

25. CAPACITY OF RENEWABLE RESOURCES

25.1 INTRODUCTION

This chapter presents an assessment of the capacity of renewable resources that are likely to be significantly affected by the Harper Creek Project (the Project) to meet the needs of the present and those of the future, in accordance with section 16 (2) (d) of the *Canadian Environmental Assessment Act* (CEAA; 1992), and section 14.5 of the Project Application Information Requirements.

Chapters 9 through 22 of this Application for an Environmental Assessment Certificate / Environmental Impact Statement (Application/EIS) evaluate the potential Project-related effects on valued components (VCs), as well as the potential cumulative effects. In many cases, VCs, or groups of VCs, can be considered renewable resources from a biological or land use perspective, and are used as the basis for identifying renewable resources. This assessment considers the potential effects of the Project on the capacity of renewable resources during the Project Construction, Operations, and Closure phases, to assess whether the capacity of these resources for current and future needs could be affected by the Project.

25.2 METHODOLOGY

The Application/EIS has identified the regulatory requirements, issues, and values identified during the consultation process for the Project and the Application/EIS has identified the VCs that may be affected as a result of the Project, potential cumulative effects and the significance of any residual and cumulative effects.

The results of the VC effects assessments reported in the Application / EIS are compiled and analyzed in this chapter to arrive at a finding on the integral effect of the Project on the capacity of renewable resources. Using the assessment findings of the Application/EIS, a review of the approaches taken in the literature and other comprehensive environmental assessments, this chapter follows the following methods:

- identify VCs which could act as renewable resources for which “not significant (moderate)” or “significant (major)” potential residual/cumulative adverse effects are predicted as a result of the Project, either alone, or acting cumulatively with other projects;
- identify the parties that use and value the identified renewable resources in the LSA/RSA currently and who likely will continue to use them in the future; and
- determine whether the sustainable use of the identified renewable resources by identified parties will potentially be impaired by the Project using the Application/EIS significance findings as a basis for that determination.

25.2.1 Spatial and Temporal Boundaries

25.2.1.1 Spatial Boundaries

Spatial boundaries are determined based on the anticipated magnitude and spatial extent of Project related effects. They are determined by the location and distribution of VCs and can be defined as the anticipated zone of influence between the Project component/activity and the VC being studied. There are three zones of influence between the Project and the VC being studied: the Project Site, the local study area (LSA), and the regional study area (RSA). The spatial boundaries for the capacity for renewable resources assessment include the RSA boundaries for each VC, as defined in the applicable assessment chapters 9-22).

25.2.1.2 Temporal Boundaries

Temporal boundaries are the time periods considered in the assessment for various Project phases and activities. Temporal boundaries should reflect those periods during which planned Project activities are reasonably expected to potentially affect a VC. These boundaries are adjusted as appropriate to reflect seasonal and annual variations, or biophysical constraints related to a VC.

Potential effects will be considered for each phase of the Project as described in Table 25.2-1. Note that the Operations phase will comprise a first stage of 23 years (Operations 1) and a second stage of five years (Operations 2).

Table 25.2-1. Temporal Boundaries for the Capacity of Renewable Resources Assessment

Phase	Project Year	Length of Phase	Description of Activities
Construction	-2 and -1	2 years	Pre-construction and construction activities.
Operations 1	1 to 23	23 years	Active mining in the open pit from year 1 through year 23.
Operations 2	24 to 28	5 years	Low-grade ore processing from the end of active mining through to the end of year 28.
Closure	29 to 35	7 years	Active closure and reclamation activities while the open pit and TMF are filling.
Post-Closure	36 onwards	50 years	Steady-state long-term closure condition following active reclamation, with ongoing discharge from the TMF and monitoring.

25.2.2 Identification of Renewable Resources

Natural resources are typically produced by whole functioning ecosystems, which can be degraded through project-specific or cumulative effects over time. For this reason the Application/EIS includes individual assessments on specific separate ecological VCs (Chapters 9-22) as preparation for this assessment of the capacity of renewable resources. This chapter includes a qualitative assessment of the capacity of renewable resources due to the inherent challenges of forecasting effects at the ecosystem level, and the limitations of each of the effects assessments discussed in chapters 9-22.

25.2.2.1 *Scoping of Renewable Resources*

Renewable resources that could be affected by the Project were scoped in by categorizing VCs that are valuable for human uses (e.g., commercial, recreational, subsistence, and traditional land use), as discussed in the effects assessment chapters 9-22. In particular, the assessment of the current use of lands and resources for traditional purposes (Chapter 22) includes information on the current use of renewable resources, including tables which identify fish, wildlife and plant resources harvested by the local First Nations in the vicinity of the Project. This information was provided to the Proponent by local First Nations, and in the Simpcw First Nation Traditional Land Use/Ecological Knowledge Study ([Appendix 21-A](#)).

Renewable resources were scoped in based on a review of the VCs assessed in the Application, and are presented in Table 25.2-2. This information was used to inform the selection of renewable resources, but traditional use plants were not evaluated as a VC in Chapter 15 (Terrestrial Ecology Effects Assessment), as the Project was not expected to have an adverse interaction with plant species that are traditionally used by Aboriginal groups in the LSA. Traditional use plants are therefore not included in the assessment, but are evaluated in Chapter 22.

25.2.2.2 *Analyzing Renewable Resources*

To identify renewable resources that may be significantly affected by the Project, as per the requirements under CEAA (1992), VCs were analyzed for their potential to experience a moderate or major scale residual effect from the Project. Moderate to major scale residual effects represent those where Project-related effects on individuals (moderate scale) or populations (major scale) become distinguishable for natural variation, and can be irreversible (major scale). In contrast, minor residual effects are indistinguishable from natural variation and are general fully reversible, so effects are not expected to lower the capacity of the resource to provide for current and future uses. If no residual effects are predicted for VCs, then the mitigation proposed is expected to be successful in preventing any potential effects from occurring during all Project phases.

This approach was intended to select for the renewable resources that have the greatest potential to be affected by the Project, in a way that may lower the capacity of that resource to provide for current and future uses. For example, fish and wildlife species are valued for commercial or subsistence use (e.g., hunting, fishing, and trapping), and several activities depend on the land base as a renewable resource, such as agriculture and forestry.

Surrogate VCs were used where possible to focus the assessment on resources which may act as indicators of ecosystem health. Subsequently, there were several VCs that may be renewable resources but were not considered for inclusion in the assessment, including surface water quality, surface water quantity, caribou, grizzly bear, fisher, and wolverine. Fish and fish habitat are considered a surrogate for water quality and water quantity. The key residual effects on fish, fish habitat, and aquatic resources from the Project have two primary effect pathways: changes in water quantity and changes in water quality, as discussed in Section 25.4. Drinking water quality was also analyzed in Table 25.2-2, but no residual effects were identified. Caribou, grizzly bear, fisher, and wolverine will have limited interaction with current and potential future human uses at the Project, as none of these species are extensively hunted or trapped in the region (Chapter 18, Chapter 22).

Table 25.2-2. Renewable Resource VCs at the Harper Creek Project

Renewable Resource	Utility	Potential Effects	Mitigation Measures	Residual Effect?	Significance of Residual Effects	
					Project	Cumulative
Air Quality	Supports human life, as well as plant and animal life	Increase in TSP, PM ₁₀ , PM _{2.5} , and dust deposition	Emission reduction measures, e.g., baghouses. Fugitive dust reduction measures, e.g., road watering.	Yes	Not significant (moderate)	Not significant (moderate)
Water Quality	Human consumption	Contamination from contact water and mine related effluent	Project design measures described in section 5.5.2.3, Selenium Management Plan (Section 24.12), Sediment and Erosion Control Plan (Section 24.11), Mine Waste and ML/ARD Management Plan (24.9) and Fish and Aquatics Effects Monitoring and Management Plan (Section 24.6).	No	n/a	n/a
Fish and Fish Habitat	Recreational fishing and Aboriginal harvesting opportunities	Changes in Water Quantity to Upper Harper Creek, T Creek and P Creek	Diverting non-contact and contact water; maintaining natural networks; reusing contact water to minimize the use of freshwater. Implementing the sedimentation and erosion control plan to avoid morphologic changes. Implementation of Fish and Aquatic Effects Monitoring and Management Plan (Section 24.6), Site Water Management Plan (Section 24.13); Sediment and Erosion Control Plan (Section 24.11); Fish Habitat Offsetting Plan (Appendix 14-E)	Yes	Not significant (moderate)	n/a
Moose	Resident and Aboriginal hunting opportunities	Habitat alteration, disturbance and displacement, mortality due to vehicle collisions	Project Site reclamation (Chapter 7), Traffic and Access Management Plan (Section 24.16), Wildlife Management Plan (Section 24.19)	Yes	Not Significant (minor)	Not Significant (minor)
Mule Deer	Resident and Aboriginal hunting opportunities	Habitat alteration, disturbance and displacement, mortality due to vehicle collisions	Project Site reclamation (Chapter 7), Traffic and Access Management Plan (Section 24.16), Wildlife Management Plan (Section 24.19)	No	n/a	n/a

(continued)

Table 25.2-2. Renewable Resource VCs at the Harper Creek Project (completed)

Renewable Resource	Utility	Potential Effects	Mitigation Measures	Residual Effect?	Significance of Residual Effects	
					Project	Cumulative
Commercial Interests - Forestry		Change in access and use of forest resources	Traffic and Access Management Plan (Section 24.16); consultation with forest licencees who use the Vavenby Mountain, Saskum Plateau and Vavenby-Saskum FSRs before deciding whether to establish additional gates (aside from the gate at the Project Site), and cattle guards, if necessary to prevent livestock drift, along the Mine Access Road; upgrading the FSRs to improve overall road condition and safety for users. Commercially merchantable timber will be harvested prior to, or during, construction.	No	n/a	n/a
Commercial Interests - Agriculture/ Grazing		Change in access and use of range tenures	HCMC has an agreement with range tenure holder (RAN077435) for potential impacts of the Project on use of this tenure; HCMC has agreed to the installation of a cattle guard to control livestock drift if needed; in consultation with MFLNRO along the Mine Access Road, if warranted; installation of wing fencing, at appropriate locations along the Mine Access Road to prevent cattle drift, if required; upgrading the FSRs to improve overall road condition and safety for users; monitoring of livestock movement along Mine Access Road; Site Water Management Plan (Section 24.13); Sediment and Erosion Control Plan (Section 24.11).	No	n/a	n/a
Commercial Interests - Trapping		Change in access and use of trapline tenures	HCMC has mitigation agreements with trapline holders TR0337T001 and TR0341T003.	No	n/a	n/a

25.2.2.3 Renewable Resources Selected for Assessment

Based on the scoping and analyzing exercise in Section 25.2.1 and 25.2.2, the renewable resources considered further in this assessment are air quality, fish and fish habitat (Table 25.2-3).

Table 25.2-3. Renewable Resources Selected for Assessment

Renewable Resource	Utility	Residual Effect?	Significance of Residual Effects	
			Project	Cumulative
Air Quality	Supports human life, as well as plant and animal life	Yes	Not significant (moderate)	Not significant (moderate)
Fish and Fish Habitat	Recreational fishing and Aboriginal harvesting opportunities	Yes	Not significant (moderate)	n/a

25.3 CURRENT AND FUTURE USES OF RENEWABLE RESOURCES

The parties that presently use or have rights to use the renewable resources identified in Section 25.2 are described in detail in Chapter 18, Commercial and Non-commercial Land Use Effects, and Chapter 22, Current Use of Land and Resources for Traditional Purposes, of the Application/EIS. A summary of current and future resource use in the Project, the LSA and the RSA is summarized below.

25.3.1 Aboriginal Resource Use

The Project is located within the traditional territory of the Secwepemc (Shuswap) Nation (See Figure 23.1-1). The Secwepemc Nation asserts interests to Secwepemcul'ecw territory, an area that encompasses approximately 145,000 km² of the central interior region of the province. The Secwepemc Nation was composed of historic divisions with stewardship responsibilities for areas within the Nation. The Adams Lake Indian Band, Simpcw First Nation, Little Shuswap Lake Indian Band and Neskonlith Indian Band are members of the Secwepemc Nation. In addition, the Métis Nation BC have expressed a land use interest in the RSA

The Simpcw First Nation, Adams Lake Indian Band, Neskonlith Indian Band, and Little Shuswap Lake Indian Band are known to harvest fish in a number of lakes and rivers within and surrounding the RSA. Several fish species are harvested, including Chinook Salmon (*Oncorhynchus tshawytscha*), Sockeye Salmon (*O. nerka*), Bull Trout (*Salvelinus confluentus*), and Rainbow Trout (*O. mykiss*). Only the Simpcw First Nation is known to conduct fish harvesting within the LSA. Harper Creek was identified by Simpcw First Nation as a place where traditionally or currently they harvest Bull Trout and Rainbow Trout; no information was provided on the use of other waterways associated with the Project (i.e., P Creek, T Creek, Baker Creek, or Jones Creek) specifically for fishing (Chapter 22, Current Use of Land and Resources for Traditional Purposes). Rainbow Trout and Bull Trout are present in lower Harper Creek, but Bull Trout are the only species present in upper Harper Creek (Chapter 14, Fish and Aquatic Resources Effects Assessment). Thus, it is likely that lower Harper Creek provides the most valuable fishing opportunities for the Simpcw First Nation.

The Simpcw First Nation, also traditionally harvested and trapped wildlife, and collected a number of plant foods in the area ([Appendix 22-A](#)). However, wildlife and plant harvesting opportunities are not expected to be significantly affected by the Project (Section 25.2; Table 25.2-2). At the time of submission of the Application/EIS, there was no information that identified any fishing, hunting, trapping, or gathering sites or areas by the Adams Lake Indian Band, Neskonlith Indian Band, or the Little Shuswap Indian Band within the LSA. Harper Creek Mining Corporation (HCMC) will continue its efforts to update the Adams Lake Indian Band, Neskonlith Indian Band, and the Little Shuswap Indian Band on the development of the Project, and understand potential impacts of the Project on their Aboriginal interests.

At the time of submission of the Application/EIS, there was no information that identified any fishing, hunting, trapping, or gathering sites or areas by the Métis Nation BC within the LSA. Harper Creek Mining Corporation (HCMC) will continue its efforts to update the Métis Nation BC on the development of the Project, and understand potential impacts of the Project on their Aboriginal interests.

25.3.2 Commercial and Non-commercial Resource Use

Hunting in the Project RSA is primarily for subsistence purposes, and is carried out by resident and Aboriginal hunters (see above). There are no guide outfitting licensed areas in the LSA or RSA (Chapter 18, Section 18.4.3.11). Moose, mule deer, and white-tailed deer are the main species hunted in the Wildlife Management Units (WMUs) that overlap the RSA. Other big game species, such as caribou, elk, bighorn sheep, and mountain goat, are present within WMUs that overlap with the Project, though they are reportedly not hunted within the RSA. Fowl hunted in the area includes mostly upland birds such as grouse (blue, spruce, ruffed). Some hunting of waterfowl (ducks and geese) occurs along the North Thompson River. Most fowl hunting occurs incidental to other hunting activities and stakeholders report only occasional sightings of these species (Chapter 18, Section 18.4.3.11). Three of the hunted species were included in the Application/EIS as VCs: moose, mule deer, and mountain caribou, all of which were identified as being not significantly affected by the Project (See Table 25.2-2).

Sport-fishing is a popular activity on streams, rivers, and lakes in the RSA. Rainbow Trout, Dolly Varden (*Salvelinus malma*), and Bull Trout are the primary species caught by recreational anglers. Lakes within the RSA generally start to freeze over in late October and therefore have limited use beyond this time. Fishing for Chinook and Sockeye Salmon occurs on the Clearwater River and along the North Thompson River from Little Fort to Clearwater (Chapter 18, Section 18.4.3.13). Bull Trout are the only species present in upper Harper Creek, P Creek, and T Creek in the LSA (Chapter 14, Section 14.4.3). Currently, sport-fishing for Bull Trout has not been documented to occur in upper Harper Creek, P Creek, and T Creek.

Other commercial land use interests in the area include water, forest, and range licensees, and trappers. However, none of the renewable resources that these land use activities depend on are expected to be experience a residual effect as a result of the Project (See Table 25.2-2).

25.4 ASSESSMENT OF EFFECTS ON RENEWABLE RESOURCES

The assessment of potential Project-related effects on the capacity of renewable resources is based on characterization and significance criteria identified in the Effects Assessment Methodology (see Chapter 8, Section 8.6.5). The majority of effects on renewable resources are expected to diminish during the Post-Closure phases of the Project. Air quality is expected to rebound quickly after mining operations cease, while effects on fish and fish habitat will require additional time to reverse the effects of the Project.

25.4.1 Air Quality

The potential Project-related effects on air quality are assessed in detail in Chapter 9 (Air Quality Effects Assessment). Residual effects of the Project on air quality were evaluated to investigate the capacity of the atmospheric environment to continue providing clean air for current and future resource users (Chapter 18, Commercial and Non-commercial Land Use Effects Assessment, and Chapter 22, Current Use of Land and Resources for Traditional Purposes). A summary of the residual effects assessment, after mitigation is considered, is presented below:

- The Project was expected to have a moderate scale residual effect on air quality. Though mitigation measures will be employed to control emissions at their source, and limit the creation of fugitive dust from Project activities, the air quality model predicted that there will be elevated criteria air contaminants (CAC) emissions and dust deposition levels following mitigation.
- PM_{2.5} (particles less than 2.5 micrometers; μm) emissions during both Construction and Operations, and total suspended particulates (TSP) emissions during Construction, are predicted to be below the relevant objectives. PM₁₀ (particles less than 10 μm in diameter) and dust deposition levels during both Construction and Operations, and TSP during operation, are predicted to be above relevant guidelines, though the effect will be localized to within a few kilometres of the source.
- Air quality is expected to return to baseline conditions following closure of the Project, and hence the effect is fully reversible. The receiving environment has also been exposed to activities that affect ambient air quality, such as forestry transportation and timber processing in Vavenby. Thus the atmospheric environment has a neutral resilience to increased emissions resulting from the Project.

Given the above assessment, the Project is not expected to affect the long-term sustainability of clean air (as measured by baseline conditions) for future and current users of the RSA. Although the air quality model predicted exceedances of the TSP, PM₁₀, and dust deposition guidelines, the frequency and duration of the effect was rated on a worst-case approach; air quality concentrations will be lower than the predicted levels for the majority of the 28 years of Project Operations. Furthermore, Project-related effects on air quality are localized and reversible. Thus, the capacity of the atmospheric environment to provide clear air to current and future users is not expected to be impaired by the Project.

25.4.2 Fish and Fish Habitat

The potential Project-related effects on fish and fish habitat VCs are assessed in detail in Chapter 14 (Fish and Aquatic Resources Effects Assessment); only residual effects with a moderate scale are considered in this section. A number of mitigation and management measures have been proposed that will minimize and mitigate for potential for effects to fish and fish habitat, including the Fish Habitat Offsetting Plan (Section 14.5.2; [Appendix 14-D](#)). A summary of the residual effects assessment, after mitigation is considered, is presented below.

25.4.2.1 Changes in Water Quality

The Project is predicted to have a moderate residual effect on fish, specifically Bull Trout, in upper Harper Creek due to changes in water quality. Although there will be numerous management strategies to mitigate for changes to water quality (e.g., Sections 24.6, Fish and Aquatic Effects Monitoring and Management Plan; 24.9, Mine Waste and ML/ARD Management Plan; 24.11, Sediment and Erosion Control Plan; 24.12, Selenium Management Plan; 24.13, Site Water Management Plan; 24.14, Soil Salvage and Storage Plan; and 24.15, Spill Prevention and Response Plan), concentrations of some parameters are predicted to be greater than the BC Water Quality Guidelines for Protection of Aquatic Life (BC WQGs) in upper Harper Creek. Bull Trout is a species of conservation concern in BC and Canada (COSEWIC 2012; BC CDC 2014).

Key findings of the residual effects assessment for changes in water quality on fish (Section 14.5) include:

- The primary residual effect on fish is the potential for toxicity due to predicted increases in the concentration of some parameters in upper Harper Creek, P-Creek and T-Creek (e.g., cadmium, copper, and selenium).
- A seasonal fish barrier at km 18.5 on Harper Creek delineates the difference between lower Harper Creek (Bull Trout, Rainbow Trout, and Coho Salmon) and upper Harper Creek (Bull Trout only).
- Residual effects on affected reaches are expected to last into the future (Post-Closure), but water quality is expected to improve with the passage of time and thus effects are partially reversible.

The overall magnitude of residual effect is considered not significant (moderate).

25.4.2.2 Changes in Water Quantity

The Project is predicted to have a moderate residual effect on fish habitat in upper Harper Creek due to changes in water quantity. Although there will be numerous strategies to mitigate for changes to water quantity (e.g., Section 24.6, Section 24.11, Section 24.13, and [Appendix 14-E](#), Fish Habitat Offsetting Plan), there will be reductions in stream flow in T-Creek, P-Creek and upper Harper Creek between P Creek and T Creek, which are likely to extend for prolonged periods (through Post-Closure), below established threshold and pre-mine levels, resulting in the potential to decrease fish habitat area..

The key findings of the residual effects assessment for changes in water quantity on fish (Section 14.5) include:

- The predicted reductions in discharge yield predictions of medium effects in upper Harper Creek between P Creek and T Creek, and high effects in T Creek and P Creek. When assessed from a watershed perspective, within the whole of Harper Creek the effects identified above are considered to be of medium magnitude.
- These sections of stream are likely to experience prolonged periods of decreased water quantity (through Post-Closure), below established threshold and pre-mine levels, resulting in the potential to decrease fish habitat area.
- Bull Trout is considered to have a low resiliency to cope with changes to their habitat, given their narrow habitat requirements and demonstrated declines in disturbed habitats (COSEWIC 2012).

25.4.2.3 Mitigation Measures

Given the potential for toxicity to fish resulting from elevated concentrations of some parameters, and fish habitat loss due to reductions in stream flow, and the underlying low resiliency of Bull Trout to cope with these changes, several monitoring strategies will be implemented in order to monitor fish populations in affected reaches. The Fish and Aquatic Effects Monitoring and Management Plan (Section 24.6) and the Selenium Management Plan (Section 24.12) will be implemented to ensure that any changes in the aquatic environment or biological receptor (such as fish) are identified and adaptively managed before adverse effects to the fish population can occur. A Fish Habitat Offsetting Plan ([Appendix 14-E](#)) has been developed to offset the residual effects on fish occurring as a result of the Project, to reduce the magnitude of the Projects effect on the fish and fish habitat renewable resource. With the implementation of these measures, the capacity of the fish and fish habitat resource in the RSA to support current and future fishing opportunities is not expected to be affected by the Project.

25.5 CONCLUSION

Three renewable resources were evaluated (air quality, fish and fish habitat), and the capacity of renewable resources to continue to meet the needs of the present and the future is not anticipated to be significantly affected by the Project. The result of the assessment of the capacity of renewable resources to continue to provide services to present and future generations is shown in Table 25.5-1.

Table 25.5-1. Effects of Harper Creek Project on Renewable Resources

Renewable Resource	Current Capacity of Resource Impaired? (Life of Mine)	Future Capacity of Resource Impaired? (Post-Closure)
Air Quality	No	No
Fish and Fish Habitat	No	No

Project-related effects on air quality are localized and reversible, and the capacity of the atmospheric environment to provide clear air to current and future users is not expected to be impaired by the Project.

The Project is expected to have a residual effect on fish and fish habitat due to changes in water quality and quantity in T-Creek, P-Creek and upper Harper Creek between P Creek and T Creek. A Fish Habitat Offsetting Plan has been developed ([Appendix 14-E](#)) to mitigate habitat loss, and with implementation of the mitigation measures described in Section 14.5.2, the effects are not anticipated to alter or affect Aboriginal fishing, or any commercial or recreational fishing within the RSA currently or in the future.

REFERENCES

1992. *Canadian Environmental Assessment Act* SC. C. C. 37.

BC CDC. 2014. *BC Conservation Data Centre: Species Summary: Salvelinus confluentus - interior lineage*. BC Ministry of Environment. <http://a100.gov.bc.ca/pub/eswp/> (accessed Oct 4, 2014).

COSEWIC. 2012. *COSEWIC assessment and status report on the Bull Trout Salvelinus confluentus in Canada*. Committee on the Status of Endangered Wildlife in Canada. www.registrelep-sararegistry.gc.ca/default_e.cfm (accessed October 4, 2014).