19. VISUAL QUALITY ASSESSMENT

19.1 INTRODUCTION

Harper Creek Mining Corporation (HCMC) proposes to construct and operate the Harper Creek Project (the Project), an open pit copper mine near the unincorporated community of Vavenby, British Columbia (BC). The Project location and infrastructure is shown in Figure 19.1-1. This chapter describes the baseline visual quality conditions, and undertakes a scoping and effects assessment to characterize potential effects on visual quality as a result of the Project. The chapter is informed by the baseline report provided in Appendix 19-A (Platt 2012). This chapter follows the effects assessment methodology described in Chapter 8 of this Application for an Environmental Assessment Certificate / Environmental Impact Statement (Application/EIS).

19.2 REGULATORY AND POLICY FRAMEWORK

The Application Information Requirements (AIR), approved by the British Columbia Environmental Assessment Office (BC EAO; 2011) on October 21, 2011, includes a requirement to assess the Project's effects on visual quality. Section 6.23 of the AIR states the assessment will consider potential visual impacts of the Project on the North Thompson River Valley near Vavenby and the surrounding recreational areas such as Dunn Peak. Recreational use of the Barrière River watershed is considered high and includes fishing, hunting, boating, and other activities such as snowmobiling and cross-country skiing (BC EAO 2011).

There is currently no provincial or federal legislation regulating visual quality. The *Forest and Range Practices Act* (2002b) requires forest operators to set specific targets or develop strategies for addressing environmental priorities and objectives regarding visual quality. The British Columbia Ministry of Forests, Lands and Natural Resources Operations (BC MFLNRO) has established procedures and created tools for performing visual impact assessments to aid in managing visual effects of forestry activities. Proponents in other sectors are encouraged to apply these procedures and tools to limit visual quality effects of their projects. These procedures and tools are used to assess the Project's potential effects on visual quality.

The Project falls within the Kamloops Land and Resource Management Plan (LRMP), which is a subregional land use plan. Under the Kamloops LRMP, the Project is subject to legislation and regulations for Crown land and resource management (BC ILMB 1995). The Kamloops LRMP includes visual quality objectives (VQOs) for visually sensitive areas, in terms of their resource value. A VQO indicates the desired visual condition based on social concerns and the physical characteristics of the landscape. By being consistent with the VQOs, visual resource management can guide development activities in a manner that minimizes impacts to visually sensitive areas. With respect to mining and VQOs, the Kamloops LRMP states that the objectives do not preclude mine development activities and every effort should be made to meet VQOs (BC ILMB 1995). Table 19.2-1 provides a summary of applicable statutes and regulations for potential visual quality effects.

Figure 19.1-1
Project Location and Infrastructure

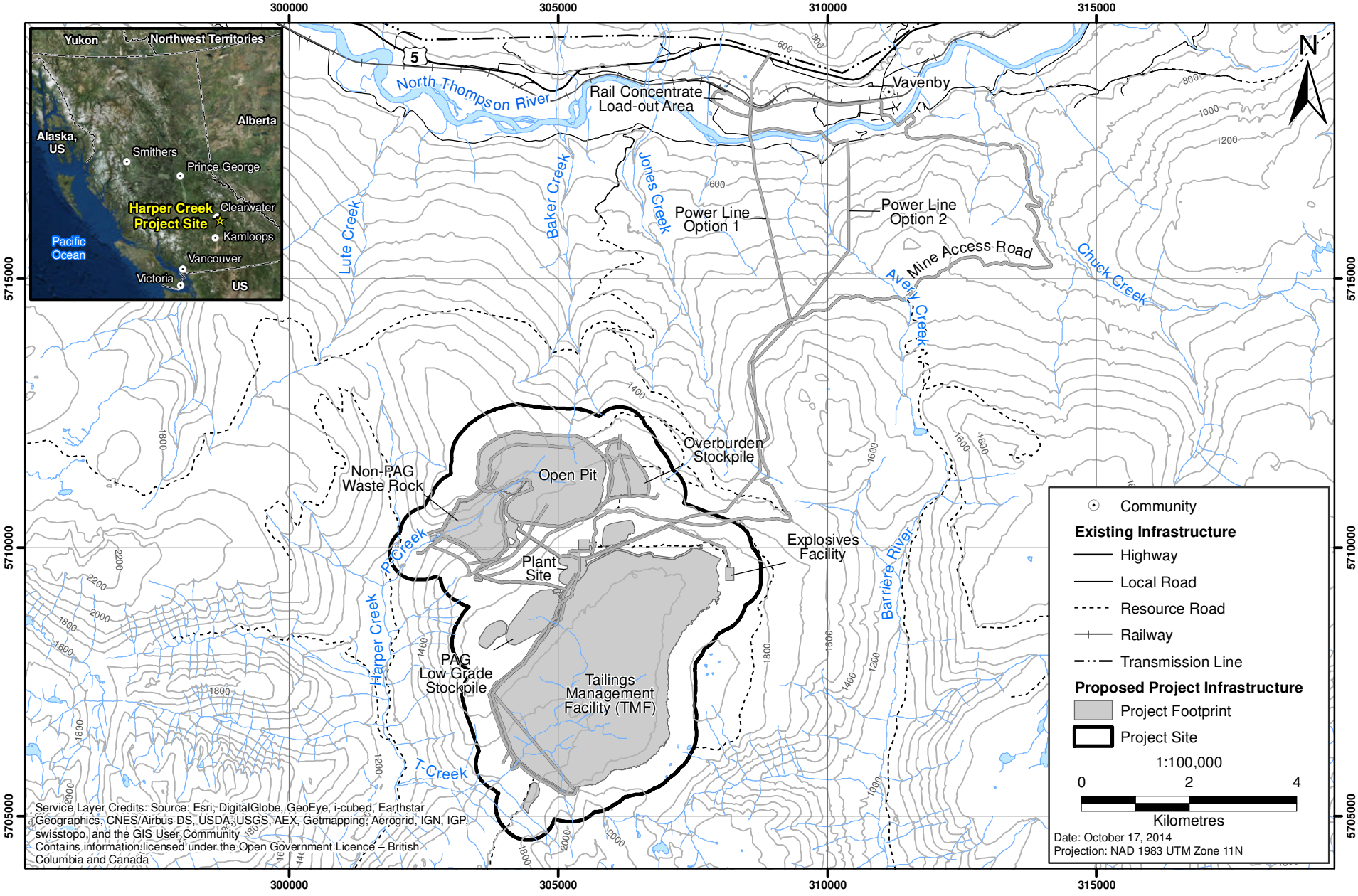


Table 19.2-1. Summary of Applicable Statutes and Regulations for Potential Visual Quality Effects, Harper Creek Project

Name	Level of Government	Description
Kamloops LRMP	Provincial (BC Ministry of Environment)	The Kamloops LRMP identifies several Resource Management Zones which are described in Chapter 18, Section 18.4.3.1. The LRMP includes visual quality objectives for resource development visual quality objectives (VQOs) for visually sensitive areas, in terms of their resource value.

The Kamloops LRMP identifies communities, public use areas, and travel corridors (including roadways, waterways, and major road corridors) as visually sensitive areas (BC ILMB 1995). The LRMP applies to the management of visually sensitive areas on Crown land. Visually sensitive areas also include viewpoints identified through referral or planning processes, where maintaining visual quality is important. Resource development is permitted and encouraged within visually sensitive areas consistent with achieving VQOs, when a VQO has been established. Management of visual quality by non-timber uses is to be managed in accordance with the *Forest Practices Code Act* (1996b) and other provincial guidelines for visual quality (BC ILMB 1995).

19.3 SCOPING THE EFFECTS ASSESSMENT

19.3.1 Valued Components

The BC EAO defines Valued Components (VCs) as components "that are considered important by the proponent, public, First Nations, scientists, and government agencies involved in the assessment process" (BC EAO 2013). To be included in the Application/EIS, there must be a perceived likelihood that the VC will be affected by the Project. VCs proposed for assessment were identified in the AIR (BC EAO 2011) and in the Canadian Environmental Assessment Agency (CEA Agency 2011) Background Information document.

19.3.1.1 Consultation Feedback on Proposed Valued Components

A preliminary list of proposed VCs was drafted early in Project planning based on the expected components and activities of the Project, the type of project being proposed, the local area and region where the Project would be located, and the consultation with federal, provincial, and local government agencies.

Concerns about potential visual quality effects of the mine and power line were raised by Aboriginal groups (Appendix 3-F), by government agencies (Appendix 3-J) and the public (Appendix 3-L). Concerns relating to visual quality effects on public recreation in the Dunn Peak Protected Area were also raised. A summary of how scoping feedback was incorporated into the selection of assessment subject areas and VCs is summarized below in Table 19.3-1.

In the AIR (BC EAO 2011), visual quality is identified as a VC under the social subject area.

Table 19.3-1. Consultation Feedback on Proposed Valued Components

Subject Area VC	Feedback by*				Issues Raised	Proponent Response
	AG	G	P/S	O		
Visual Quality		x			• Dunn Peak Protected Area is accessed through the Harper Creek drainage and is within viewing distance of the proposed mine. Should discuss potential impact to Dunn Peak Protected Area (Ministry of Environment - Thompson Region, April 15, 2009).	Viewpoints 7 and 14 assess visual quality effects for the Dunn Peak Protected Area.
		x			• The Barriere watershed has high recreational use including development along the Barrière Lakes and hunting and fishing (Simpcw First Nation, September 12, 2011).	The viewshed analysis indicates there will be no visual impacts around Barrière Lake (see Figure 19.4-3, Visual Quality Viewpoint Locations).
			x		• Visual impact of mine on surrounding properties	In accordance with section 6.2.3 of the AIR, potential effects of the Project from strategic viewpoints are assessed (e.g., North Thompson River valley near Vavenby and surrounding recreational areas such as Dunn Peak) (see Section 19.4.2.1 and Figures 19.4-1 and 19.4-2).
			x		• Visual impact of power line	In accordance with section 6.2.3 of the AIR, potential effects of the Project from strategic viewpoints are assessed (e.g., North Thompson River valley near Vavenby and surrounding recreational areas such as Dunn Peak). Figure 19.4-1 shows the footprint and study areas in relation to surrounding parks and recreational areas. The footprint (see Figure 19.1-1) includes the two power line route options, the rail load out and the Mine Access Road.

**AG = Aboriginal Group; G = Government; P/S = Public/Stakeholder; O = Other*

19.3.1.2 Selecting Valued Components

Based on the results of the assessment of potential interactions between the Project and visual quality, as identified in Table 19.3-2, on consultations with the EA Working Group, First Nations, and the public, visual quality was selected as a VC.

Table 19.3-2. Project Components and Activities with the Potential to Cause Visual Quality Effects

Category	Project Components and Activities	Visual Quality
Construction		
Concrete production	Concrete batch plant installation, operation and decommissioning	x
Dangerous goods and hazardous materials	Hazardous materials storage, transport, and off-site disposal	
	Spills and emergency management	
Environmental management and monitoring	Construction of fish habitat offsetting sites	
Equipment	On-site equipment and vehicle use: heavy machinery and trucks	x
Explosives	Explosives storage and use	
Fuel supply, storage and distribution	Fuel supply, storage and distribution	
Open pit	Open pit development - drilling, blasting, hauling and dumping	x
Potable water supply	Process and potable water supply, distribution and storage	
Power supply	Auxiliary electricity - diesel generators	
	Power line and site distribution line construction: vegetation clearing, access, poles, conductors, tie-in	x
Processing	Plant construction: mill building, mill feed conveyor, truck shop, warehouse, substation and pipelines	x
	Primary crusher and overland feed conveyor installation	x
Procurement and labour	Employment and labour	
	Procurement of goods and services	
Project Site development	Aggregate sources/ borrow sites: drilling, blasting, extraction, hauling, crushing	x
	Clearing vegetation, stripping and stockpiling topsoil and overburden, soil salvage handling and storage	x
	Earth moving: excavation, drilling, grading, trenching, backfilling	x
Rail load-out facility	Rail load-out facility upgrade and site preparation	x
Roads	New TMF access road construction: widening, clearing, earth moving, culvert installation using non-PAG material	x
	Road upgrades, maintenance and use: haul and access roads	x
Stockpiles	Coarse ore stockpile construction	x
	Non-PAG Waste Rock Stockpile construction	x
	PAG and Non-PAG Low-grade ore stockpiles foundation construction	x
	PAG Waste Rock stockpiles foundation construction	x

(continued)

Table 19.3-2. Project Components and Activities with the Potential to Cause Visual Quality Effects (continued)

Category	Project Components and Activities	Visual Quality
Construction (*cont'd*)		
Tailings management	Coffer dam and South TMF embankment construction	x
	Tailings distribution system construction	x
Temporary construction camp	Construction camp construction, operation, and decommissioning	x
Traffic	Traffic delivering equipment, materials and personnel to site	
Waste disposal	Waste management: garbage, incinerator and sewage waste facilities	
Water management	Ditches, sumps, pipelines, pump systems, reclaim system and snow clearing/stockpiling	
	Water management pond, sediment pond, diversion channels and collection channels construction	x
Operations 1		
Concentrate transport	Concentrate transport by road from mine to rail loadout	x
Dangerous goods and hazardous materials	Explosives storage and use	
	Hazardous materials storage, transport, and off-site disposal	
	Spills and emergency management	
Environmental management and monitoring	Fish habitat offsetting site monitoring and maintenance	
Equipment fleet	Mine site mobile equipment (excluding mining fleet) and vehicle use	x
Fuel supply, storage and distribution	Fuel storage and distribution	
Mining	Mine pit operations: blast, shovel and haul	x
Ore processing	Ore crushing, milling, conveyance and processing	x
Potable water supply	Process and potable water supply, distribution and storage	
Power supply	Backup diesel generators	
	Electrical power distribution	x
Processing	Plant operation: mill building, truck shop, warehouse and pipelines	x
Procurement and labour	Employment and labour	
	Procurement of goods and services	
Rail load-out facility	Rail-load out activity (loading of concentrate; movement of rail cars on siding)	x
Reclamation and decommissioning	Progressive mine reclamation	x

(continued)

Table 19.3-2. Project Components and Activities with the Potential to Cause Visual Quality Effects (continued)

Category	Project Components and Activities	Visual Quality
Operations 1 (*cont'd*)		
Stockpiles	Construction of Non-PAG tailings beaches	x
	Construction of PAG and Non-PAG Low Grade Ore Stockpile	x
	Non-PAG Waste Rock Stockpiling	x
	Overburden stockpiling	x
Tailings management	Reclaim barge and pumping from TMF to Plant Site	x
	South TMF embankment construction	x
	Sub-aqueous deposition of PAG waste rock into TMF	
	Tailings transport and storage in TMF	x
	Treatment and recycling of supernatant TMF water	
Traffic	Traffic delivering equipment, materials and personnel to site	
Waste disposal	Waste management: garbage and sewage waste facilities	
Water management	Monitoring and maintenance of mine drainage and seepage	
	Surface water management and diversions systems including snow stockpiling/clearing	x
Operations 2	*Includes the Operations 1 non-mining Project Components and Activities, with the addition of these activities:*	
Processing	Low grade ore crushing, milling and processing	
Reclamation and decommissioning	Partial reclamation of Non-PAG waste rock stockpile	x
	Partial reclamation of TMF tailings beaches and embankments	x
Tailings management	Construction of North TMF embankment and beach	x
	Deposit of low grade ore tailings into open pit	
Water management	Surface water management	
Closure		
Environmental management and monitoring	Environmental monitoring including surface and groundwater monitoring	
	Monitoring and maintenance of mine drainage, seepage, and discharge	
	Reclamation monitoring and maintenance	
Open pit	Filling of open pit with water and storage of water as a pit lake	x
Procurement and labour	Employment and labour	
	Procurement of goods and services	

(continued)

Table 19.3-2. Project Components and Activities with the Potential to Cause Visual Quality Effects (completed)

Category	Project Components and Activities	Visual Quality
Closure (*cont'd*)		
Reclamation and decommissioning	Decommissioning of rail concentrate loadout area	x
	Decommissioning and reclamation of mine site roads	x
	Decommissioning and removal of plant site, processing plant and mill, substation, conveyor, primary crusher, and ancillary infrastructure (e.g., explosives facility, truck shop)	x
	Decommissioning of diversion channels and distribution pipelines	x
	Decommissioning of reclaim barge	x
	Reclamation of Non-PAG LGO stockpile, overburden stockpile and Non-PAG waste rock stockpile	x
	Reclamation of TMF embankments and beaches	x
	Removal of contaminated soil	x
	Use of topsoil for reclamation	x
Stockpiles	Storage of waste rock in the non-PAG waste rock stockpile	x
Tailings management	Construction and activation of TMF closure spillway	x
	Maintenance and monitoring of TMF	
	Storage of water in the TMF and groundwater seepage	x
	Sub-aqueous tailing and waste rock storage in TMF	
	TMF discharge to T-Creek	
Waste disposal	Solid waste management	
Post-Closure		
Environmental management and monitoring	Environmental monitoring including surface and groundwater monitoring	
	Monitoring and maintenance of mine drainage, seepage, and discharge	
	Reclamation monitoring and maintenance	
Open pit	Construction of emergency spillway on open pit	x
	Storage of water as a pit lake	x
Procurement and labour	Procurement of goods and services	
Stockpiles	Storage of waste rock in the non-PAG waste rock stockpile	x
Tailings management	Storage of water in the TMF and groundwater seepage	x
	Sub-aqueous tailing and waste rock storage	
	TMF discharge	

Note: a column is marked with an X when it has been determined that the Project component or activity could potentially interact with the VC.

19.3.2 Defining Assessment Boundaries

Assessment boundaries define the maximum limit within which the effects assessment and supporting studies (e.g., predictive models) are conducted. Boundaries encompass the areas within, and times during which, the Project is expected to interact with the VCs, as well as any constraints due to political, social, and economic realities, and limitations in predicting or measuring changes. Boundaries relevant to visual quality are described below.

19.3.2.1 Temporal Boundaries

Temporal boundaries are the time periods considered in the assessment for various Project phases and activities, and are shown in Table 19.3-3. Temporal boundaries reflect those periods during which planned Project activities are reasonably expected to potentially affect a VC. Potential effects will be considered for each phase of the Project, although the largest potential effect of the Project on visual quality is expected to be Year 23, during the Operations 1 phase.

Table 19.3-3. Temporal Boundaries Used in the Assessment for Visual Quality

Phase	Project Year	Length of Phase	Description of Activities
Construction	-2 and -1	2 years	Pre-construction and construction activities.
Operations 1	1 - 23	23 years	Active mining in the open pit from Year 1 through to Year 23.
Operations 2	24 - 28	5 years	Low-grade ore processing from the end of active mining through to the end of Year 28.
Closure	29 – 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.

19.3.2.2 Spatial Boundaries

Project Site

The Project Site consists of the mine site with a defined buffer of 500 metres (m) around the primary Project components, and also includes linear facilities as shown in Figure 19.1-1. Mine site components include the open pit; the open pit haul road, primary crusher and ore conveyor; mill plant site with ore processing facilities and intake/outtake pipelines; TMF; overburden, topsoil, PAG waste rock, and non-PAG waste rock stockpiles; and non-PAG and PAG low-grade ore stockpiles.

Local Study Area

The local study area (LSA) boundary was created by determining a distance at which a land user could clearly view the Project. Within 8 km, several shapes and pattern of objects emerge from the general background based on the description of moderate and low viewing distance ratings defined by BC MOF 1997. Beyond 8 km the viewer will "see outlines of general shapes and patterns with little discernible texture and color, and a sense of overall perspective" (BC MOF 2001). The

LSA boundary includes a radius of 8 km around the Project infrastructure, which will encompass the foreground and mid-ground view of the landscape (BC MOF 2001; Figure 19.3-1).

Regional Study Area

The regional study area (RSA) boundary was created by determining the maximum distance at which a land user could see the Project. According to the World Meteorological Organization's *Guide to Meteorological Instruments and Methods of Observation* (WMO 2008), an object must occupy at least 0.5° of the total view relative to a viewer to be seen, and stand out from its surroundings (WMO 2006). This means that from a distance of 5 m an object must be at least 4.3 centimetres (cm) in size to be discernible. For the purposes of calculating the viewshed for the Project infrastructure, a size of 6.5 km was used which corresponds to the maximum horizontal width of infrastructure components. An area up to 56 km distance from the Project should therefore encompass all potential areas that could have views of the Project infrastructure, as indicated in Figure 19.3-1.

19.3.2.3 Technical and Administrative Boundaries

No administrative or technical boundaries apply to the visual quality effects assessment.

19.4 BASELINE CONDITIONS

19.4.1 Regional and Historical Setting

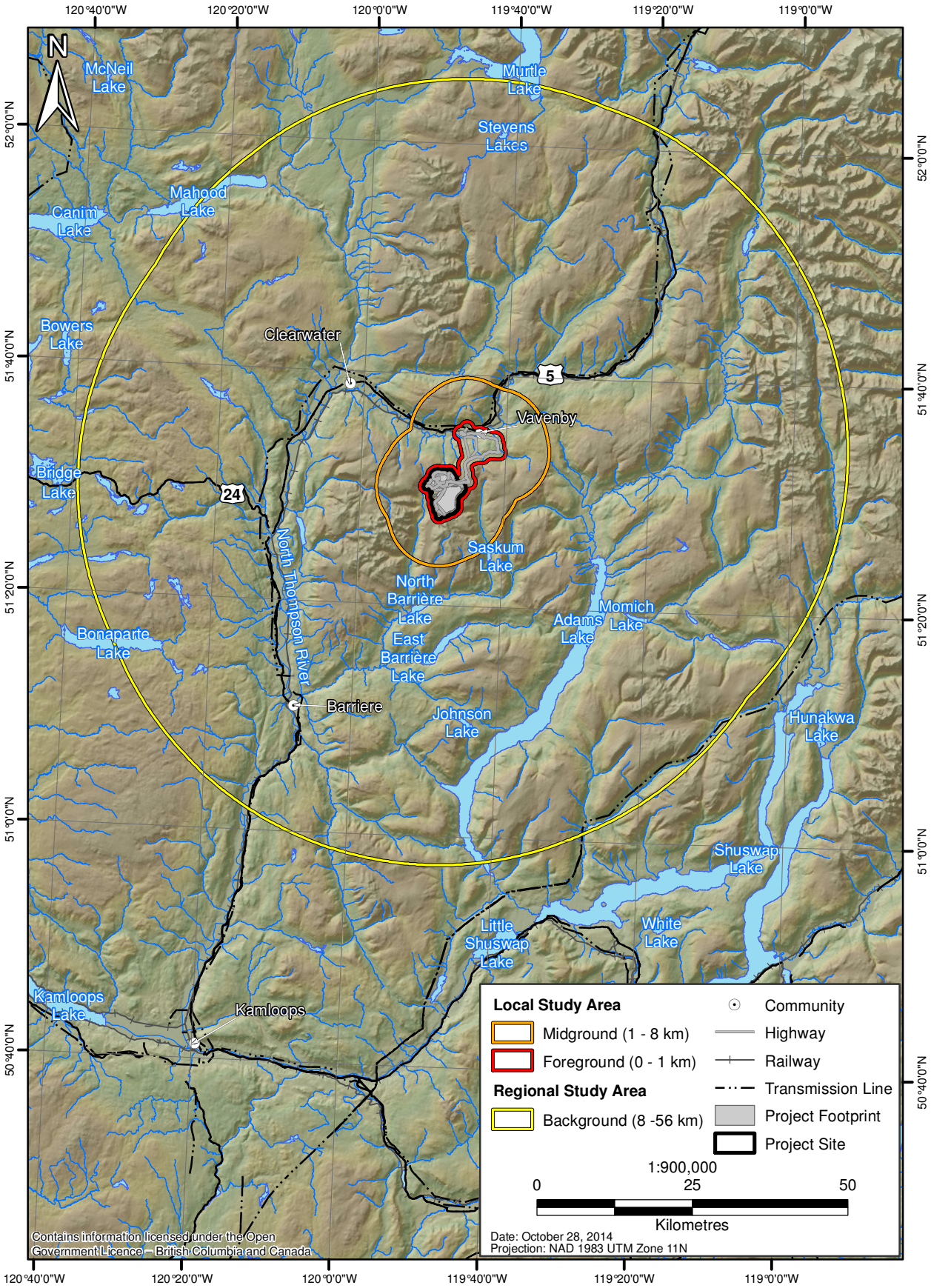
The proposed Project facilities are located on a plateau just north of Harp Mountain at approximately 1,800 metres above sea level and straddle the boundary between the Headwaters and Kamloops Forest Districts. The proposed power line, off-site facilities, and part of the proposed open pit are within the Headwaters Forest District, while all other facilities are within the Kamloops Forest District.

The Project's proposed power line and access roads begin in Vavenby. Current access to the Project Site is via the Jones Creek Forest Service Road (FSR) and/or the Vavenby Mountain FSR. The Project Site is located southwest of Vavenby and the Southern Yellowhead Highway (Highway 5). There are several provincial parks in the region. The Project facilities are also adjacent to a series of designated recreational trails known as the Foghorn-Harp Snowmobile Trail network. There are recreation facilities servicing several lakes to the south. The area around the lakes is used for a variety of activities including fishing, canoeing, camping, and other recreational activities.

The area surrounding the Project has a long history of forestry activities, and has recently been logged, with a high density of forestry access roads. Forestry is a primary economic activity in the North Thompson area; however, the industry within the Kamloops Forest District has experienced recent declines due to mountain pine beetle infestation and other economic influences (Chapter 18). There are large areas of regenerating forests and clear cuts in the area. Forestry has had an effect on the visual quality of the area, including the Project Site.

Figure 19.3-1

Visual Quality Local and Regional Study Areas



There are a variety of commercial and non-commercial land uses in the area. Commercial land use in the region has largely focused on resource development, including forestry (logging), agriculture, and mining. Other commercial land uses in the region include ranching and trapping. Public or non-commercial use includes hunting, hiking, snowmobiling, All Terrain Vehicle (ATV) riding, boating, and skiing (Chapter 18).

19.4.2 Baseline Studies

19.4.2.1 Objectives

This section summarizes the Visual Impact Assessment (VIA) appended in Appendix 19-A (Platt 2012). The objective of this study was to estimate the potential impact of the Project on visually sensitive and scenic landscapes in the vicinity of the Project. The VIA includes:

- Viewshed Analysis;
- Digital terrain modeling and development situation;
- Photographic panorama comparison; and
- Relevant planimetric map products.

19.4.2.2 Methods

The methods used to determine where there is the potential for visual quality effects are based on the procedures in the *Visual Impact Assessment Guidebook* (BC MOF 2001). This guidebook provides recommendations to help forest resource managers comply with the *Forest Practices Code Act* (1996b).

Spatial information was studied and recorded using ArcGIS. Spatial data containing potentially sensitive areas identified during the literature and data review were overlaid on GIS-based maps to compare the various types of data. Locations for field investigation were chosen by overlaying the potentially sensitive areas with the viewshed analysis results. Panoramic photographs were taken at each location to confirm both the existing visual conditions and the viewing distances.

19.4.2.3 Viewshed Analysis

A viewshed analysis was performed using the ESRI ArcGIS 10.1 3D Analyst Viewshed tool to identify the areas that could potentially be viewed from the location of Project infrastructure. The analysis assumed that an area that could be seen from Project infrastructure could also have a view of the Project infrastructure. The location and assumed height of proposed infrastructure was inserted into a digital elevation model (DEM), with an approximate resolution of 20 m, created by the Centre for Topographic Information (BC MSRM 2002).

19.4.2.4 Sensitive Areas Intersecting with the Viewshed

A review of relevant literature and land use data was conducted to identify potentially sensitive areas. The following paragraphs provide an overview of the general land use areas visible in the visual quality LSA and RSA based on this review.

Communities and Travel Corridors

The Project could be visible from Vavenby, Clearwater, and stretches of Highway 5.

Parks and Protected Areas

Figure 19.4-1 identifies the parks and protected areas in the visual quality LSA and RSA. The Project could be visible from areas within the Dunn Peak Protected Area, which is 0.5 km from the Project Site. The Project may be visible along areas of the Dunn Peak trail, which is accessed through the Harper Creek Watershed and leads to the base of Dunn Peak. The Dunn Matterhorn Peak is the highest point in the Shuswap Highlands.

The Project may be visible from areas near Wells Gray Provincial Park, located 22 km from the Project Site as well as Raft Mountain near Caligata Lake Provincial Park, located 23 km from the Project Site. The park is used for hiking and recreational fishing, and is also near Raft Mountain snowmobiling and backcountry ski trails.

Commercial Recreation Tenures

Figure 19.4-2 identifies the commercial recreation tenures in the visual quality LSA and RSA. The Project could be visible from the following tenures:

- a multiple use tenure near Wells Gray Park, 17 km north of Vavenby and 22 km north of the Project Site,
- a tenure near the North Thompson River, 15 km west from the Mine Access Road and northwest of the Project Site;
- a snowmobiling tenure, 54 km from the Project Site;
- three heli-hiking tenures between 48 km and 53 km west of the Project Site;
- a cat-ski tenure, 44 km southeast of the Project Site;
- an alpine skiing tenure south of Clearwater, 17 km east of the Project Site;
- a guided freshwater recreation tenure on the North Thompson River, 11 km west of the Project Site; and
- a heli-skiing tenure, 26 km east of the access road and 32 km east of the Project Site.

19.4.2.5 Viewpoints

Viewpoints were selected based on the literature review and identification by land users in the visual quality LSA and RSA. Several visually sensitive areas were identified and locations were selected for field investigation from several of these areas. A list and map of viewpoint locations is provided in Table 19.4-1 and Figure 19.4-3, respectively.

Figure 19.4-1

Provincial Parks and Protected Areas in the Local and Regional Study Areas

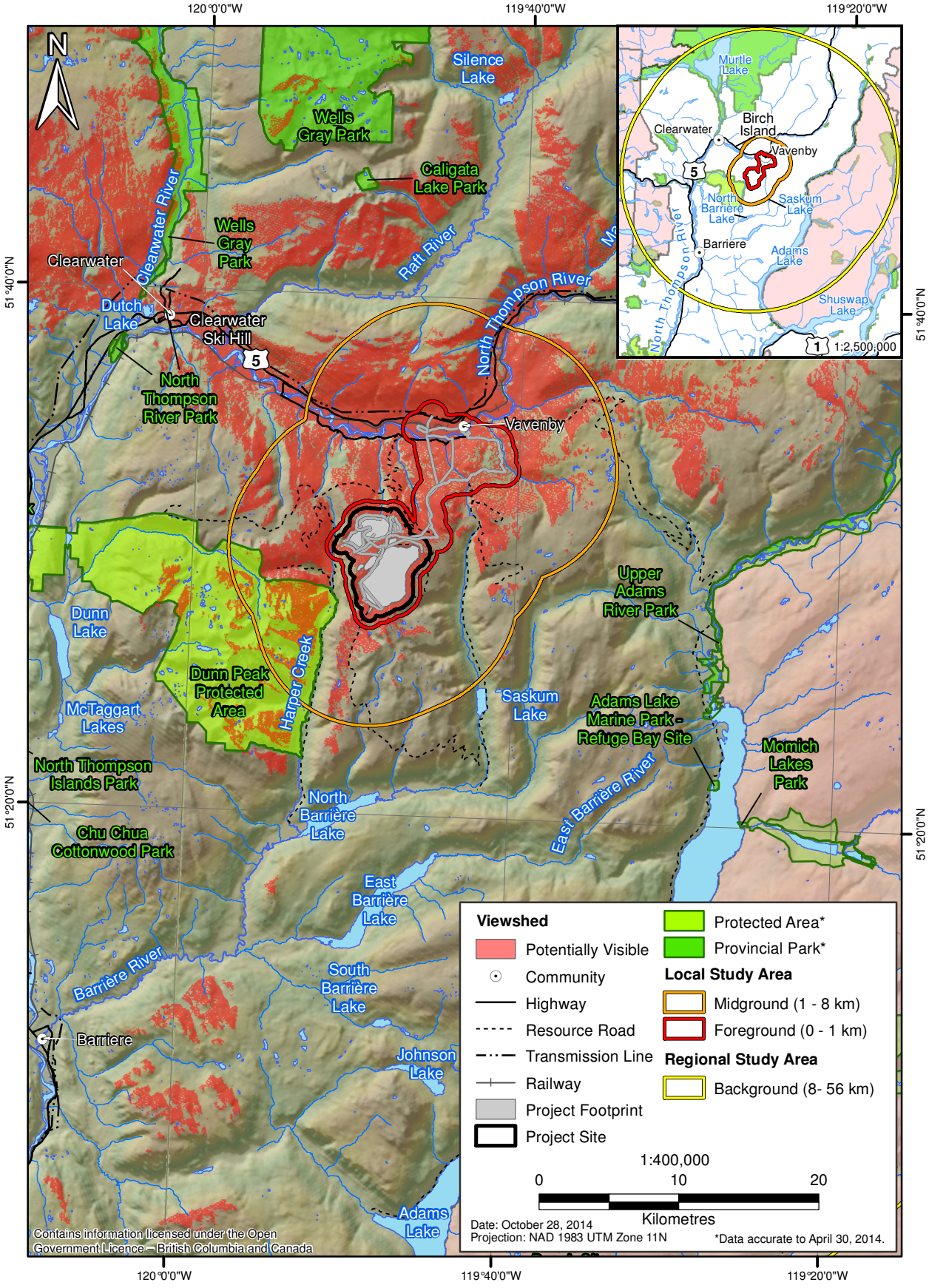


Figure 19.4-2

Commercial Recreation Tenures in the Local and Regional Study Areas

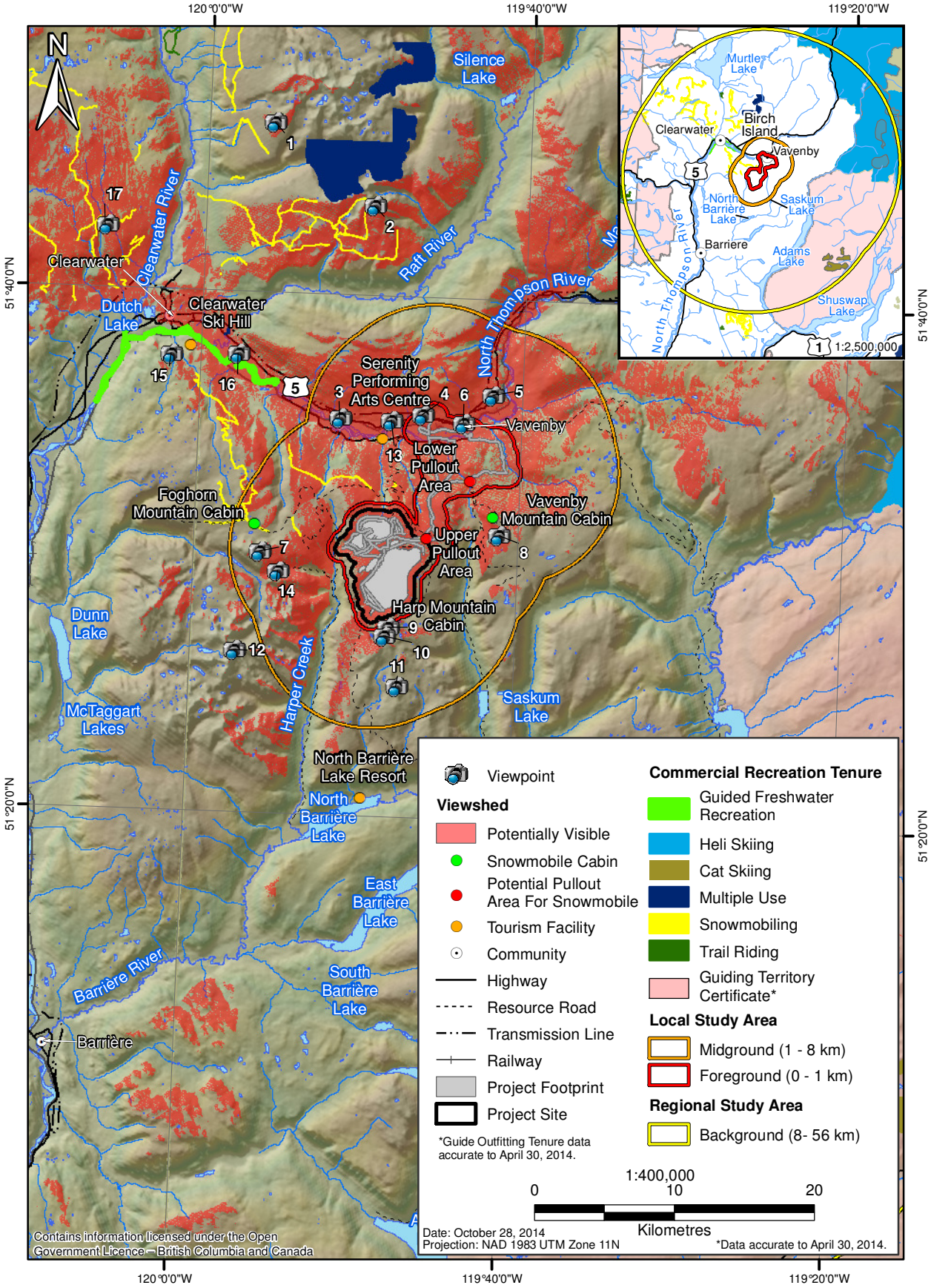


Figure 19.4-3

Visual Quality Viewpoint Locations

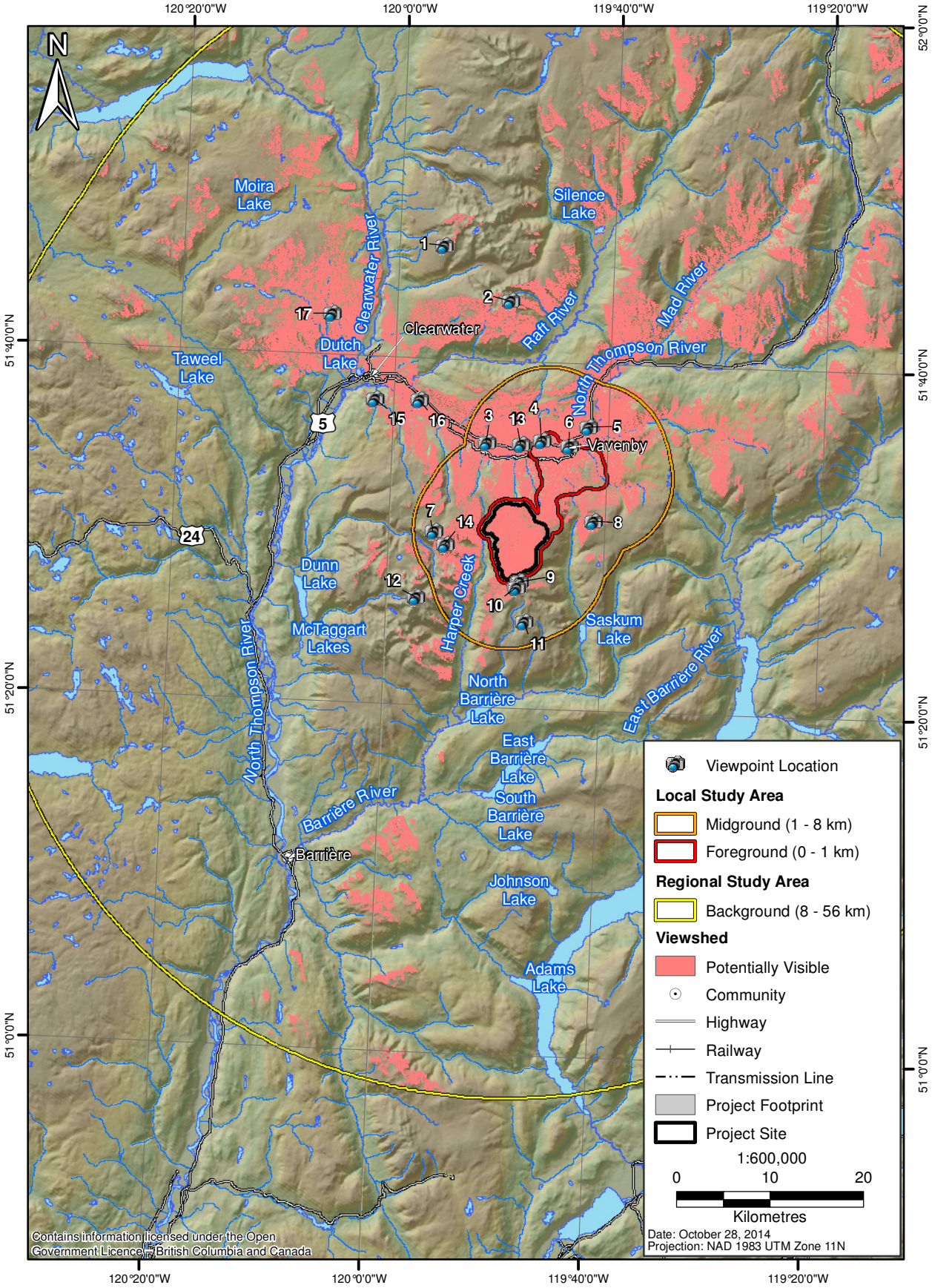


Table 19.4-1. Viewpoint Locations

Viewpoint ID	Name	Latitude	Longitude	Elevation (m)
1	Trophy Meadows	51° 46' 33.760" N	119° 55' 59.088" W	1,968
2	Raft Mountain	51° 43' 30.813" N	119° 49' 37.076" W	2,189
3	Highway 5-1	51° 35' 20.279" N	119° 51' 16.294" W	448
4	Highway 5-2	51° 35' 32.898" N	119° 46' 11.073" W	555
5	Highway 5-3	51° 36' 23.432" N	119 41 53.078" W	575
6	Vavenby	51° 35' 18.028" N	119° 43' 36.911" W	484
7	Granite Mountain	51° 30' 4.778" N	119° 55' 53.856" W	2,250
8	Vavenby Lookout Cabin	51° 31' 1.693" N	119° 41' 11.092" W	1,795
9	Harp Mountain	51° 27' 20.216" N	119° 47' 49.705" W	2,108
10	Harp Mountain Trail #1	51° 26' 59.894" N	119° 48' 3.692" W	2,208
11	Harp Mountain Trail #2	51° 25' 3.971" N	119° 47' 11.649" W	2,152
12	Dunn Peak Summit	51° 26' 14.334" N	119° 57' 15.807" W	2,638
13	Highway 5-2 Alt	51° 35' 17.674" N	119° 48' 5.63" W	505
14	Dunn Peak Trailhead	51° 29' 22.133" N	119° 54' 43.984" W	1,548
15	Clearwater Ski Hill	51° 37' 51.913" N	120° 0' 35.263" W	634
16	North Thompson River Tours	51° 37' 3.868" N	119° 56' 39.643" W	414
17	Snowmobile Trail	51° 42' 23.494" N	120° 6' 6.221" W	1,283

In a follow-up study, several sites were selected, but not visited for field investigation. One location was chosen for the guided river tours near Clearwater (Viewpoint 15), one was chosen for the nearby Clearwater Ski Hill (Viewpoint 16), and one was chosen for snowmobile trails to the northwest of Clearwater (Viewpoint 17).

19.4.3 Existing Conditions

A series of photographs were taken to create a panorama, at a selection of viewpoints (Appendix 7 of Appendix 19-A). Dunn Peak and the Dunn Peak trailhead do not have full panorama photography. The photographs are used to confirm the existing visual conditions, confirm impact of viewing distances, and, during the impact assessment, to confirm that the computer-generated models are spatially accurate and reasonably replicate the real world (Platt 2012). The photographs were used to rate the existing landscape's visual character in the HASSELL Matrix analysis, as explained in Section 19.5.1.

19.5 EFFECTS ASSESSMENT AND MITIGATION

The effects of the Project on visual quality depend on a person's ability to see the Project Site. Large and wide objects are more likely to be seen than smaller ones. The landscape surrounding the infrastructure is also important because there could be physical barriers between it and the viewer. Large Project components in particular could potentially have an effect on visual quality. For example, the east overburden stockpile and the power line may be noticeable on the landscape. The power line

will exist for the life of the mine and post-closure; however, the east overburden stockpile may not be visible until the later stages of mine development, and will be reclaimed post-closure. The TMF and the open pit cover a large area and could potentially be seen from large distances at higher elevations.

19.5.1 Screening Potential Project Effects on Visual Quality

The relationship between Project components and activities and potential Project effects is established using an impact matrix. The impact matrix applies a risk-based approach to filter potential effects into low-, moderate-, or high-risk ratings as a result of Project-VC interactions. This process serves to focus the effects assessment on the Project components and activities that are likely to have the most influential effects on each VC, in accordance with the methodology described by BC EAO (2013). The impact matrix results below evaluate the risk of effects on each VC being assessed. When data are lacking, professional judgement is used to inform this evaluation. Attention was given to establishing causal linkages between Project activities and VCs, in order to delineate the associated risks and potential effects. Risk ratings for each of the VCs as to low, moderate, or high risks associated with key activities of interaction are described in Table 19.5-1.

Table 19.5-1. Risk Ratings of Project Effects on Visual Quality Valued Components

Project Components and Activities	Visual Quality
Construction	
On-site equipment and vehicle use: heavy machinery and trucks	●
Open pit development - drilling, blasting, hauling and dumping	●
Power line and site distribution line construction: vegetation clearing, access, poles, conductors, tie-in	●
Plant construction: mill building, mill feed conveyor, truck shop, warehouse, substation and pipelines	●
Primary crusher and overland feed conveyor installation	●
Aggregate sources/ borrow sites: drilling, blasting, extraction, hauling, crushing	●
Clearing vegetation, stripping and stockpiling topsoil and overburden, soil salvage handling and storage	●
Earth moving: excavation, drilling, grading, trenching, backfilling	●
Rail load-out facility upgrade and site preparation	●
New TMF access road construction: widening, clearing, earth moving, culvert installation using non-PAG material	●
Road upgrades, maintenance and use: haul and access roads	●
Coarse ore stockpile construction	●
Non-PAG Waste Rock Stockpile construction	●
PAG and Non-PAG Low-grade ore stockpiles foundation construction	●
PAG Waste Rock stockpiles foundation construction	●
Coffer dam and South TMF embankment construction	●
Tailings distribution system construction	●

(continued)

Table 19.5-1. Risk Ratings of Project Effects on Visual Quality Valued Components (continued)

Project Components and Activities	Visual Quality
Construction (*cont'd*)	
Construction camp construction, operation, and decommissioning	●
Water management pond, sediment pond, diversion channels and collection channels construction	●
Operations 1	
Concentrate transport by road from mine to rail loadout	●
Mine site mobile equipment (excluding mining fleet) and vehicle use	●
Mine pit operations: blast, shovel and haul	●
Ore crushing, milling, conveyance and processing	●
Electrical power distribution	●
Plant operation: mill building, truck shop, warehouse and pipelines	●
Rail-load out activity (loading of concentrate; movement of rail cars on siding)	●
Progressive mine reclamation	●
Construction of Non-PAG tailings beaches	●
Construction of PAG and Non-PAG Low Grade Ore Stockpile	●
Non-PAG Waste Rock Stockpiling	●
Overburden stockpiling	●
Reclaim barge and pumping from TMF to Plant Site	●
South TMF embankment construction	●
Tailings transport and storage in TMF	●
Surface water management and diversions systems including snow stockpiling/clearing	●
Operations 2	
Partial reclamation of Non-PAG waste rock stockpile	●
Partial reclamation of TMF tailings beaches and embankments	●
Construction of North TMF embankment and beach	●
Closure	
Filling of open pit with water and storage of water as a pit lake	●
Decommissioning of rail concentrate loadout area	●
Decommissioning and reclamation of mine site roads	●
Decommissioning and removal of plant site, processing plant and mill, substation, conveyor, primary crusher, and ancillary infrastructure (e.g., explosives facility, truck shop)	●
Decommissioning of diversion channels and distribution pipelines	●
Decommissioning of reclaim barge	●
Reclamation of Non-PAG LGO stockpile, overburden stockpile and Non-PAG waste rock stockpile	●
Reclamation of TMF embankments and beaches	●

(continued)

Table 19.5-1. Risk Ratings of Project Effects on Visual Quality Valued Components (completed)

Project Components and Activities	Visual Quality
Closure (*cont'd*)	
Removal of contaminated soil	●
Use of topsoil for reclamation	●
Storage of waste rock in the non-PAG waste rock stockpile	●
Construction and activation of TMF closure spillway	●
Storage of water in the TMF and groundwater seepage	●
Post-Closure	
Construction of emergency spillway on open pit	●
Storage of water as a pit lake	●
Storage of waste rock in the non-PAG waste rock stockpile	●
Storage of water in the TMF and groundwater seepage	●

Notes:
** Includes Operations 1 and Operations 2 as described in the temporal boundaries.*
● *= Low risk interaction: a negligible to minor adverse effect could occur; no further consideration warranted.*
● *= Moderate risk interaction: a potential moderate adverse effect could occur; warrants further consideration.*
● *= High risk interaction: a key interaction resulting in potential significant major adverse effect or significant concern; warrants further consideration.*

19.5.2 Analyzing Project Effects

Seventeen viewpoints were selected for the Project, as identified in Table 19.4-1. Of the 17 viewpoints, five were based on established VQO polygons and were assessed using the BC MFLNRO's Visual Impact Assessment Procedure, which is explained in Appendix 19-A (Platt 2012). Table 19.5-2 identifies the VQO and perspective view alteration limits used in the assessment.

Table 19.5-2. VQO Definition and Perspective View Alteration Limits

Visual Quality Objective	Perspective View Alteration Percentage	Definition
Preservation	0	Very small in scale and not easily distinguishable from the pre-project landscape
Retention	0 – 1.5	Difficult to see, small in scale, and natural in appearance
Partial Retention	1.6 – 7.0	Easy to see, small to medium in scale, and natural not rectilinear or geometric in shape
Modification	7.1 – 18.0	Very easy to see, and is large in scale plus natural in its appearance, or small to medium in scale, but with some angular characteristics

The remaining 12 viewpoints were rated using the HASSELL Matrix described in Section 19.5.2.2. The baseline panoramic photographs were used to rate the existing landscape's visual character. The three-dimensional (3-D) visualizations were used to measure the degree of visual modification and

the vertical visual effect. The viewshed analysis from specific viewpoints and the 3-D visualizations were used to calculate the horizontal visual effect. These visual aspects are described further below. HASSELL Matrix evaluation results for the 12 viewpoints were used to determine potential visual quality effects. These results are described in Section 19.5.3.

19.5.2.1 Analytical Tools

The Kamloops LRMP includes VQOs covering part of the assessment area (see Sub-appendix 5 of Appendix 19-A; Platt 2012); therefore, two different procedures were used to assess visual quality effects of the Project. In cases where there is a VQO, the assessment is based on the BC MFLNRO's Visual Impact Assessment Procedure (BC MOF 2001). This assessment verifies the Project will meet the established VQO by considering:

- the visual sensitivity of the landscape;
- the number of viewers;
- the viewer's level of concern;
- the number of viewing opportunities; and
- the viewing time.

The VQOs indicate the desired visual condition for the area. Any development should be managed to agree with the objective. A list of values is provided in Table 19.5-3.

Table 19.5-3. Potential Visual Quality Objectives

Objective	Code	Description
Preserved	P	No visible human-caused alterations
Retained	R	Human-caused alterations are visible but not evident
Partially Retained	PR	Human-caused alterations are evident but subordinate and therefore not dominant
Modified	M	Human-caused alterations are dominant but have natural appearing characteristics
Maximally Modified	MM	Human-caused alterations are dominant and out of scale
Excessively Modified	EM	Human-caused alterations are excessive and greatly out of scale

In areas where there are no established VQOs, the HASSELL Matrix is used to rate viewpoint locations. The HASSELL Matrix is a system developed by HASSELL Pty Ltd. (HASSELL 2005) and is based on the standard visual management system for assessing visual effects. The standard visual management system was based on models for quantifying potential changes to landscape composition (Litton 1974). The HASSELL Matrix measures the following aspects of visual quality to assess a development's total visual effect on the landscape:

- existing landscape visual character;
- degree of visual modification;

- horizontal visual effect;
- vertical visual effect; and
- distance of visual effect.

19.5.2.2 HASSELL Matrix System

The existing landscape visual character aspect is assigned a value from one to five, as shown in Table 19.5-4. The degree of visual modification aspect of visual quality is measured by assessing the degree of visual change to the existing landscape that would result from a project, balanced with consideration of the landscape's capacity to absorb or mitigate visual effects, and assigning that a value from one to five, as shown in Table 19.5-5.

Table 19.5-4. Existing Landscape Visual Character

Description	Value	Typical Character/Modification
Unmodified landscape/natural	5	No or minimal effect from anthropogenic sources (e.g., national parks, coastlines, native forest areas)
Natural transition landscape	4	Changing landscape character associated with the interface between natural areas and modified rural, pastoral, or agricultural zones
Modified rural landscape, agricultural, pastoral areas	3	Rural landscape defined by field patterns, forestry plantations, and agricultural areas, and associated small roads and buildings
Rural transition landscape	2	Landscape associated with the interface between rural, agricultural areas, and more developed suburban or urban zones
Highly modified landscape, urban/industrial	1	Substantially developed landscape with a high level of visual effects associated with buildings, factories, roads, and other related infrastructure

Source: HASSELL (2005).

Table 19.5-5. Degree of Visual Modification

Degree of Visual Modification (expressed as percentage of change)	Value	Description of Visual Modification
80 to 100	5	Substantial visual effects: the existing landscape character is completely changed or modified to accommodate the development
60 to 79	4	Increasing visual effects: the landscape is seen as changed permanently with the development dominating the existing landscape
40 to 59	3	Moderate visual effects: medium level of change to the landscape character; the landscape is less able to absorb change because of the scale, frequency, or extent of the development
20 to 39	2	Limited effects: the development is noticeable within the landscape, but the capacity for the landscape to absorb the development through vegetation growth or landforms is high
0 to 19	1	No or minor visual effects within the landscape: the development is considered in keeping with the existing landscape character

Source: HASSELL (2005).

The horizontal visual effect aspect of visual quality concerns the human field of vision. This field is described as an angle of 200º horizontally. Using this fixed visual reference, an assessment is made of the possible effect of a project within this measurable area. The centre of a proposed development is established and an angle of 100º on each side is defined. The extent of visual effect within this zone is then measured. The overall assessment is conducted for an entire development, rather than for individual infrastructure. This measurement of effect is then described as a percentage of the panorama and is assigned a value from one to five, as shown in Table 19.5-6.

Table 19.5-6. Horizontal Visual Effect

Degree of Horizontal Visual Effect of the Panorama Measured at 200º Field of Vision (expressed as percentage of change)	Value	Description of Visual Modification
80 to 100	5	Substantial visual effects throughout the whole panorama
60 to 79	4	Increasing visual effects
40 to 59	3	Moderate visual effects
20 to 39	2	Limited visual effects
0 to 19	1	No or minor visual effects

Source: HASSELL (2005).

The vertical visual effect aspect of visual quality is measured in a similar way to the horizontal visual effect, but the field of view is described as 150º. This assessment ensures that the visual effect in relation to proximity is considered. This aspect is assigned a value from one to five, as shown in Table 19.5-7.

Table 19.5-7. Vertical Visual Effect

Degree of Vertical Visual Impact of the Panorama Measured at a 150º Field of Vision (expressed as percentage of change)	Value	Description of Visual Modification
80 to 100	5	Substantial visual effects
60 to 79	4	Increasing visual effects
40 to 59	3	Moderate visual effects
20 to 39	2	Limited visual effects
0 to 19	1	No or minor visual effects

Source: HASSELL (2005).

The distance of visual effect aspect of visual quality is a measurement of how visual effect is modified by distance. The effect of scale, topography, vegetation, aerosols, and weather changes with distance and, in turn, changes the degree of visual effect. This aspect is assigned a value from one to five, as shown in Table 19.5-8.

Table 19.5-8. Distance of Visual Effect

Distance to Development (km)	Value	Description
0 to 0.5	5	Adjacent
0.5 to 1	4	Foreground
1 to 3	3	Middle ground
3 to 5	2	Distant middle ground
Over 5	1	Background

Source: HASSELL (2005).

The values of all five visual aspects are then added together resulting in the final visual effect value, which is used to determine the degree of visual effect, as shown in Table 19.5-9.

Table 19.5-9. Final Visual Effect Rating

Degree of Visual Effect	Value
Severe	21 to 25
Substantial	17 to 20
Moderate	13 to 16
Slight	9 to 12
Negligible	5 to 8

Source: HASSELL (2005).

19.5.3 Viewpoints

19.5.3.1 Visual Quality Objectives

Viewpoints 3, 4, 5, 6, and 13 are related to specific VQOs. Sub-appendix 5 of Appendix 19-A (Platt 2012) shows these viewpoints in relation to the established VQOs in the vicinity of the Project. Viewpoints 3, 4, 5, and 13 are located along Highway 5, while Viewpoint 6 is located near Vavenby. Viewpoint 3 is 9.5 km west of Vavenby and has an established VQO of Partial Retention, Viewpoint 4 is 3.3 km west and has an established VQO of Modification, Viewpoint 5 is 2.5 km west and has an established VQO of Modification, and Viewpoint 13 is 5.6 km west of Vavenby and has an established VQO of Modification. The highway corridor provides sustained side viewing to the south across the North Thompson River Valley. Existing forest activity can be seen from these locations. Nearby trees could provide a minor barrier to the view of the Project. Viewpoint 6 is on a popular recreational area in Vavenby. The recreation sensitivity and significance for Viewpoint 6 is high and has an established VQO of Partial Retention. Table 19.5-10 lists viewpoints with specific characteristics.

19.5.3.2 Provincial Parks

Viewpoint 1 is in Trophy Meadows in Wells Gray Provincial Park. It is an easily accessible sub-alpine meadow, which is a popular hiking area. The meadow does not provide a barrier to the view of the Project.

Table 19.5-10. List of Viewpoints with Specific Characteristics

Viewpoint Name	VP #	Importance*	Field of View	Direction	VQO**
Trophy Meadows	1	5	38.6	165	NA
Raft Mountain	2	5	38.6	176	NA
Highway 5 – 1a	3	2	44	111	PR
Highway 5 – 1b	3	2	71	169	M
Highway 5 – 2	4	2	95	158	PR
Highway 5 – 3	5	3	56	209	PR
Vavenby	6	5	90	182	PR
Granite Mountain	7	2	60	86	NA
Vavenby Lookout Cabin	8	5	45	278	NA
Harp Mountain	9	NA	41	341	NA
Harp Mountain 1	10	5	60	354	NA
Harp Mountain 2	11	5	56	346	NA
Dunn Peak Summit	12	5	45	55	NA
Highway 5 – 2 alt	13	2	65	176	M
Dunn Peak Trailhead	14	5	25	80	NA
Clearwater Ski Hill	15	3			NA
North Thompson River	16	5			NA
Lizard Head Mountain	17	1			NA

** Importance is based on the "Effectiveness Evaluation of Visual Impacts" (BC MOF 2008). Importance of the viewpoint is determined using a five-point scale from Low (1) to High (5). The scale is calibrated to the viewing duration: (1) Low - glimpse view, less than 10 seconds, (2) sustained side view, (3) Moderate - sustained focal view, travelling toward the alteration for more than one minute, (4) viewpoint is at a rest stop, campsite, or other static short-term view location, (5) High - viewpoint is the location of a community, commercial tourist-related enterprise, or other static long-term view location.*
*** VQO (Visual Quality Objective) is explained in detail in Figure 3 of Appendix 19-A (Platt 2012).*

19.5.3.3 Commercial Recreation Tenures

Viewpoint 2 is on the south slopes of Raft Mountain, near the Willis Snowmobile Cabin. The viewpoint is upslope of the cabin site. The location is in the area of networks of cross-country ski and snowmobile trails. The ground is clear and the nearby trees do not provide a barrier to the view of the Project. The recreation sensitivity and significance for Viewpoint 2 is high.

Viewpoint 7 is on a location near the summit of Granite Mountain, approximately 2.1 km from a maintained shelter. Granite Mountain is part of the Foghorn-Harp Snowmobile Trail and a snowmobile commercial recreation tenure.

19.5.3.4 Snowmobile, Multi-use Tenure (Non-commercial)

Viewpoint 8 is on a road landing in an area of recent harvesting, 1,380 m from the Vavenby Mountain Lookout Cabin. This site was chosen because it will be a good representation of potential viewing windows created by future forestry harvesting activities.

Viewpoint 9 is on Harp Mountain, 400 m from the Harp Mountain Cabin. Harp Mountain is a well-known managed snowmobile area and a popular hiking and cross-country skiing area. The Foghorn-Harp Snowmobile Trails are designated as active recreation trails by the provincial recreation inventory. The topography and trees will provide a barrier to the view of the Project. The recreation sensitivity and significance for Viewpoint 9 is high.

Viewpoints 10 and 11 are on a trail designated by the provincial recreation inventory. Harp Mountain is a well-known managed snowmobile area and the area is popular for hiking and cross-country skiing. The recreation sensitivity and significance rating for Viewpoints 10 and 11 is high.

Viewpoint 12 is on the summit of Dunn Peak. The Dunn Peak summit is accessed via the Dunn Peak Trail. This is the highest point in the Shuswap Highlands and it provides 360º panoramic views. The recreation sensitivity and significance for Viewpoint 12 is high.

Viewpoint 14 is from the head of Dunn Peak Trail and parking area. The trail is a moderately popular day and overnight hiking destination and leads to the base of Dunn Peak. The recreation sensitivity and significance for Viewpoint 14 is high.

19.5.3.5 Alpine Ski Tenure

Viewpoint 15 is from a location within the Clearwater Ski Hill alpine skiing tenure. The recreation sensitivity and significance for the viewpoint is medium.

19.5.3.6 River Tour Tenure

Viewpoint 16 is from a point within the North Thompson River tenure for river tours. The recreation sensitivity and significance rating for the viewpoint is high.

Viewpoint 17 is from a point within a snowmobile commercial recreation tenure that leads to Lizard Head Mountain. The recreation significance and sensitivity recreation rating for the area is low.

19.5.4 Viewpoint Viewshed

A second viewshed analysis was completed from baseline viewpoints. Viewshed modelling included the same DEM from the BC Terrain Resource Information Mapping program used in the baseline viewshed analysis. The modelling also included Vegetation Resources Inventory data from the British Columbia Integrated Land Management Bureau. The DEM was used to provide topographic information, and the vegetation resources inventory was used to add tree height data to the modelled landscape 3-D visualization.

19.5.4.1 3-D Visualization

A 3-D visualization was created to model the changes in visual quality for photographs taken during the baseline study at the selected viewpoints. The surrounding ecosystems were recreated based on a DEM and GIS shapefiles containing spatial data of water and vegetation features. Proposed Project features were added to the model to create a view with potential vertical and horizontal changes caused by the infrastructure. The results from the model can be seen in Sub-appendix 7 of Appendix 19-A (Platt 2012).

19.5.5 Viewpoint Assessment

19.5.5.1 Points with Visual Quality Objectives

From Viewpoint 3, portions of the power line right-of-way and the east overburden stockpile are visible. The proposed power line is visible along a stretch on the upper slope where it parallels the contours. Following the definition and perspective view alteration limits shown in Table 19.5-2, the alteration to the landscape accounts for less than a 1% addition. Existing forest activity disturbance accounts for 1.3%. The top of the east overburden stockpile is visible above a mature stand of balsam trees that have a projected height of 22 m. This stand is not likely to provide further screening over the life of the Project. The amount of effect meets the VQO definition of Modification.

From Viewpoint 4, portions of the power line right-of-way and the east overburden stockpile are visible. The power line is 2 km from the viewpoint, putting it in the middle ground, while the Project Site is 7.9 km from the viewpoint, putting it in the background. Following the definition and perspective view alteration limits shown in Table 19.5-2, the alteration to the landscape accounts for less than a 1% addition. Existing forest activity disturbance accounts for less than 1%. The proposed power line route has straight tangents and climbs perpendicular to contours, and is visible as it climbs across contours on the lower and mid-slopes. The mitigating factor here is the variability that already exists on the landscape. Variable stands of conifer and deciduous trees with varying ages and undulating terrain help this straight tangent look more natural. The top of the east overburden stockpile is visible above a mature stand of balsam trees that is anticipated to grow to a height of 22 m. This stand is not likely to provide further screening over the life of the Project. The amount of effect meets the VQO definition of Partial Retention.

From Viewpoint 5, the top of the east overburden stockpile is visible and could be prominent in the viewscape. The power line is 7 km from the viewpoint, putting it in the middle ground, while the Project Site is 11.2 km from the viewpoint, putting it in the background. A mitigating factor is that the stockpile is in the background and therefore its visual effect is diminished. The mature stand of balsam trees in front of the stockpile will not likely provide further screening over the life of the Project. The amount of effect meets the VQO definition of Partial Retention.

From Viewpoint 13, the east overburden stockpile is visible on the horizon. The stockpile is at the very top of the slope, 7 km away from the viewpoint, and is above an area with significant tree stand variability. This variability in stand age, stocking, and height will continue through the life of the Project as this area is an active forestry cutblock. The amount of effect meets the VQO definition of Modification.

19.5.5.2 Parks

From Viewpoint 1, the PAG low-grade stockpile and north non-PAG stockpile will be visible. The Project Site is 29 km from the viewpoint, putting it in the background. Topography will block part of the Project Site. Project facilities would only be visible on clear days, free of haze and low cloud.

19.5.5.3 Snowmobile, Multi-use Tenure

The proposed mine facilities will be visible from Viewpoint 2, including the pit. The Project Site is 22 km from the viewpoint. However, due to the large scale of the Project, the facilities will be visible on moderately clear days. The topography will block part of the Project Site.

From Viewpoint 6, the east overburden stockpile is visible. The power line is 2.8 km from the viewpoint, putting it in the middle ground, while the Project Site is 8.5 km from the viewpoint, putting it in the background. A mitigating factor is that the stockpile is in the background on an upper slope. The mature stand of balsam trees in front of the stockpile will not likely provide further screening over the life of the Project.

Most of the proposed Project facilities are visible from Viewpoint 7, including the stockpiles and the TMF, the open pit, and the plant facilities. The Project Site is 7 km from the viewpoint. There will be a high impact on the visual landscape from this viewpoint based on its moderate viewing distance and the scale of the proposed Project facilities. It is important to note that this viewpoint is from the Granite Mountain summit and the facilities are not visible from the Foghorn Mountain Meadows (shelter site) or the designated trail network in the area.

The east overburden stockpile, power line right-of-way, northwest topsoil stockpile, and a small portion of the open pit are visible from Viewpoint 8. The Project Site is 6 km from the viewpoint. This is an area of regenerating forests and viewing windows to the Project Site are limited. Over time, as the Project Site is developed, these viewing windows will change as regenerating forests grow and continue to add to vegetative screening and new harvesting activities open up new viewing windows.

From Viewpoint 9, the PAG low-grade stockpile and TMF, including the dam embankment, would be visible. The Project Site is 1.3 km from the viewpoint. The Project facilities are not visible from the Harp Mountain Cabin.

Viewpoint 10 has an unobstructed view of the proposed mine facilities. The Project Site is 2.5 km from the viewpoint. Most facilities would be visible from this location, including the plant site buildings and infrastructure.

From Viewpoint 11 a small portion of the TMF is visible and is approximately 7 km away. The peak of Harp Mountain is between the viewpoint and the mine facility.

All Project facilities will be visible from Viewpoint 12. However, this viewpoint is not as accessible to the average recreational user so there will not be a large number of viewers, compared to the more accessible hiking and snowmobile trails in the area. At a 10 km viewing distance, the mine will be well beyond the immediate foreground, mitigating its visual impact.

From Viewpoint 14, the PAG stockpiles and the west topsoil stockpiles will be visible when looking east and will offer potential glimpse views while travelling along the access road. No other mine facilities would be visible. This area is sparsely vegetated and views of the mine facilities are expected to be short in duration. It should be noted that the Project facilities are not expected to be

visible from the Dunn Peak Trail itself, as it is more heavily vegetated and quickly turns to the south behind a large ridge.

From Viewpoint 15 looking east the Project Site will likely not be visible. The location is 17 km to the northwest of the Project. As the Project cannot be seen, no further analysis will be done for this location.

19.5.5.4 River Tour Tenure

Viewpoint 16, which is located within the North Thompson River tenure for river tours, has a view on the western part of the Project Site (see Figures 19.4-2 and 19.4-3). The viewpoint is 12.5 km northwest of the Project Site, outside the LSA. The view of Project infrastructure can only be seen for a portion of the river tour at a distance which makes it hard to discern individual infrastructure items. Vegetation and topography are mitigating factors for the view.

Viewpoint 17 has a view on the Project from a similar angle as viewpoint 16 only farther away (22 kilometres). This viewpoint is part of the snowmobile trails northwest from Clearwater. The viewpoint is located at an elevation of 1,283 metres and therefore has a better and wider view of the Project. The distance from the Project makes it even harder to discern any individual infrastructure items.

19.5.6 Non-VQO Viewpoints

Table 19.5-11 summarizes the HASSELL Matrix values for each of the sites with no VQO, based on the information above.

Table 19.5-11. Results of Hassel Matrix for Non-VQO Viewpoints

Viewpoint	Area	Existing Landscape Visual Character	Degree of Visual Modification	Horizontal Visual Effect	Vertical Visual Effect	Distance of Visual Effect	Final Visual Effect Rating	Degree of Visual Effect
1	Trophy Meadows	5	1	1	1	1	9	Slight
2	Raft Mountain	4	2	2	1	1	10	Slight
7	Granite Mountain	4	3	4	1	1	13	Moderate
8	Vavenby Lookout Cabin	3	1	1	1	1	7	Negligible
9	Harp Mountain	4	3	2	2	3	14	Moderate
10	Harp Mountain Trail #1	4	2	3	1	3	13	Moderate
11	Harp Mountain Trail #2	5	1	1	1	1	9	Slight
12	Dunn Peak Summit	4	2	3	1	1	11	Slight
14	Dunn Peak Trailhead	5	1	2	1	1	10	Slight

(continued)

Table 19.5-11. Results of Hassel Matrix for Non-VQO Viewpoints (completed)

Viewpoint	Area	Existing Landscape Visual Character	Degree of Visual Modification	Horizontal Visual Effect	Vertical Visual Effect	Distance of Visual Effect	Final Visual Effect Rating	Degree of Visual Effect
15	Clearwater Ski Hill	NA	NA	NA	NA	NA	NA	NA
16	North Thompson River Tours	3	2	1	1	1	8	Slight
17	Lizard Head Mountain	4	2	2	1	1	10	Slight

19.5.7 Mitigation Measures

With the implementation of mitigation measures, as summarized in Table 19.5-12, effects on visual quality can be reduced.

Table 19.5-12. Proposed Mitigation Measures and their Effectiveness

Potential Effects	Proposed Mitigation Measure	Effectiveness *(Low/Moderate/High/Unknown)*	Residual Effect *(Y/N)*
Effect of alteration to the landscape associated with the Project components on visual quality	Re-vegetate disturbed areas not directly affected by the Project during the Construction and Operations phases	Moderate	Y
	Re-vegetate directly disturbed areas following decommissioning and Closure	High	N

During the Operations phase, for viewpoints with a moderate classification from the HASSELL Matrix, mitigation measures include re-vegetating areas not directly affected by the Project. At viewpoints 2, 9, and 10 there will be a residual effect. These viewpoints are at locations close to the mine at high elevations. The Project will have a similar effect on all of these sites. A number of stockpiles and the tailings facility could have an effect on visual quality for viewpoints at higher elevations. Due to the size of the facilities and the less obstructed view from the high viewpoints, the facilities will cause a residual effect. The east overburden stockpile will become visible from many locations as it grows throughout the mine life. Mitigation should be considered when it reaches a height that will affect views. At closure, the TMF embankments will be vegetated, which will reduce the residual effect to a non-significant level.

In addition to these mitigation measures, good visual design principles can be taken into consideration during Project design and construction. Visual design is a process that works with visual patterns and lines of force to guide changes to development design in ways that meet the needs of many resource values, including economic, recreational, ecological, and social values. The following are examples of good visual design principles:

- utilizing variable clearing widths - keeping right-of-way clearing as narrow as possible when safe to do so will create a variable width that makes the corridor more natural in appearance; this also fits well with hazard tree abatement procedures along the power line corridor;
- utilizing benches in topography and less visually sensitive terrain;
- utilizing screens created from vegetation;
- exploiting visual shadows (hidden areas);
- avoiding straight edges when possible;
- feathering forest edges along cleared areas and right-of-ways; feathered edges look more natural in appearance;
- re-vegetation of exposed soil and rock;
- rehabilitating road and right-of-ways with grasses and vegetation following construction;
- considering infrastructure aesthetics (using non-reflective material and natural colours); and
- engineering road clearing widths as narrow as possible where safe to do so and feasible for construction; standard clearing widths can be reduced whenever side slopes and road prisms allow.

19.5.8 Predicted Residual Effects and Characterization

19.5.8.1 Residual Effects on Visual Quality

As listed in Table 19.5-10, the viewpoints in close proximity to the Project are most likely to be visually affected by the Project activities to an extent not exceeding a moderate effect. Large and more intrusive Project infrastructure, such as the TMF or the waste rock stockpile, will be most visually obvious during the Operations phase. These components will be re-vegetated during closure, which will limit the extent to a slight effect.

19.5.8.2 Characterization of Effect of Alteration to the Landscape Associated with the Project Components on Visual Quality

Residual effects will largely occur during the Operations phase. The magnitude of the effect will be moderate, based on the HASSELL Matrix results for the sites with potential residual effects. The sites that will have a residual effect are those closest (within 3 km) to the Project. The sites are in the foreground or middle ground, based on the HASSELL Matrix definition. The effect will be long-term. Even though construction and operation of the mine will span a long period, the time during which its size will be significant enough to cause an effect will be much shorter. The frequency of the effect will be sporadic or regular, depending on the seasonal popularity of the particular site. The effect is partially reversible. The mitigation measure will help to reduce the effect during the Closure phase; however, the view will be changed from the current landscape appearance. The resiliency of the area to absorb the effect is neutral. Topography and vegetation can reduce the effect on the landscape; however, when the Project is in the foreground, the environment will have less of a mitigating effect. Table 19.5-13 lists the characterization criteria for visual quality; these are based on Table 8.6-2 Attributes for Characterization of Residual Effects (Chapter 8 Assessment Methodology), with the exception of the biophysical criterion, which was developed specifically for the visual quality VC.

Table 19.5-13. Definitions of Specific Characterization Criteria for Visual Quality

Timing	Magnitude	Biophysical* (distance to development in km)	Socio-economic	Duration	Frequency	Reversibility	Resiliency
Construction phase	Negligible	Foreground (0.5- 1)	Individual/ household	Short term	One time	Reversible	Low
Operations phases	Low	Middle ground (1-3)	Community	Medium term	Sporadic	Partially reversible	Neutral
Closure phase	Moderate	Distant middle ground (3-5)	Regional/ Aboriginal	Long term	Regular	Irreversible	High
Post-Closure phase	High	Background (>5)	Beyond regional	Far future	Continuous	-	-

**Definitions are from Table 19.5-8.*

19.5.8.3 Likelihood of Effect of Alteration to the Landscape Associated with the Project Components on Visual Quality

Likelihood refers to the probability of the predicted residual effect occurring and is determined according to the attributes identified in Table 19.5-14.

Table 19.5-14. Attributes of Likelihood of Effects

Probability Rating	Quantitative Threshold
High	> P80 (effect has > 80% chance of effect occurring)
Moderate	P40 - P80 (effect has 40 - 80% chance of effect occurring)
Low	< P40 (effect has < 40% chance of effect occurring)

There is a high likelihood that there will be a residual effect on visual quality caused by the Project. The Project's size will ensure that it takes up a large proportion of a view, even from a distance. If the higher elevation viewpoint locations continue to be used as viewpoints, the view of the Project will be clearer because there is less topography and dense vegetation to block the view.

19.5.8.4 Summary of Residual Effects on Visual Quality

During the Operations phase, the Project will alter the visual quality of the landscape. When mitigation measures are applied there will still be a residual effect (Table 19.5-15).

Table 19.5-15. Summary of Residual Effects on Visual Quality

Valued Component	Project Phase (Timing of Effect)	Cause-Effect [1]	Mitigation Measure(s)	Residual Effect
Visual Quality	Operations	Construction of Project facilities will alter visual quality of landscape	Re-vegetate disturbed areas not directly affected by the Project during Construction and Operations	Alteration by Project on visual quality

[1] *"Cause-effect" refers to the relationship between the Project component or physical activity that is causing the change or effect in the condition of the receptor VC, and the actual change or effect that results.*

The study has taken into account the degree of change caused by the Project. Based on the result of the HASSEL Matrix on the viewpoints, the scale of the significance of adverse residual effect is moderate, and therefore the significance rating of this VC would be not significant. The significance rating applies to the Project as a whole. The individual locations are affected by the development to varying degrees. The areas further away from the Project are only affected slightly. However, the closer areas will have a greater degree of change.

19.5.9 Confidence and Uncertainty in Determination of Significance

The confidence rating for the determination of significance is moderate, although there is confidence in the modelling techniques and the mitigation effectiveness is known. The baseline data use conservative estimates on areas that have potential views of the site, as vegetation is not considered as a possible mitigating factor. There is not enough information available about vegetation height and density to accurately estimate the effect it has on the visibility of the project. The sites chosen are those where the Project is most likely to be seen.

19.5.10 Summary of the Assessment of Residual Effects for Visual Quality

There is a high likelihood that the Project will cause an effect on visual quality. After mitigation is applied the magnitude will be moderate, the geographic extent will be foreground to middle ground, the duration will be long-term, the frequency will be continuous, the change will be reversible in the long-term, and the resiliency of the environment to absorb the change is low (Table 19.5-16). The scale of the significance of the adverse residual effect will be moderate and the rating is considered to be not significant.

19.6 CUMULATIVE EFFECTS ASSESSMENT

19.6.1 Scoping Visual Quality Cumulative Effects

Cumulative effects are the result of Project-related residual effects interacting with the residual effects of other human actions (i.e., anthropogenic developments, projects, or activities) to produce a combined effect. The methodologies used in the cumulative effects assessment (CEA) are outlined in Section 8.7.

19.6.1.1 Valued Components and Project-Related Residual Effects

A moderate residual effect resulting in alteration to the landscape associated with the Project components and infrastructure during operations was identified in the project effects assessment as described in Table 19.5-16. This effect will be assessed for cumulative alteration to the landscape.

19.6.1.2 Defining Assessment Boundaries

Similar to the Project-related effects, assessment boundaries define the maximum limit within which the cumulative effects assessment (CEA) is conducted. A CEA considers past, present, and reasonably foreseeable future projects and activities, within an effects assessment study area boundaries or beyond, that may in combination exacerbate a particular effect. Given the nature of visual effects assessment, its scoping in terms of the need for CEA is approached in a manner that recognizes the extensive and dissimilar spatial criteria typical of such assessments.

Table 19.5-16. Summary of Key Effects, Mitigation, Residual Effects, Likelihood, Significance, and Confidence

Key Effect	Mitigation Measures	Summary of Residual Effects Characterization Criteria *(Magnitude, Biophysical, Socio-economic, Duration, Frequency, Reversibility, Resiliency)*	Likelihood *(High, Moderate, Low)*	Significance of Adverse Residual Effects		Confidence *(High, Moderate, Low)*
				Scale *(Minor, Moderate, Major)*	Rating *(Not Significant; Significant)*	
Alteration to the landscape associated with the Project components and infrastructure	Re-vegetate disturbed areas not directly affected by the Project during Construction and Operations	Moderate, foreground to middle ground, Community Long-term, Continuous, Reversible, Low	High	Moderate	No Significant	Moderate

In scoping the Project for visual CEA, it is noticeable that the RSA for the Project-related assessment is large, since visual effects are generally visible from further afield than, for instance, the effects on a terrestrial component may be felt. With reference to the WMO's *Guide to Meteorological Instruments and Methods of Observation* (WMO 2008) described in Section 19.3.1.3 above, for the largest envisaged width of Project infrastructure of 6.5 km, a viewer would not be able to discern such infrastructure beyond a distance of 56 km. The RSA for the visual quality assessment for the Project was thus set at a 56-km radius from the site. Although the CEA area as defined for the Project extends beyond the visual quality assessment RSA in places, the present and reasonably foreseeable future projects outside of the visual quality assessment RSA may be discounted as possibly being affected since none of the Project infrastructure would be discernable.

The BC MOF *Visual Impact Assessment Guidebook* (BC MOF 2001) regards 8 km as the nominal maximum distance at which the shape and pattern of an object emerges from the background and it is evident that the effect of scale, topography, vegetation, airborne particles, and weather modifies visibility distances. Locations beyond 8 km were thus regarded as background for the study, as evident in Figure 19.4-3.

That changes in distance significantly influence changes in the degree of visual effect is further illustrated by the HASSELL Matrix applied in this assessment, where the lowest value, i.e., least impact, assignable is for distances greater than 5 km (Table 19.5-7).

As such, the CEA area is the same as the RSA defined in Section 19.3.3.2 and is presented in Figure 19.6.1.

19.6.1.3 Projects and Activities Considered

Figure 19.6-1 shows the location of past, present, and reasonably foreseeable future projects for the CEA of the Project. The definitions are as follows:

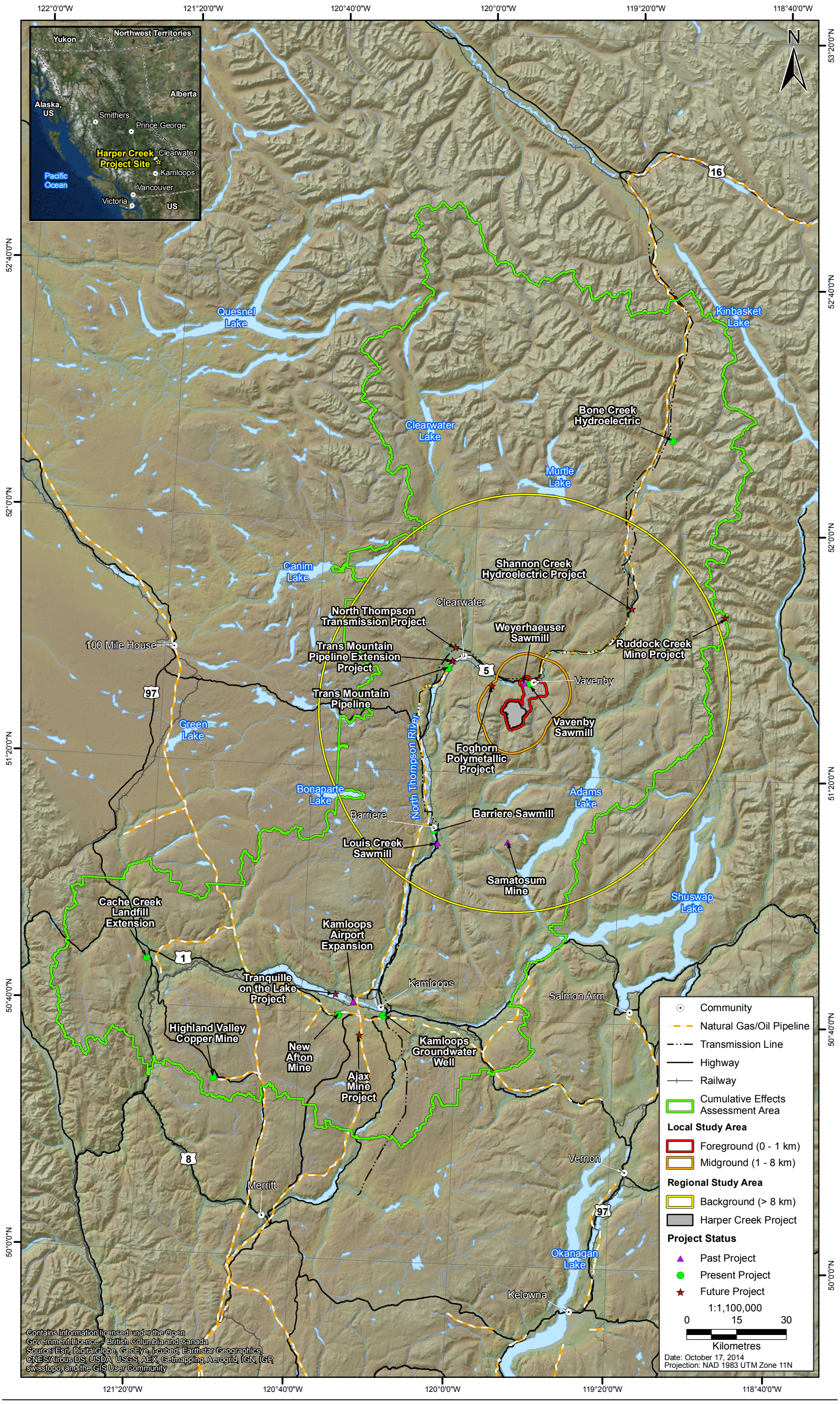
- **Past**: no longer operational projects and activities that were implemented in the past 50 years. This temporal boundary enables to take into account any far-future effects from past projects and activities[1].
- **Present**: active and inactive projects and activities; and
- **Future**: certain projects and activities that will proceed, and reasonably foreseeable projects and activities that are likely to occur. These projects are restricted to those that 1) have been publicly announced with a defined project execution period and with sufficient project details for assessment; and/or 2) are currently undergoing an environmental assessment, and/or 3) are in a permitting process.

As illustrated in Figure 19.6-1, of the three presently active projects in the RSA, namely the Vavenby and Barriere sawmills and the Trans Mountain Pipeline, it is only the Vavenby Sawmill that warrants consideration, since the others would fall outside the areas of potential visibility. Given the changed landscape in which the sawmill is located in, and the disparate nature of the vistas from the sawmill, it can be scoped out of the visual CEA.

[1] Far future effects are defined as effects that last more than 37 years, as per Table 8.6-2: Attributes for Characterization of Residual Effects.

Figure 19.6-1

Location of Past, Present, and Reasonably Foreseeable Future Projects for the Cumulative Effects Assessment



Of the four foreseeable future projects in the greater area, namely the Shannon Creek Hydroelectric Project, North Thompson Transmission Project, Trans Mountain Pipeline Extension Project, and Foghorn Polymetallic Project, only Foghorn Polymetallic projects warrant consideration, since the others may be discounted as they would fall outside the areas of potential visibility. Given the distance to the transmission project, i.e., greater than 8 km, it is regarded as background, and the location of the Foghorn project on the lower slopes below the Project mine site, also at the 8 km distance mar, is also regarded as background. There has also been a no registration reserve under the Mineral Tenure Act (1996f) for uranium and thorium since 2008. As a result there is a high level of uncertainty regarding the timing for the development of this project, and whether the Project would be constructed during the life of the Harper Creek Project. Therefore, it is unlikely that the two projects will interact to create a cumulative residual effect and further assessment is not warranted.

Considering the context of past, present, and reasonably foreseeable future projects that may be affected by the Project as described in this section, it is considered appropriate to discount any cumulative effects and scope them out of the Application/EIS. Cumulative effects derived from the visual quality VC, and specifically the residual effect of alteration to the landscape associated with construction and operation activities, will thus not be considered further.

19.7 CONCLUSIONS FOR VISUAL QUALITY

Spatial information, including baseline studies, GIS, enhanced photographic imagery, and recognized tabular assessment methods were used to assess the potential for the visual quality of the greater area to be affected by the visibility of infrastructure that would comprise the Project. After considering mitigation measures, a residual effect in the form of the alteration to the landscape associated with construction and operation activities was identified for visual quality. This residual effect is predicted to be **not significant** (Table 19.5-14).

The Project-related residual effect was not carried forward to the CEA, since potential interactions with other projects were scoped out, as described in Section 19.6.1.

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