# Proposed Regulatory Framework for Coal Mining

*Consultation Document*

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## 1. Introduction

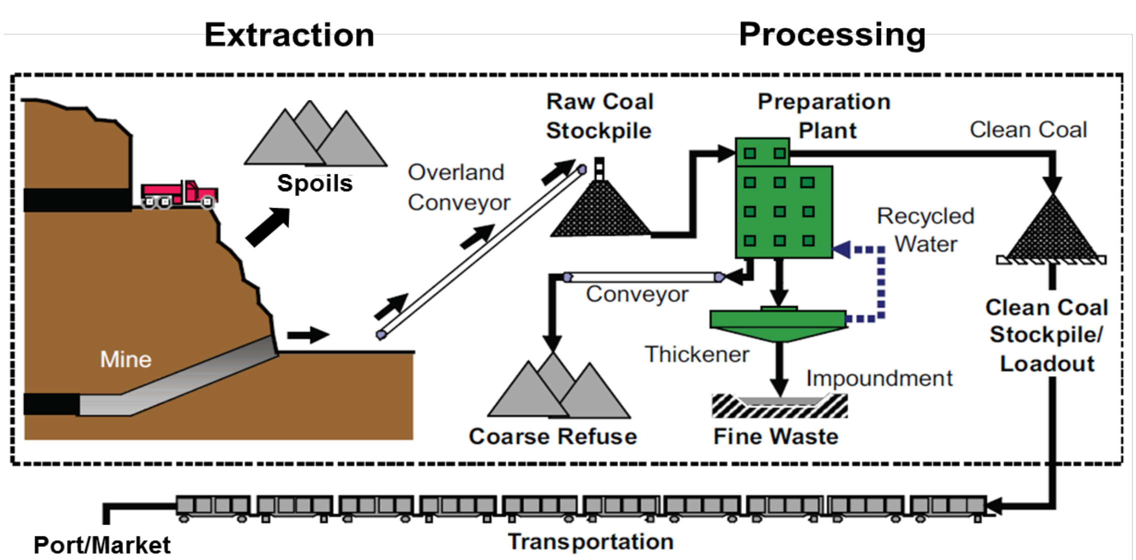
Environment and Climate Change Canada (ECCC) has prepared this consultation document to inform interested parties and solicit feedback on the key elements of the proposed framework for a new regulation for the coal mining sector. Interested parties may comment in writing by mail or e-mail (see Section 5 for details).

## 2. Context

### *2.1. Background*

Canada is a mid-size producer of coal, ranking 12th among global coal producing countries. In 2015, Canadian mines produced 62 million tonnes of coal. Canadian coal mines produce metallurgical coal (used in steelmaking), as well as thermal coal (used to generate power). There are two types of mining methods used in Canada: underground and surface mining. The majority of coal mines are surface mines, which include strip mines and mountain mines.

Coal mining involves extraction and processing operations. Extracted coal is sent to preparation plants for processing, while mine wastes generated from extraction are placed in spoils. Effluent is generated from both extraction (e.g. due to precipitation and runoff) and processing operations (e.g. tailings impoundments). Most effluent treatment at coal mining operations in Canada is done by conventional means, i.e., diversion, settling, and sedimentation, and the treated effluent is then discharged into the receiving environment. Effluent from coal processing operations can also be recycled. A general overview of coal mining operations[1] is presented in Figure 1.




[1] Figure 1. Overview of coal mining operations (adapted from Virginia Center for Coal and Energy Research; Virginia Polytechnic Institute and State University, 2009).

Local and regional water quality may be affected by mining activity at coal mines. After being removed to access the coal, waste rock and overburden can be placed in spoil piles or pits. The material stored in spoil piles is exposed to the natural elements. Such exposure can lead to the leaching of contaminants into surface waters through runoff from rain or snow, or through groundwater. Coal mining can also generate air emissions, including fine particulate matter, from the extraction (e.g., drilling, blasting, hauling, collection, transportation and fugitive releases) and processing (e.g., crushing, pulverizing, drying) operations.

## *2.2. Issue*

Coal mining operations can generate mine waste including effluent, tailings (coal rejects) and solid wastes (e.g., waste rock, overburden and fine particulates). The environmental effects of coal mining have been well documented in scientific literature. Effects can be categorized on the basis of the media impacted (i.e., surface water, groundwater, soils, sediments, airsheds), biological systems impacted (i.e., human health and ecological), and geographic scale (i.e., on site, adjacent to site, downstream surface waters, groundwaters and airsheds). The impact of these releases on the environment varies according to the mining method used as well as the local geology, climate, and rainfall. This document focusses on coal mine releases to water and their potential negative effects on fish and aquatic life.

### 2.2.1. Substances of Concern

Selenium, nitrate and total suspended solids are typically the substances of concern related to coal mining effluent, although there may be others that are associated with localized geology.

#### *2.2.1.1. Selenium*

Selenium has been identified as an issue for coal mining operations in certain regions in Canada, namely north and southeastern B.C. and western Alberta. Selenium is known to be a bioaccumulative element, and its effect on aquatic organisms can be related to their internal body concentrations. The most severe effect resulting from long-term exposure to elevated concentrations of selenium in the food web is reproductive failure in egg-laying vertebrates (fish, waterbirds and amphibians).[2] In fish, excess selenium may accumulate in fish eggs and affect developing embryos and larvae, while adults appear to be less affected. Field studies conducted in Canada and other regions of North America have demonstrated the hazards and reproductive effects of selenium on birds and fish when present at sufficiently high concentrations in the food web, as well as its potential impacts on fish populations and biodiversity, all of which affect the integrity of various ecosystems. Effects to aquatic life from selenium are best predicted from concentrations in fish tissues, especially fish eggs and ovaries.

The draft screening assessment report published in July 2015 by Environment and Climate Change Canada (ECCC) and Health Canada in *Canada Gazette*, Part I proposed to conclude that selenium and its compounds meet the criteria under paragraph 64(a) and 64(c) of the *Canadian Environmental Protection Act, 1999* (CEPA 1999) as they are entering or may enter the environment in a quantity or a concentration or under conditions that have or may have an

[2] Environment Canada. (2015). *Draft Screening Assessment: Selenium and its compounds.* Environment Canada and Health Canada. http://www.ec.gc.ca/ese-ees/default.asp?lang=En&n=301B5115-1

immediate or long-term harmful effect on the environment or its biological diversity, and constitute or may constitute a danger in Canada to human life or health. The report also concluded that selenium and its compounds meet the criteria for persistence and bioaccumulation, as defined in the *Persistence and Bioaccumulation Regulations* made under CEPA 1999. The coal mining sector was identified as posing a risk to the aquatic environment due to releases of selenium. The publication of the final Screening Assessment Report is expected in 2017.

##### *2.2.1.2. Nitrate*

Nitrate in coal mine effluents is typically associated with the use of explosives in blasting operations. Coal mining may require blasting to remove rock or overburden, resulting in the release of some nitrate from ammonium nitrate blasting powder. While much coal mining is done by equipment which can rip the softer rock matrix without the need for blasting, certain types of coal mining operations, such as mountainous coal mining operations, require a significant amount of blasting. As a result, nitrate is likely entering the environment from coal mining activities.

##### *2.2.1.3. Total Suspended Solids*

Total suspended solids (TSS) are solid materials, both mineral and organic, that have been moved from their place of origin by air, water, ice, or gravity. TSS from coal mining are generated following the removal of vegetation, blasting of overburden and the use of heavy equipment, all of which create erosion and introduce sediment into streams. Sediment loads are particularly high in coal mining operations located in mountainous and hilly terrains due to increased erosion rates. Suspended solids reduce light penetration in water and alter a waterway's temperature. Fish production and spawning grounds are often affected by high TSS loadings due to smothering. Furthermore, TSS may act as a carrier for other pollutants such as heavy metals, although TSS from coal mining more commonly consists of sand, silt and clay.

### 2.2.2. Legacy Mining and Waste Management

Coal mining has occurred in certain areas (e.g., the Elk River valley of British Columbia) for over 100 years. In the Elk River valley, underground mining began in the late nineteenth century. However, since the late 1960’s, coal mining has been by surface mining methods from five mountain mines in the valley. Operating coal mines are also located in other areas of British Columbia as well as Alberta, Saskatchewan and Nova Scotia, some of which are located in historical mining areas.

Mountain mining involves removing large quantities of geological material (overburden and waste rock) in order to reach coal seams which may be much deeper under the surface than at strip mines. Mine waste from mountainous areas is often placed in valleys due to spatial constraints. Generally, mountain mines occupy large footprints, with mine waste piles often reaching hundreds of metres in height and many square kilometres around the base.

Mine waste (e.g., waste rock) can pose significant challenges depending upon its composition and reactivity with the surrounding environment. In some mining areas, particularly in western Canada, selenium tends to be found in similar geological environments as coal. Waste rock that was previously thought to be inert has been placed in large piles that are exposed to the elements. Water from seasonal or intermittent streams, pre-existing streams/rivers, precipitation and runoff can infiltrate these waste rock piles and can carry selenium and other contaminants into local water bodies if it is not controlled and/or treated. Recent studies have found that the generation of waste rock associated with mining increases selenium releases.

The effective management of mine effluent (including seepage and run-off) as well as other mine waste represents a key aspect of the management of coal mining facilities. The large quantity of annual precipitation and snowmelt in some areas of Canada poses a challenge for the effective environmental management of many Canadian coal mines. These challenges require a thorough understanding of the hydrological regime, topography and watershed boundaries within the mine area. Collecting effluent that leaches from mine waste may be technologically challenging in regions where, in particular, mountain mining occurs, due to the historical deposition of mine waste in and near water bodies.

More recent coal mine developments generally go through or have gone through much more rigorous environmental assessments prior to start-up than mines that commenced operations long ago. Based on more recent scientific understanding of the issues that can arise from coal mining, newer mines tend to be designed in such a way as to reduce or mitigate the extent of environmental impacts that can occur. By comparison, those mines that commenced operations long ago did not have the benefit of our current knowledge and were not necessarily designed to minimize or mitigate environmental impacts. Some of these mines are still currently operational and now must consider the environmental impacts of historic mining practices.

Cumulative environmental impacts of legacy issues can increase over time if not managed properly. Several current operations in Canada have been showing negative impacts. This has been the case for selenium and nitrate in the Elk River valley and elsewhere across other provinces where coal mining occurs. TSS have also been shown to be released at high concentrations from coal mines across the country. Other parameters such as arsenic and sulphate have shown negative impacts in localized areas such as Long Lake near the Quinsam Mine on Vancouver Island, however these parameters are not generally at concentrations of concern from effluents at most coal mines.[3]

Geochemical studies of waste rock piles in the Elk River valley indicate that they will continue to release selenium for a very long period of time. Waste rock placed decades ago continues to release selenium at a steady rate today, and is expected to continue doing so far into the future.[4] Historical mining practices are also contributing to environmental impacts in areas outside the Elk River valley.

## *2.3. Existing Environmental Management in Canada*

The management of coal mining and, in particular, coal mining effluent has been a topic of discussion in many fora for a number of years involving all jurisdictions in Canada. Interested parties have consistently indicated the need for regulatory clarity and for all levels of government to work cooperatively.

[3] Stantec. (2011). *Study on Canadian Coal Mining Effluents: Final Report.* Stantec Consulting Limited.
[4] Teck. (2014). *Elk Valley Water Quality Plan.* Teck (Teck Coal Limited).

### 2.3.1. Provincial Requirements

Provincial regulatory requirements include effluent quality standards that are established through provincial permitting processes. Many provinces have established processes whereby the standards for effluent quality are established on a site-specific/case-by-case basis. The number of contaminants of concern to provincial regulators for coal mining operations has been increasing in recent years – most existing effluent discharge permits include limits for TSS, pH, floating solids, visible foam, oil or other substances, and general toxicity as represented by acute lethality testing using rainbow trout[3] and *Daphnia magna*. Measures targeted at specific contaminants such as selenium include effluent and receiving environment-based compliance limits as well as site-specific Selenium Management Plans.

In British Columbia, Ministerial Order No. M113 (Order) was issued in April 2013, requiring Teck Coal Limited to prepare an Area Based Management Plan for the Elk River valley to remediate water quality effects of coal mining operations and to guide future development. The goal of the Elk Valley Water Quality Plan is to stabilize and reverse the increasing trend of selenium, nitrate and other substances to ensure the ongoing health of the watershed, while at the same time allowing for continued sustainable mining in the region. The plan was approved by the British Columbia provincial Minister on November 18, 2014, and a provincial permit was subsequently issued. The permit incorporated the short, medium and long-term targets for selenium (and other contaminants) outlined in the plan.

Provincial governments in Alberta and British Columbia have also required some mines to submit and implement Selenium Management Plans as a condition of issued permits. These plans can include identification of best management practices or technologies that will achieve a reduction of selenium releases to the environment within a given timeframe (usually over several years), as well as requirements to submit periodic progress reports. Selenium Management Plans have been required for the following mines: Cardinal River Operations (Luscar and Cheviot mines) and Grande Cache mine in Alberta; and Willow Creek, Trend (including the Roman expansion), Brule and Wolverine (Perry Creek) mines in British Columbia.

### 2.3.2. Federal Requirements

Effluent from coal mining in Canada must comply with all applicable federal legislation including the *Canadian Environmental Protection Act, 1999* (CEPA 1999) and the *Fisheries Act,* as well as applicable provincial permits and licenses. The Minister of the Environment and Climate Change is responsible for the administration and enforcement of the pollution prevention provisions of the *Fisheries Act.* Subsection 36(3) of the *Fisheries Act* prohibits anyone from depositing or permitting the deposit of a deleterious substance of any type in water frequented by fish, or in any place under any conditions where the deleterious substance, or any other deleterious substance that results from the deposit of the deleterious substance, may enter any such water. The *Fisheries Act* allows for the establishment of federal regulations that would authorize the discharge of deleterious substances under conditions set out in the regulations.

# 3. Proposed Regulatory Framework for Coal Mining

## *3.1. Objective*

The objective of the regulations under consideration would be to reduce the threats to fish, fish habitat and human health from fish consumption by decreasing the level of harmful substances discharged to surface water from coal mine effluent.

## *3.2. Elements of the Proposed Regulations*

Most of the provisions of the regulations for coal mining would be modelled after the *Metal Mining Effluent Regulations* under the *Fisheries Act*. Other provisions are being considered in acknowledgement of the unique challenges associated with existing mines and the effluent (e.g. runoff) from mine waste rock and overburden.

### 3.2.1. Application

The regulations would apply to all coal mines in Canada discharging effluent which enters, or depositing other mine waste into, water bodies frequented by fish.

<u>Focus question</u>:

Do you agree with the proposed application of the regulations? If not, please explain what other types of activities should be covered by the proposed regulation.

### 3.2.2. Deleterious substances and effluent discharge limits

Mines would collect and monitor all effluent originating from mines to be discharged through defined Final Discharge Points (FDP). Effluent limits for total selenium, total nitrate and TSS are being considered. For selenium, compliance may be tied to concentrations of selenium in fish tissues and receiving waters. For TSS, a flexibility mechanism that accounts for exceptional precipitation or high flow events may be established for some mines. Additional deleterious substances may be considered for the establishment of effluent compliance limits. The pH of effluent would be within a specified range. Effluent would be required to be non-acutely lethal to fish (e.g., rainbow trout) and invertebrates (e.g., *Daphnia magna*).

<u>Focus question</u>:

Do you agree with the proposal to regulate selenium, nitrate and TSS with national minimum baseline standards? Please provide information that would be helpful in establishing such limits.

### 3.2.3. Mine waste management

#### *3.2.3.1. New mines and expansion projects*

A requirement to segregate mine wastes containing elevated levels of selenium would be established for new mines and expansion projects. Placing mine wastes such as waste rock and overburden in contained areas designed to prevent weathering and mobilization of deleterious substances will reduce selenium releases.

<u>Focus question</u>:

Do you agree with the proposal for new mines and expansion projects? If not, please explain the challenges associated with this proposal and propose alternative approaches.

*3.2.3.2. Existing mountain mines with legacy issues*

3.2.3.2.1. Receiver-Based Compliance Limits

It is recognized that for some existing mines it may not be feasible to collect all effluent and release it through defined FDPs due to historical mine design and practices. In these cases, requirements for water quality in the receiving environment would be considered.

3.2.3.2.2. Long-Term Selenium Reductions

ECCC is proposing to incorporate a long-term approach to managing selenium releases associated with mines having legacy issues, as described in Section 2. Release reductions required specifically for selenium would be tied to the concentration of selenium in fish tissue in the exposure area. Mines with elevated releases of selenium to the environment would be required to measure selenium concentrations in fish tissue. If the concentration of selenium in fish tissue is above a set trigger, releases of selenium from the mine would need to be reduced. Interim compliance targets may be used to facilitate progressive selenium reductions towards a final, long-term, compliance limit.

<u>Focus question</u>:

Given the long-term challenges associated with legacy issues, do you agree with the proposal for long-term reductions?

- If so, how far into the future do you feel is appropriate to allow mines with legacy issues to come into compliance with a final compliance limit?
- If not, please explain why and propose alternative approaches.

**3.2.4. Mine Waste Disposal Areas (i.e., Tailings Impoundment Areas)**

Disposal of mine wastes into water bodies frequented by fish would be allowed under certain conditions, but only if it is shown to be the best option for disposal, taking into account environmental, technical, socio-economic and economic factors. Mine wastes include tailings (coal rejects), waste rock, overburden, and refuse. Proponents seeking to dispose of mine wastes into natural water bodies frequented by fish would be required to conduct an assessment of alternatives that conforms to section 2 of the *Guidelines for the Assessment of Alternatives for Mine Waste Disposal*[5], as amended from time to time by ECCC. A fish habitat compensation plan would also be required.

**3.2.5. Environmental Effects Monitoring (EEM)**

Effluent and water quality monitoring studies, as well as biological monitoring studies would be required. These would include:

[5] Environment Canada. (2011). *Guidelines for the Assessment of Alternatives for Mine Waste Disposal.* Mining and Processing Division. http://ec.gc.ca/Publications/default.asp?lang=En&xml=5ECBCE8B-7E50-49E3-B7AD-8C21A575E873

- effluent characterization;
- sub-lethal toxicity testing of effluent;
- water quality characterization of reference and exposure areas .
- site characterization;
- fish population studies;
- fish tissue studies; and
- benthic invertebrate community studies.

Other studies may be considered.

#### 3.2.6. Reporting requirements

Reporting requirements and the frequency of reporting to ECCC would be established for:

- regulated parameters (i.e., deleterious substances, acute lethality results, pH, etc.);
- substances monitored under the EEM requirements; and
- biological monitoring studies conducted under the EEM requirements.

#### 3.2.7. Closure

Requirements would be established for mines intending to cease commercial operation, and would include conducting final biological monitoring studies for EEM.

## 4. Next Steps

The key targets for regulatory development are outlined below:

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| **March 31, 2017** | Interested parties are welcome to provide feedback on the *Proposed Regulatory Framework for Coal Mining* to ECCC by March 31, 2017 (refer to the additional information below about providing feedback). |
| **2018** | Proposed coal mining effluent regulations under the *Fisheries Act* published in *Canada Gazette* Part I for a 60-day comment period. |
| **2019** | Final coal mining effluent regulations under the *Fisheries Act* published in *Canada Gazette* Part II. |

## 5. Providing Feedback

We would like to invite all interested parties to provide comments and feedback on the proposed coal mining regulations framework as discussed in this document. Please send your feedback in writing to:

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