue Selenium	≤ 0.5 µg/g (dry)
	≤ 0.1 µg/g (wet)
Fish Tissue Mercury	≤ 0.05 µg/g (wet)

Annex E Proposed Locations for ECPs

The maps presented in the figures below were adopted and modified, with permission, from Teck Coal Limited's documentation prepared for the 2020 annual reporting under BC provincial Permit 107517. ECCC placed markers for the proposed ECP locations. The maps also show locations of: existing monitoring locations as well as compliance points and order stations for the provincial Permit 107517 as last amended in July, 2021.

Figure E-1 shows the proposed location of the ECP on the Fording River for the Fording River Mine. The ECP corresponds to the provincial compliance point, E223753, located downstream of the mine on the Fording River, upstream of Chauncey Creek.

Figure E-2 shows the proposed locations of two (2) ECPs for the Greenhills mine. The first corresponds to the order station on the Fording River, 0200378, downstream of the mine. This ECP is ~20km downstream from the Fording River mine. The second ECP corresponds to the provincial compliance point on the Elk River, E300090.

Figure E-3 shows the proposed location of the ECP on the Fording River for the Line Creek mine. This location corresponds to the order station, 0200028.

Figure E-4 shows the proposed location of the three (3) ECPs for the Elkview mine. The first corresponds to the provincial compliance point on Harmer Creek. The second corresponds to the order station, E300091, on Michel Creek downstream of the mine but before the confluence with the Elk River. The third corresponds to the order station, 200393, on the Elk River downstream of Michel Creek.

Figure E-5 shows the proposed location of the ECP on Michel Creek for the Coal Mountain mine, which corresponds to the provincial compliance point, E258937.

Figure E-1 Map of Fording River Operation and Proposed ECP on Fording River.

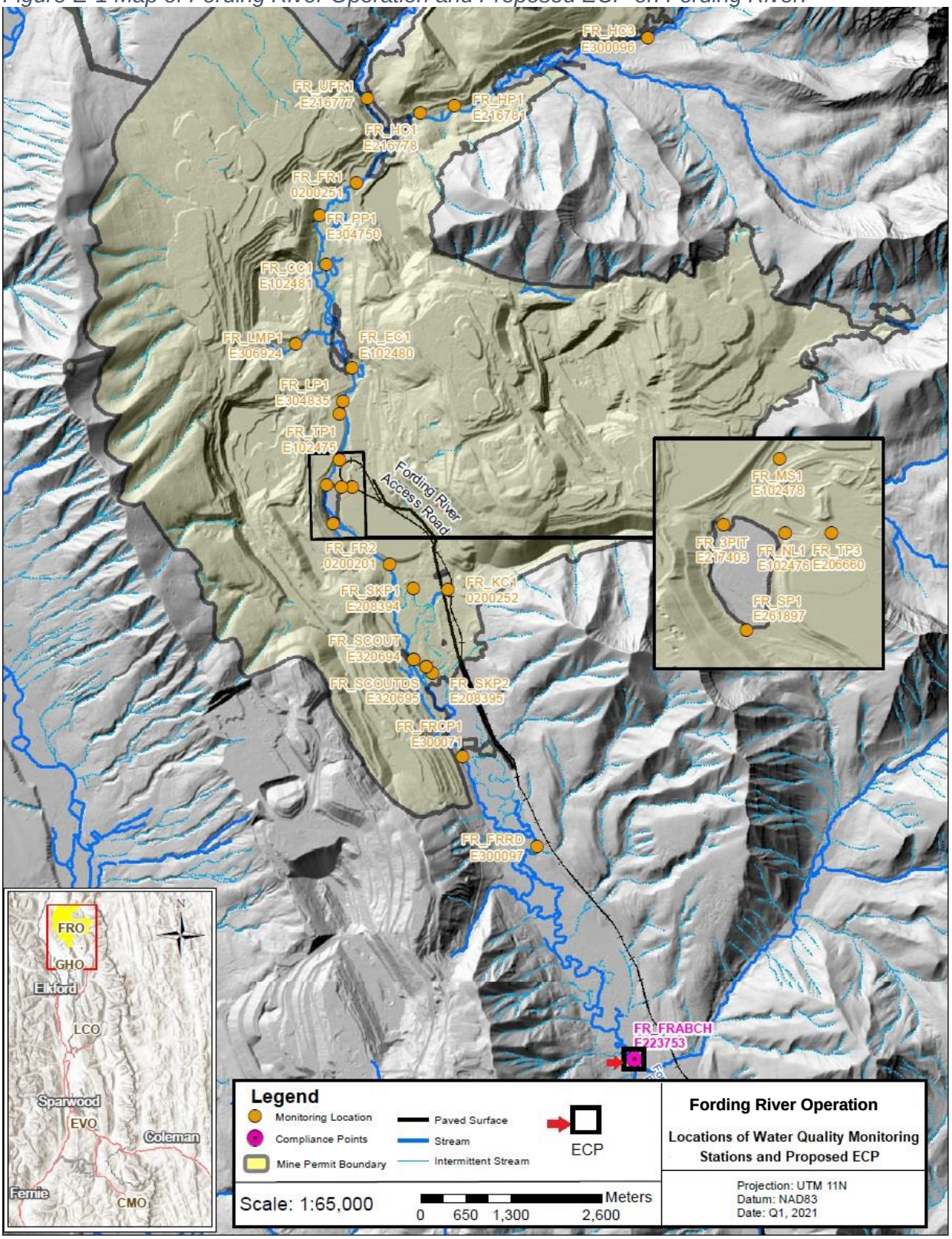


Figure E- 2 Map of Greenhills Operation and Proposed ECPs on Fording River and Elk River.

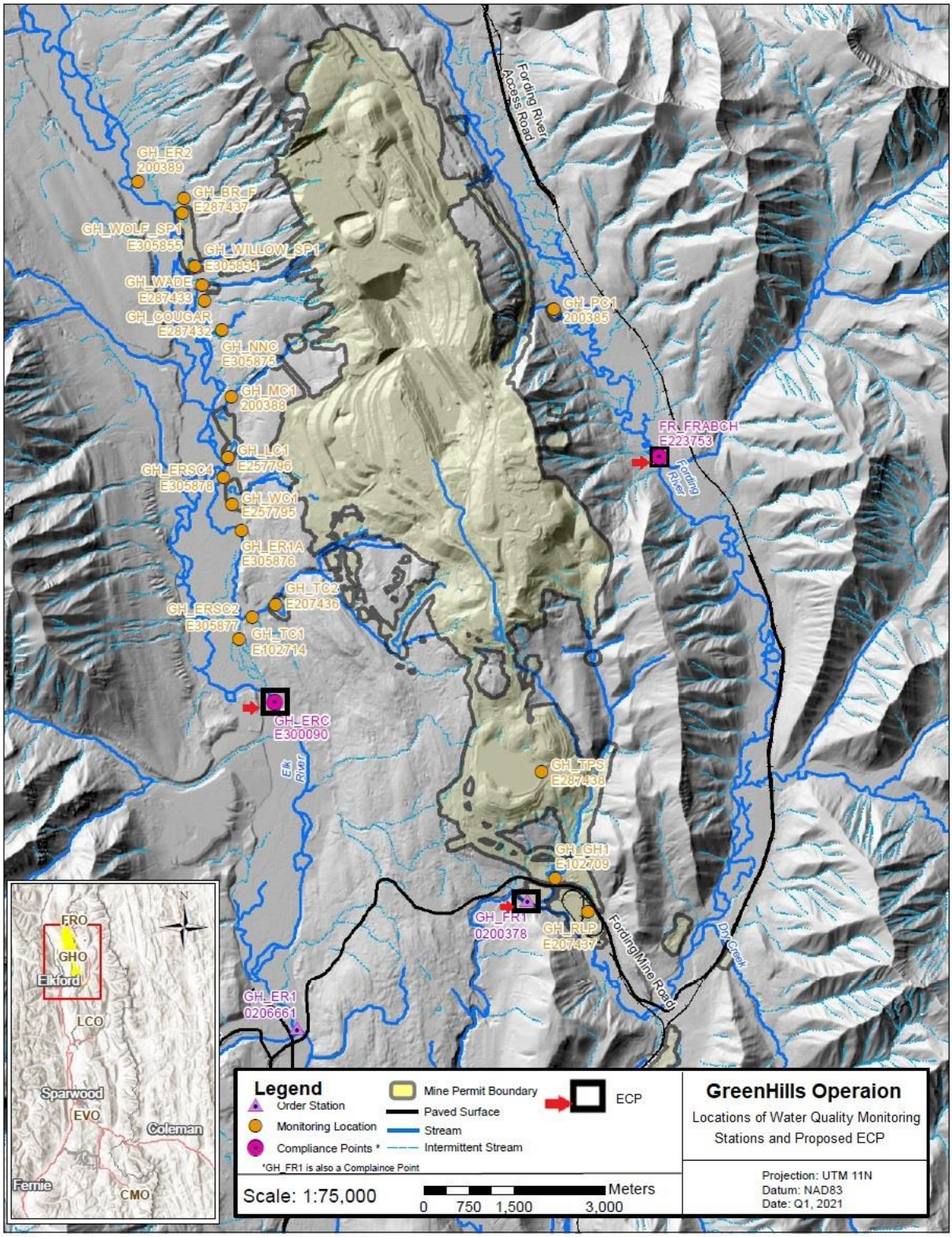


Figure E- 3 Map of Line Creek Operation and Proposed ECP on Fording River.

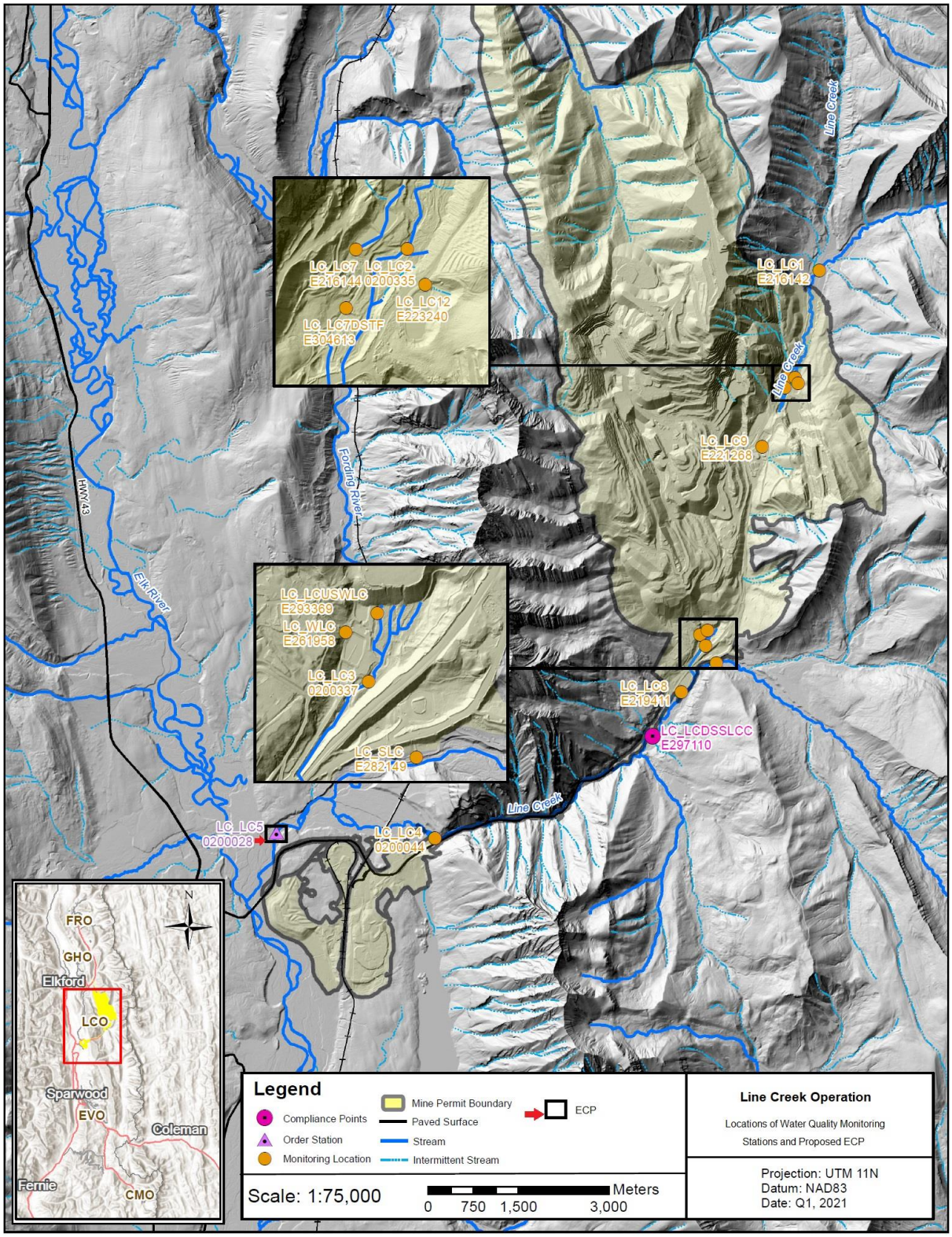


Figure E- 4 Map of Elkview Operation and Proposed ECPs on Michel Creek, Harmer Creek, and Elk River.

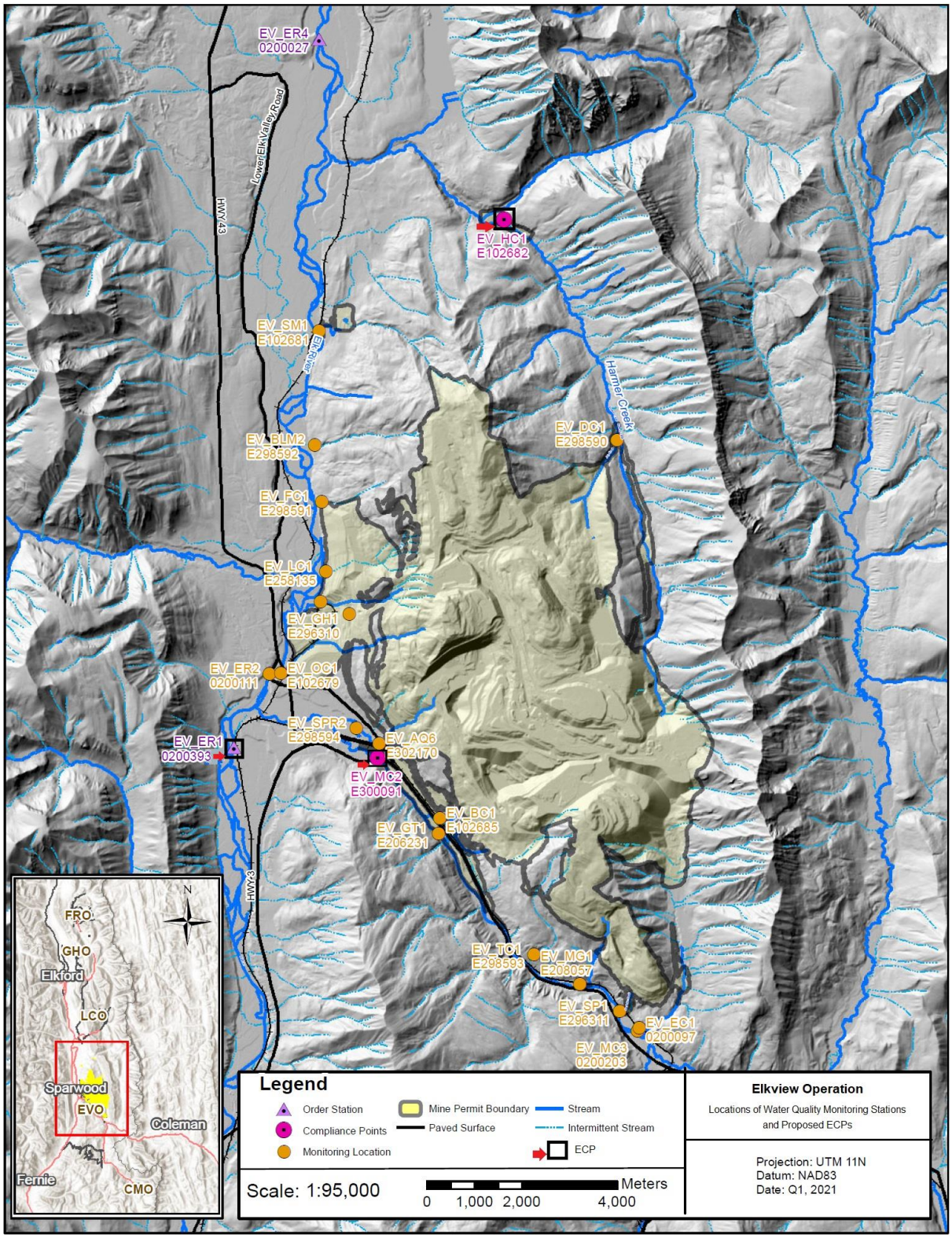
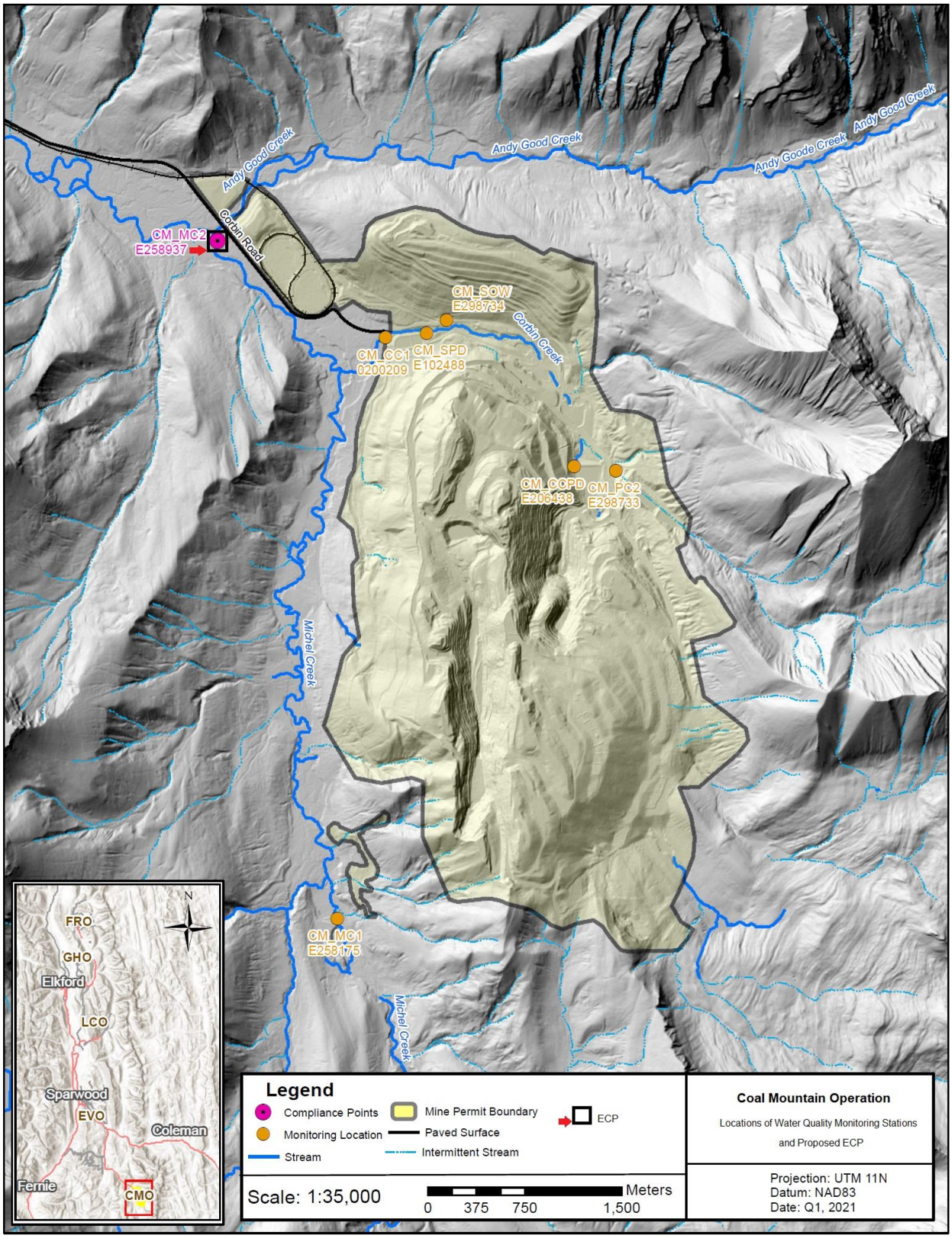


Figure E- 5 Map of Coal Mountain Operation and Proposed ECP on Michel Creek.



Annex F Environmental Effects Monitoring Studies

Table F-1 Proposed Substances and Parameters for Effluent Characterization and Water Quality Monitoring (Substances in Total Values)

Effluent characterization	Water quality monitoring
	Selenium[1]
	Nitrate[1]
	Suspended solids[1]
Aluminum	Aluminum
Ammonia	Ammonia
Arsenic	Arsenic
Cadmium	Cadmium
Calcium	Calcium
Chromium	Chromium
Cobalt	Cobalt
Copper	Copper
Dissolved Solids	Dissolved Solids
Lead	Lead
Iron	Iron
Manganese	Manganese
Mercury[2]	Mercury
Nickel	Nickel
Nitrite	Nitrite
Nitrogen	Nitrogen
Phosphorus	Phosphorus
Sulphate	Sulphate
Uranium	Uranium
Zinc	Zinc
Alkalinity (total and dissolved)	Alkalinity (freshwater, estuarine) (total and dissolved)
Hardness	Hardness (freshwater, estuarine)
Electrical conductivity	Electrical conductivity
Temperature	Temperature
	Dissolved oxygen
	Redox potential (at water-sediment interface)
	pH (freshwater, estuarine)
	Salinity (estuarine, marine)

[1] Proposed deleterious substances, see section 1.2 and 2.5.

[2]For mines subject to the general approach, it is proposed that the recording of the concentration of total mercury in effluent may be discontinued if that concentration is less than 0.10 μg/L in 12 consecutive samples from each FDP. It is proposed that if there is a new FDP at the mine or identified by an inspector or if the location of an existing FDP is changed the mine would resume the recording of the concentration of total mercury.

Table F-2 Proposed Sublethal Toxicity Reference Methods

Test	Receiving Environment	Test species	Reference method
Fish	Marine	Inland Silverside (*Menidia beryllina*) or Topsmelt (*Atherinops affinis*)	EPA/821/R-02/014
	Freshwater	Fathead Minnow (*Pimephales promelas*)[1] or Rainbow Trout (*Oncorhynchus mykiss*)	EPS 1/RM/22 or EPS 1/RM/28
Invertebrate	Marine	Echinoids (sea urchins or sand dollars)	EPS 1/RM/27
	Freshwater	Water Flea (*Ceriodaphnia dubia*)	EPS 1/RM/21
Algae	Marine	Giant Kelp (*Macrocystis pyrifera*))	EPA/600/R-95-136
	Freshwater	Green Algae (*Pseudokirchneriella subcapitata*)	EPS 1/RM/25 or MA. 500 – P.sub 1
Plant	Freshwater	Common Duckweed (*Lemna minor*)	EPS 1/RM/37

[1] Rainbow Trout are used where Fathead Minnows are not an indigenous species.

Table F-3 Proposed Calcite Requirements for Mines Subject to the General or Alternative Approaches

Substrate measurements[1]	**All coal mines**			**Mines subject to Alternative Approach**	
	Reference area	Exposure area	Along a distance of 100 m from each FDP	Along a distance of 100 m from each ECP	Exposure area upstream of ECP
Estimate of the percent area of bottom substrate covered with calcite precipitate	✓	✓	✓	✓	N/A
Description of degree of calcite concretion	✓	✓	✓	✓	N/A
The ratio of the total longitudinal distance with more than 10% calcite precipitate (B)[2] to the total longitudinal distance (A)[3]	N/A	N/A	N/A	N/A	✓
Effluent and water measurements	**All coal mines**				
Calcium Carbonate Saturation Index[4]	Calculate calcium carbonate saturation index (SI) for each sample of water collected in the exposure area and at each ECP (if applicable), and each sample of effluent using the following formula: SI = pH – pHs, where, • pH is the pH measured during WQM in the reference area • pHs is the pH of calcium carbonate saturation calculated from temperature, total dissolved alkalinity, total dissolved solids or conductivity, and total dissolved calcium.				

[1] Conducted every 3 yrs and reported in study design.
[2] B is the total longitudinal distance of water bodies within the exposure area upstream of the ECP with more than 10% bottom substrate covered with calcite precipitate.
[3] A is the total longitudinal distance of water bodies within the exposure area upstream of the ECP.
[4] Reported yearly as part of effluent, water quality and selenium monitoring reporting.

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