

20. HERITAGE EFFECTS ASSESSMENT

20.1 INTRODUCTION

Harper Creek Mining Corporation (HCMC) proposes to construct and operate the Harper Creek Project (the Project), an open-pit copper mine near the community of Vavenby, British Columbia (BC). The Project has an estimated 28-year life-of-mine based on a nominal process plant throughput of 70,000 tonnes per day. The Project is located in the Thompson-Nicola Regional District of BC, approximately 150 km northeast of Kamloops as shown in Figure 20.1-1. The Project infrastructure is shown in Figure 20.1-2.

This chapter presents the baseline heritage conditions, and undertakes a scoping and effects assessment to characterize potential effects on heritage as a result of the Project. Baseline heritage data is provided in [Appendices 20-A](#) through [20-D](#). Heritage includes physical and cultural heritage and any structure, site, or thing that is of historical, archaeological, paleontological, or architectural significance.

This chapter follows the effects assessment methodology described in Chapter 8 of the Application for an Environmental Assessment Certificate/Environmental Impact Statement (Application/EIS).

20.2 REGULATORY AND POLICY FRAMEWORK

This section provides an overview of the regulatory and policy framework related to heritage as summarized in Table 20.2-1. The Project is subject to both provincial and federal environmental assessment (EA) requirements under the BC *Environmental Assessment Act* (2002) and *Canadian Environmental Assessment Act* (1992). The requirements for the heritage effects assessment are defined in the Application Information Requirements (AIR) for the Project, approved by the British Columbia Environmental Assessment Office (BC EAO; 2011) on October 21, 2011 and in the Background Information Document issued by the Canadian Environmental Assessment Agency (CEA Agency; 2011) in April 2011.

Environmental effects caused by the Project that indirectly affect any structure, site, or thing that is of historical, archaeological, paleontological, or architectural significance is a requirement to be assessed under the *Canadian Environmental Assessment Act* (1992). Environmental effects that serve as pathways potentially affecting historical, archaeological, paleontological, or architectural sites typically relate to changes in air quality, terrestrial ecology, and accidents and malfunctions. These components are assessed in Chapters 9, 15, and 26 of the Application for an Environmental Assessment Certificate/Environmental Impact Statement (Application/EIS) respectively.

Heritage resources are largely governed by provincial legislation. Archaeological (both recorded and unrecorded) and designated heritage sites are protected under the *Heritage Conservation Act* (HCA; 1996) and the *Local Government Act* (1996). Alteration to designated heritage sites requires a site alteration permit pursuant to Section 12 of the HCA (1996). The BC *Archaeological Impact Assessment Guidelines* (BC MFLNRO 1998) inform heritage baseline studies.

Figure 20.1-1
Project Location

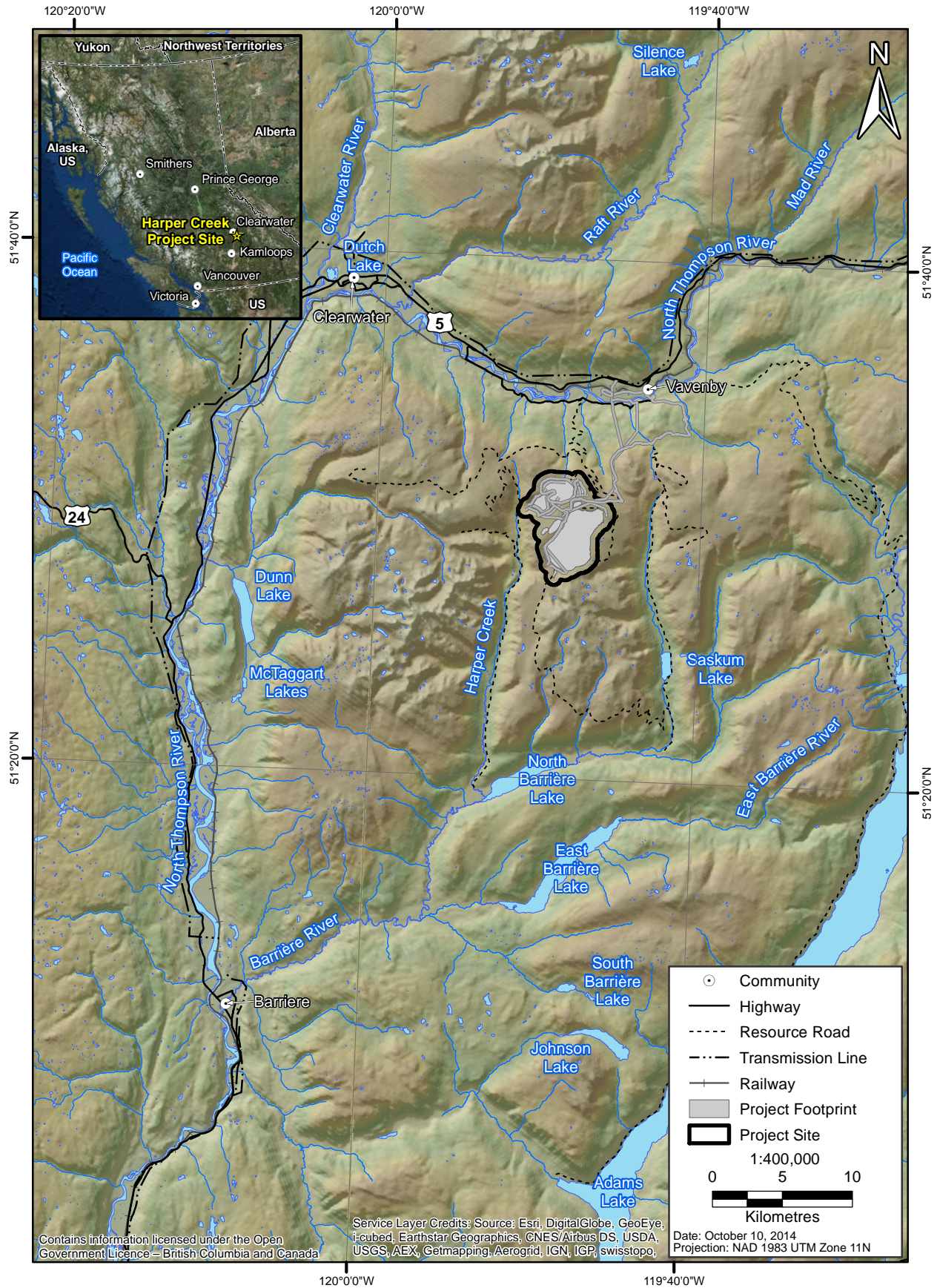


Figure 20.1-2
Project Location and Infrastructure

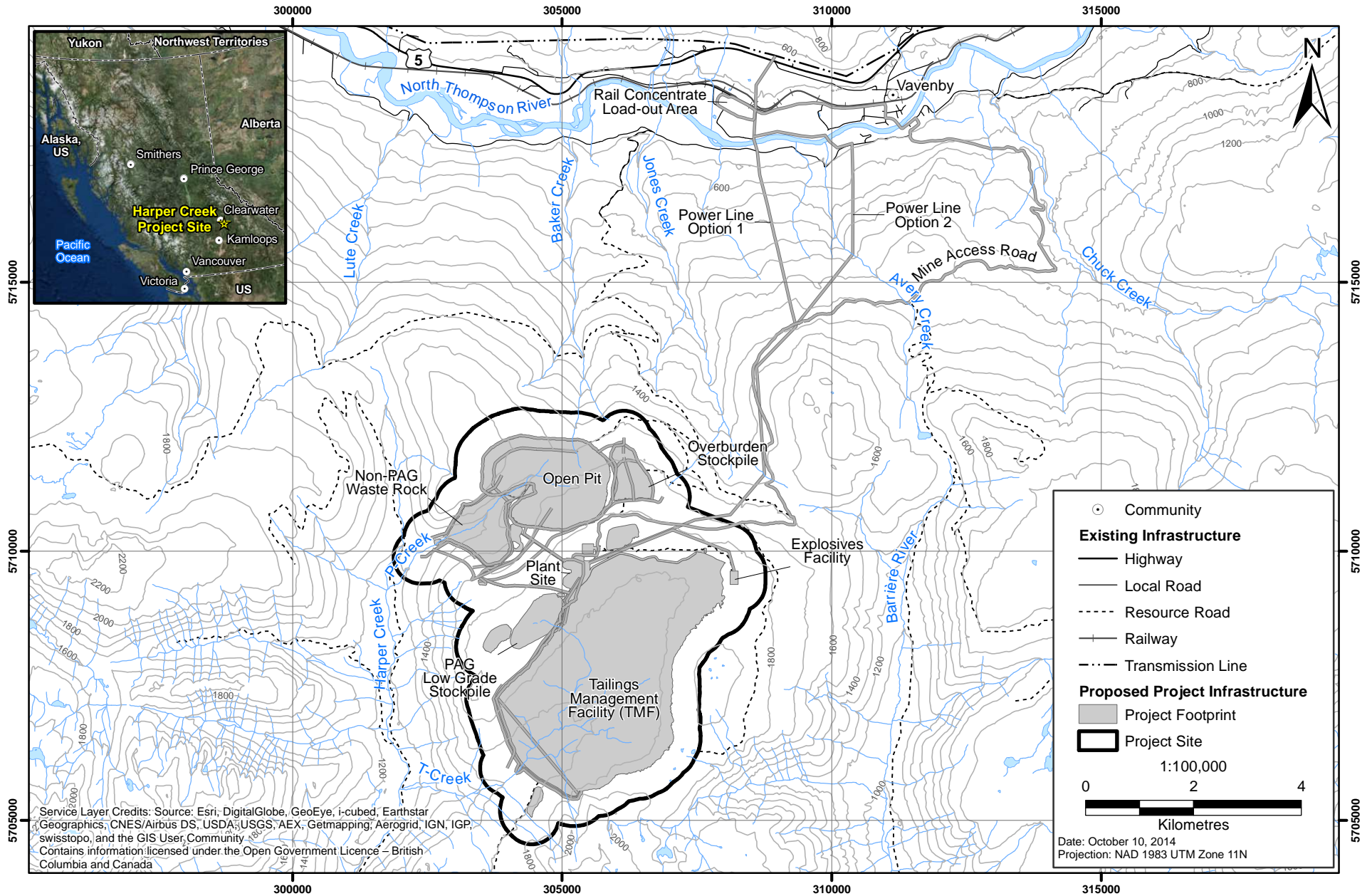


Table 20.2-1. Summary of Applicable Statutes and Guidelines for Potential Heritage Effects, Harper Creek Project

Name	Level of Government	Description
<i>Heritage Conservation Act (1996)</i>	Provincial	Authorizes issuance of permits for archaeological studies and site alterations (Section 12 and 14). Prohibits disturbance of archaeological and designated heritage sites (Section 13). Describes penalties for contravention of the Act (Section 36).
<i>Local Government Act (1996)</i>	Provincial	Authorizes local governments to pass bylaws designating properties, buildings, and/or features within their jurisdiction as protected.
<i>Ecological Reserve Act (1996)</i>	Provincial	Provides for establishment of ecological reserves on Crown land, such as areas suitable for scientific research and educational purposes and area that contain unique and rare specimens, including protection of paleontological sites.
<i>Environment and Land Use Act (1996)</i>	Provincial	Provides for creation of orders respecting environment or land use.
<i>Land Act (1996)</i>	Provincial	Provides for land reservations or designations to conserve natural or heritage resources (such as paleontological sites). It can also prohibit specific use of Crown land in designated areas.
<i>Mines Act (1996)</i>	Provincial	Requires a mine to submit a plan for the conservation and protection of “cultural heritage resources” that will be impacted by the mine to the chief inspector (Section 10). Gives the chief inspector the power to require a security to protect or mitigate damage to cultural heritage resources as a condition of a permit.
<i>Mineral Tenure Act (1996)</i>	Provincial	Allows for conditional reserves to be established over heritage sites to prevent establishment of mineral tenures that interfere with paleontological materials.
<i>Cremation, Interment and Funeral Services Act (2004)</i>	Provincial	Protects burials and graves.
Archaeological Impact Assessment Guidelines (BC MFLNRO 1998)	Provincial	Provides guidance for carrying out archaeological assessments and reporting.
Fossil Management Framework (2014)	Provincial	Provides framework for managing fossils.
Archaeological Heritage Policy Framework (1990)	Federal	Provides for achievement of “general symmetry with international standards and provincial measures.”

Provincial legislation pertaining to paleontological resources includes the HCA (1996), *Land Act* (1996), *Park Act* (1996), *Ecological Reserve Act* (1996), *Mineral Tenure Act* (1996), *Protected Areas of British Columbia Act* (2000), *Wildlife Act* (1996), and *Environmental and Land Use Act* (1996). The province has several mechanisms under these acts to protect fossil sites.

20.3 SCOPING THE EFFECTS ASSESSMENT

20.3.1 Valued Components

The British Columbia Environmental Assessment Office (BC EAO) define 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 proposed Project. VCs proposed for assessment were identified in the AIR (BC EAO 2011) and in the CEA Agency (2011) Background Information document.

20.3.1.1 Consultation Feedback on Proposed Valued Components

A preliminary list of proposed VCs was drafted early in project planning based on the expected physical works and activities of the reviewable project; type of project being proposed; local area and regions where the proposed project would be located; and consultation with federal, provincial, and local government agencies. A summary of how scoping feedback was incorporated into the selection of assessment subject areas and VCs is summarized below in Table 20.3-1.

Table 20.3-1. Consultation Feedback on Proposed Valued Component(s)

Subject Area	Feedback by*				Issues Raised	Proponent Response
	AG	G	P/S	O		
Archaeological sites and cultural landscapes	x	x			Impacts on cultural and archaeological sites or landforms and mitigation measures for rock cairns	Potential effects of the Project on cultural and archaeological sites are assessed in the Application. An Archaeological Impact Assessment (AIA) of the proposed mine site has been undertaken pursuant to Section 14 of the <i>Heritage Conservation Act</i> . An Archaeological Overview Assessment (AOA) of the access roads and transmission lines has also been completed. The AIA (November 2012) and AOA (May 2014) reports were provided to the local First Nations for review and comment. There are two recorded archaeological sites within the Local Study Area (LSA). These sites are rock cairns of unknown function as discussed in the AIA. Mitigation measures for the rock cairns will be developed in consultation with local First Nations, and the Archaeology Branch.
Paleontological sites		x			Impacts on paleontological sites	An assessment of the paleontological potential of the RSA was undertaken (see Appendix 20-D). The report concludes that the potential for paleontological sites is low.

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

20.3.1.2 Selecting Valued Components

The potential heritage VCs were screened for inclusion in the effects assessment by evaluating baseline study results carried out for the Project, legislative requirements, and the potential to

overlap (spatial and temporal) with Project components and activities (Table 20.3-2). Issues raised by government agencies, Aboriginal groups and local governments related to potential impacts on heritage resources were also considered.

Heritage baseline studies undertaken for the Project include: an archaeological impact assessment (AIA) of the mine site (Enns et al 2012), an archaeological overview assessment (AOA) of the proposed transmission line and mine access roads, and a history of land-use by local ranching families (Simonsen 2014). These reports are included as [Appendices 20-A to 20-C](#). These studies determined that archaeological sites could be affected during the Construction phase of the Project. No cultural landforms have been identified in the LSA. Archaeology is included as a VC for the effects assessment. Cultural heritage (objects and sites) were also considered as VCs. As the only cultural heritage sites and objects identified within the LSA during the assessment are also archaeological sites this VC was screened out and the sites are assessed under the VC archaeology.

Paleontological sites were considered during the scoping process, and are not included as a VC due to the results of the paleontological overview ([Appendix 20-D](#)), which determined that paleontological potential is low ([Appendix 20-D](#)).

20.3.1.3 *Valued Components Selected for Assessment*

The proposed VCs that were selected for assessment for the Project include archaeology, as discussed in Chapter 8, Table 8.4-3. The VCs selected for inclusion in the heritage effects assessment are presented in Table 20.3-3.

20.3.2 **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; any constraints due to political, social, and economic realities; and limitations in predicting or measuring changes. Boundaries relevant to heritage are described below.

20.3.2.1 *Temporal Boundaries*

Temporal boundaries are the time periods considered in the assessment for various Project phases and activities, and are shown in Table 20.3-4. 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, as described in Table 20.3-4.

20.3.2.2 *Spatial Boundaries*

Project Site

The Project Site is defined by a buffer of 500 m around the primary Project components, as shown in Figure 20.1-2. Project 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.

Table 20.3-2. Identification and Rationale for Selection of Heritage Valued Components

Category	Project Components and Activities	Known Archaeological Sites	Unknown Archaeological Sites
Construction			
Concrete production	Concrete batch plant installation, operation and decommissioning		x
Dangerous goods and hazardous materials	Hazardous materials storage, transport, and off-site disposal		x
	Spills and emergency management		x
Environmental management and monitoring	Construction of fish habitat offsetting sites		x
Equipment	On-site equipment and vehicle use: heavy machinery and trucks		
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		
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	x
	Earth moving: excavation, drilling, grading, trenching, backfilling	x	x

(continued)

Table 20.3-2. Identification and Rationale for Selection of Heritage Valued Components (continued)

Category	Project Components and Activities	Known Archaeological Sites	Unknown Archaeological Sites
Construction (cont'd)			
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
Tailings management	Coffer dam and South TMF embankment construction	x	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		x
	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		
Dangerous goods and hazardous materials	Electrical power distribution		
	Concentrate transport by road from mine to rail loadout		
	Explosives storage and use		

(continued)

Table 20.3-2. Identification and Rationale for Selection of Heritage Valued Components (continued)

Category	Project Components and Activities	Known Archaeological Sites	Unknown Archaeological Sites
Operations 1 (cont'd)			
Environmental management and monitoring	Hazardous materials storage, transport, and off-site disposal		
Equipment fleet	Spills and emergency management		
Fuel supply, storage, and distribution	Fish habitat offsetting site monitoring and maintenance		
Mining	Mine site mobile equipment (excluding mining fleet) and vehicle use		
Ore processing	Fuel storage and distribution		
Potable water supply	Mine pit operations: blast, shovel and haul		
Power supply	Ore crushing, milling, conveyance and processing Process and potable water supply, distribution and storage		
Processing	Backup diesel generators		
Procurement and labour	Electrical power distribution Plant operation: mill building, truck shop, warehouse and pipelines		
Rail load-out facility	Employment and labour		
Reclamation and decommissioning	Procurement of goods and services		
Stockpiles	Rail-load out activity (loading of concentrate; movement of rail cars on siding)		
Tailings management	Non-PAG Waste Rock Stockpiling		
Traffic	Tailings transport and storage in TMF		
Waste disposal	Treatment and recycling of supernatant TMF water		
Water management	Traffic delivering equipment, materials and personnel to site Waste management: garbage and sewage waste facilities		

(continued)

Table 20.3-2. Identification and Rationale for Selection of Heritage Valued Components (continued)

Category	Project Components and Activities	Known Archaeological Sites	Unknown Archaeological Sites
Operations 2			
Processing	Low grade ore crushing, milling and processing		
Reclamation and decommissioning	Partial reclamation of non-PAG waste rock stockpile Partial reclamation of TMF tailings beaches and embankments		
Tailings management	Construction of North TMF embankment and beach 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		
Procurement and labour	Employment and labour Procurement of goods and services		
Reclamation and decommissioning	Decommissioning of rail concentrate loadout area Partial 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		

(continued)

Table 20.3-2. Identification and Rationale for Selection of Heritage Valued Components (completed)

Category	Project Components and Activities	Known Archaeological Sites	Unknown Archaeological Sites
Closure (cont'd)			
Reclamation and decommissioning (cont'd)	Reclamation of TMF embankments and beaches Removal of contaminated soil Use of topsoil for reclamation		
Stockpiles	Storage of waste rock in the non-PAG waste rock stockpile		
Tailings management	Construction and activation of TMF closure spillway Maintenance and monitoring of TMF Storage of water in the TMF and groundwater seepage 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 Storage of water as a pit lake		
Procurement and labour	Procurement of goods and services		
Stockpiles	Storage of waste rock in the non-PAG waste rock stockpile		
Tailings management	Storage of water in the TMF and groundwater seepage 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.

Table 20.3-3. Valued Components Selected for Assessment

Assessment Category	Subject Area	Valued Components
Heritage	Cultural heritage	Archaeology

Table 20.3-4. Temporal Boundaries used in the Assessment for Heritage

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 closure, with ongoing monitoring.

Local Study Area

The LSA is defined as the Project footprint (Project Site and infrastructure as shown in Figure 20.3-1) and surrounding area within which there is a reasonable potential for immediate direct and indirect effects on a specific VC due to an interaction with a Project component(s) or activities. The heritage LSA is the area where direct and indirect effects may take place and was the focus of the baseline study (Figure 20.3-1).

Regional Study Area

The regional study area (RSA) for heritage is defined as the spatial area for which baseline data on heritage resources was sought in order to place the VCs within a regional context. The RSA is a 20-km buffer around the LSA and measures approximately 227,524 ha, and 53 km east-west by 55 km north-south. This area was established for the RSA as it captures a representative sample of known archaeological sites in the region to understand the heritage setting for the Project and enable an evaluation of the significance of sites found in the Project footprint (Figure 20.3-1).

20.4 BASELINE CONDITIONS

This section describes the heritage baseline conditions near the Project, and the historical context considered during the effects assessment.

20.4.1 Regional and Historical Setting

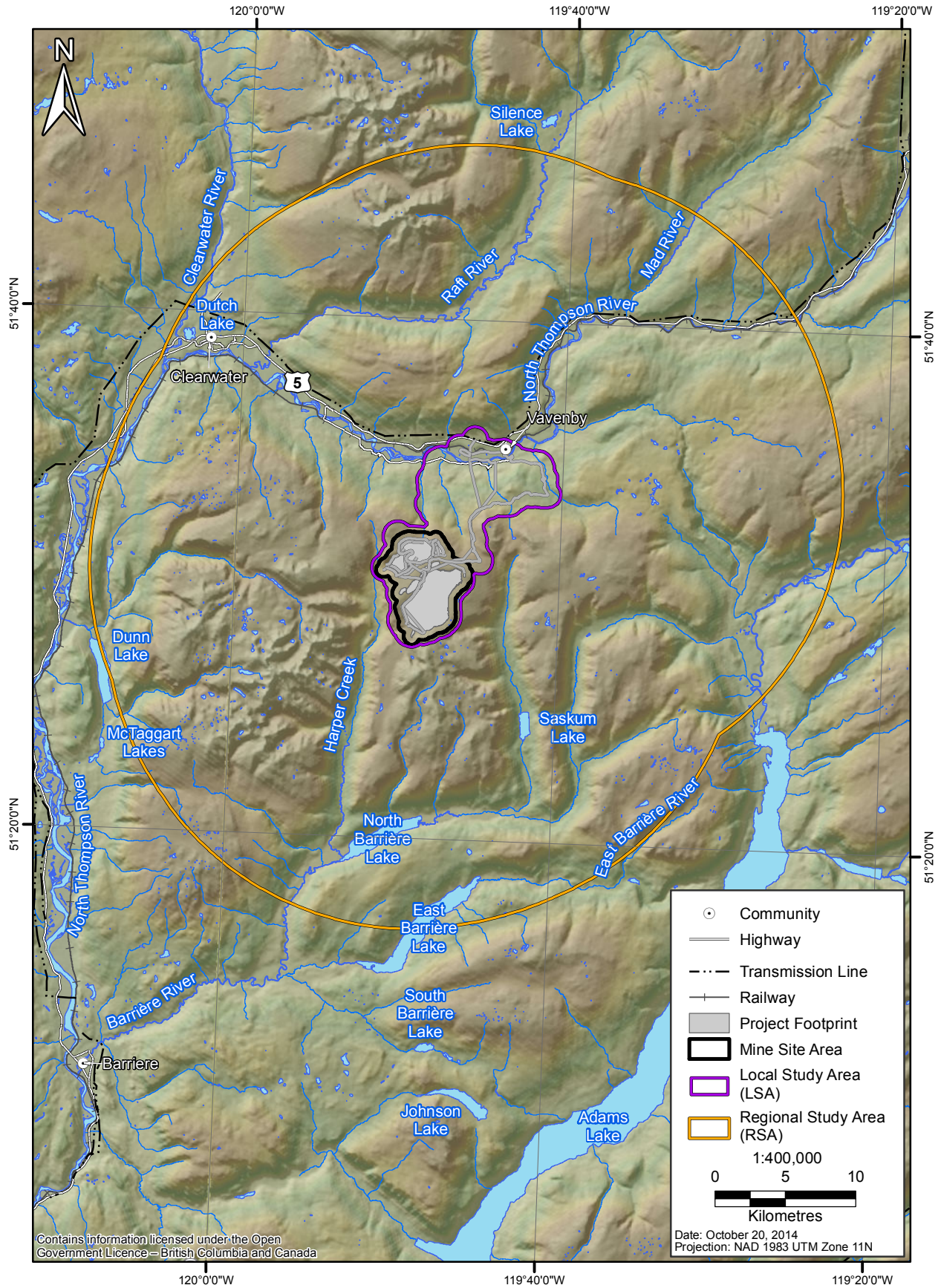
This section provides an overview of the regional and historical setting relating to cultural and physical heritage within the RSA.

20.4.1.1 Environmental Context

The Project RSA is located within the Columbia Mountains Highlands and the Thompson Okanagan Plateau of the Southern Interior of BC.

Figure 20.3-1

Heritage Local and Regional Study Areas



Paleoenvironment

The current ecological environment within the Southern Interior began to be established during the Late Pleistocene epoch following the Wisconsinan Glaciation. During the Wisconsinan glacial maximum the Cordilleran ice sheet was up to 2 km thick (Clague and James 2002). Deglaciation began as the climate warmed in the early Holocene and materials collected by the glaciers as they scoured the landscape were re-deposited. As early as 13,000 BP there were ice-free areas in the southern plateau region vegetated with pioneering grasslands and later by lodgepole pine forests between 12,000 and 10,000 BP (Hebda 1995). The southern interior plateau was completely ice free by 10,000 BP (Clague and James 2002).

Following the retreat of the Cordilleran ice sheet, the environment of the interior plateau has gone through several major changes in climate and vegetation patterns. Between 10,000 BP and 8,000 BP the climate was warmer and drier than today and the forests includes open grasslands reaching up to 1,300 masl that were part of an open plant ecology which stretched from the valley bottoms to mountain tops (Hebda 1995; Walker and Pellatt 2001; Whitlock 1992). Following this warm dry period, between 8,000 and 4,500 BP, the climate was wetter than the preceding climate but still warmer than the present climate. The grasslands receded and forests advanced during this period. This trend continued through the neoglacial period (4,500 to 3,000 BP), which was cooler and wetter than the present climate with grasslands confined to the valley bottoms (Walker and Pellatt 2001; Hebda 1995). Following 3,000 BP, temperatures rose again and modern climate and vegetation patterns were established in the region (Hebda 1995; Whitlock 1992).

Biogeoclimatic Zones

The majority of the Project Site is located within the Engelmann Spruce – Subalpine Fir (ESSF) biogeoclimatic zone. Project roads and the proposed transmission line route extend north towards Highway 5 and cross through the Interior Cedar-Hemlock (ICH) and Interior Douglas Fir (IDF) biogeoclimatic zones.

While the ESSF zone is generally found in steep and mountainous terrain, it also occurs in high valley bottoms and areas of more gently sloped hilly terrain, such as the Quesnel and Shuswap Highlands. The climate within the zone is characterized by short, cool summers and long, cold winters with the majority of precipitation falling as snow. Within the RSA, snowfall is relatively light, and soils freeze early and remain frozen for several months. Engelmann spruce and subalpine fir are the dominant tree species, with spruce generally dominating the canopy of mature stands. In drier areas of the zone, trees are primarily located in areas where snow accumulates, which provides the soils with moisture. In drier locations, lodgepole pine is often the main species, becoming established following a fire. Ungulate species within the ESSF zone include moose, mountain goat, caribou, and mule deer (BC MOF 1998).

The ICH is located on the slopes below the ESSF and above the IDF zones within the LSA. The ICH located within the LSA on the north-facing slope that drops down to the North Thompson River. This zone, home to the most productive forests in BC, has long, warm summers, and wet, cool winters. The melt water from the winter snows helps to keep soil moisture levels high. Coniferous forests of western red cedar and western hemlock are the dominant trees in these forests, though

ponderosa pine, Douglas fir, western larch, lodgepole pine, western white pine, trembling aspen, paper birch, subalpine fir, spruce, and western yew can also be found. Mule deer, whitetailed deer, and Rocky Mountain elk spend summers in the zone, while moose can overwinter in the area (BC MOF n.d.a).

The IDF within the LSA is located at the bottom of the North Thompson River Valley. This zone is warm and dry in the summer and cool in the winter with low moisture levels. Forests of Douglas fir dominate, with ponderosa pine in drier areas and spruce in wetter areas. Lodgepole pine can be found in areas of recent fire. Grasslands of bluebunch wheatgrass, junegrass, and fescues are common in this zone. Ungulates including mule deer, white-tailed deer, Rocky Mountain elk, and bighorn sheep make use of the lower snow pack to winter in this zone (BC MOF n.d.b).

Further detail on the environmental setting is provided in the Vegetation and Wildlife Baseline ([Appendix 15-A](#)).

20.4.1.2 *Ethnographic Context*

A Simpcw Traditional Land Use and Ecological Knowledge Study (TLU & EKS; [Appendix 22-A](#)) has been provided by the Simpcw First Nation's Sustainable Resources Department. Information on the Simpcw seasonal round provides information related to the types of activities undertaken by First Nations and provide context for understanding archaeological sites within the Project Site.

The Simpcw had a seasonal round that involved congregation at established pit house communities during the winter when food reserves were supplemented by hunting elk and deer and ice fishing in lakes and rivers. The winter villages were also used as gathering places during the rest of the year. The two main communities were *St yÈlltsucw* (Barriere Townsite) and *PesqlÈlten* (Finn Creek), although other sites were also periodically used. During the rest of the year, portable teepee-like structures housed the Simpcw as they moved through their seasonal round. During the spring, roots, shoots, and bulbs were harvested along with other emerging plant resources, such as berries and Labrador tea. Fish were an important staple during the spring with the Simpcw fishing for early runs of chinook salmon, as well as for the trout and whitefish found in the upland lakes. Salmon fishing continued through the summer and into the early fall with the use of fishing weirs and traps that allowed the harvest of large numbers of fish. Fish, including whitefish, trout, and sturgeon were also harvested from lakes and rivers. Berries, wild onions, and medicinal plants were harvested during the summer. From August to October, deer, caribou, sheep, and elk were hunted and smaller furbearing animals were trapped. Fishing and berry gathering also continued. Following the fall hunts, families returned to the winter villages. Additional information on Simpcw use of their territory can be found in the TLU & EKS ([Appendix 22-A](#)).

20.4.1.3 *Historical Context*

The following non-indigenous historic background is summarized from reports prepared by Terra Archaeology (Enns et al. 2012) and Bjorn Simonsen (Simonsen 2014).

The earliest non-indigenous presence in the northern reaches of the valley were likely eastern traders who ventured west in advance of the main trade from fur posts at Jasper House (HBC

Archives n.d.). In the late 1850s, the Hudson's Bay Company established a small trading post at Yehalliston, called "La Traverse" on the east bank of the North Thompson (now Little Fort) (Dunford 2000:30). This post provided a resting and grazing spot for pack strings going to and from Fort Alexandria, and it facilitated a brief trade in furs from Simpcw trappers until the region was depleted in the 1860s.

One of the earliest settlers in the Vavenby area was Frank Allingham, who established mining claims on the Mad River north of its confluence with the North Thompson, and in 1886 homesteaded pre-emption just east and north of what became Vavenby townsite. In 1905 T.A. Moilliet ("TAM") homesteaded to the north of Allingham in 1905. Generations of the Moilliet family have been raising sheep on Aveley Ranch ever since (Clearwater 1996; Dunford 2000:132; Moilliet, Moilliet, and Rendell 1985). Over the years the Moilliet family obtained other small holdings which helped support a sheep breeding operation. Aveley Ranch is still owned and operated by fourth generation Moilliets, who continue to operate their trapline and take their sheep to summer range along Lost Creek Road, Granite Mountain and Vavenby Mountain (Clearwater 1996:372; Simonsen 2014).

In 1914 the construction of the Canadian Northern Pacific railway line through Yellowhead Pass and then south towards Kamloops brought migrant workers into the area and the permanent population slowly increased with many families arriving from Scandinavia, Britain and eastern Canada (Clearwater 1996; Simonsen 2014). The arrival of the railway also made it easier for the local ranchers to get their goods to market.

Between the 1890s and 1930, pick and shovel mining operations up on Whistler (since renamed "Fog Horn" after the small mining claim of that name) and Granite Mountains, and farther south on the larger Queen Bess galena, silver-lead, and Windpass Mines kept some men seasonally employed. The village population did grow after the first and second world wars, and in response small lumber mills that sprang up to meet the growing demand. The small lumber mills eventually disappeared as the easily accessible timber was depleted. Employment based on the production of hydro line poles became the central industry in Vavenby around 1930 (Clearwater 1996:29). Firefighting also provided seasonal work for men of the valley, as did logging for the new more corporate lumber interests that entered the valley after the close of WW2.

In 1933 the Mitchell family acquired a grazing tenure that includes the Project Site from the Northern Construction Company and have been cattle ranching in the area ever since. This high country grazing area was originally used by Moilliets for sheep. The Mitchells first used this area for grazing cattle during the summer and fall when it was opened up for cattle in 1966. Ranch hands who looked after the cattle had at least one cabin and numerous camp sites on Harp Mountain (Simonsen 2014).

20.4.1.4 *Previous Archaeological Studies*

Archaeological studies within the RSA began in the late 1960s with John Corner's study of pictographs in the BC interior, during which he identified site EkQu-1 located within the RSA to the northeast of the LSA (Corner 1969). In 1968 and 1971, the British Columbia Provincial Museum (now the Royal BC Museum) recorded nine archaeological sites within the RSA: four in 1968 (EjRa-1, EjRa-2, EjRa-3, and EjRa-5) and five more in 1971 (EhQw-1, EhQw-2, EhQw-3, EhQx-2, and EjQx-4;

Hall 1969; Carl 1971). In 1969 and 1974 the Archaeological Sites Advisory Board (ASAB) conducted work in the RSA identifying six archaeological sites in 1969 (EjQx-1, EjQx-2, EjQx-3, EjQx-7, EjRa-6, and EkRa-1) and five more (EjQx-5, EjRa-10, EjRa-11, EjRa-12, and EjRa-4) in 1974 (Schurman 1969; Elmore 1974). No further archaeological research was undertaken within the RSA by government agencies after 1974 and no archaeological sites were recorded within the RSA until 1986 when two historic sites (EkQv-1 and EkQv-2) were recorded during the Canadian Northern Railway Heritage Resource Study (Arcas 1987). In 1988, work conducted in advance of the Lightguide Transmission System Project resulted in the recording of two more sites within the RSA (EjRa-9 and EkQv-3; Stryd and Curtin 1989). In 1989, an old homestead (EjQw-1) was located on a forested lot scheduled to be cleared for farming (Stryd 1989). In 1998 and 1999, archaeological sites EkQv-4 and EjRa-15 were located during assessments carried out in advance of forestry activity (Altamira 1998; Brand 2000). Two archaeological sites—(EiQw-1 and EjRa-16)—were found in 2009 in advance of land developments (Cameron 2009; Ball and Bukach 2010).

20.4.2 Baseline Studies

An AIA of the Project Site was undertaken under HCA Section 14 Investigation Permit 2011-0209 (Enns et al. 2012; [Appendix 20-A](#)) and an AOA was conducted for the access roads and proposed transmission line route options (Anderson 2014; [Appendix 20-B](#)). At the request of First Nations the entire footprint of the proposed mine development was subject to a comprehensive pedestrian survey coverage. In addition, First Nations were part of the field crews. Figure 20.4-1 shows each of the 25 ha archaeological survey units (ASUs) which were delineated throughout the AIA survey area (identified in the figure as the “Project Area”), with the area subject to pedestrian survey shown in green. The ASUs encompassed by the development footprints in 2011 were subject to survey (Enns et al. 2012; [Appendix 20-A](#)).

Archaeological site data in RSA was also gathered using the Remote Access to Archaeological Data system and the Provincial Archaeological Report Library. Kamloops Timber Supply Area AOA data, provided by the Archaeology Branch, was reviewed (Arcas 1987). An assessment of paleontological potential in the Heritage RSA was undertaken ([Appendix 20-D](#)). Other baseline studies include a report prepared by B. Simonsen (2014; [Appendix 20-C](#)), which provides historic information on the LSA and the TLU & EKS (2012; [Appendix 22-A](#)).

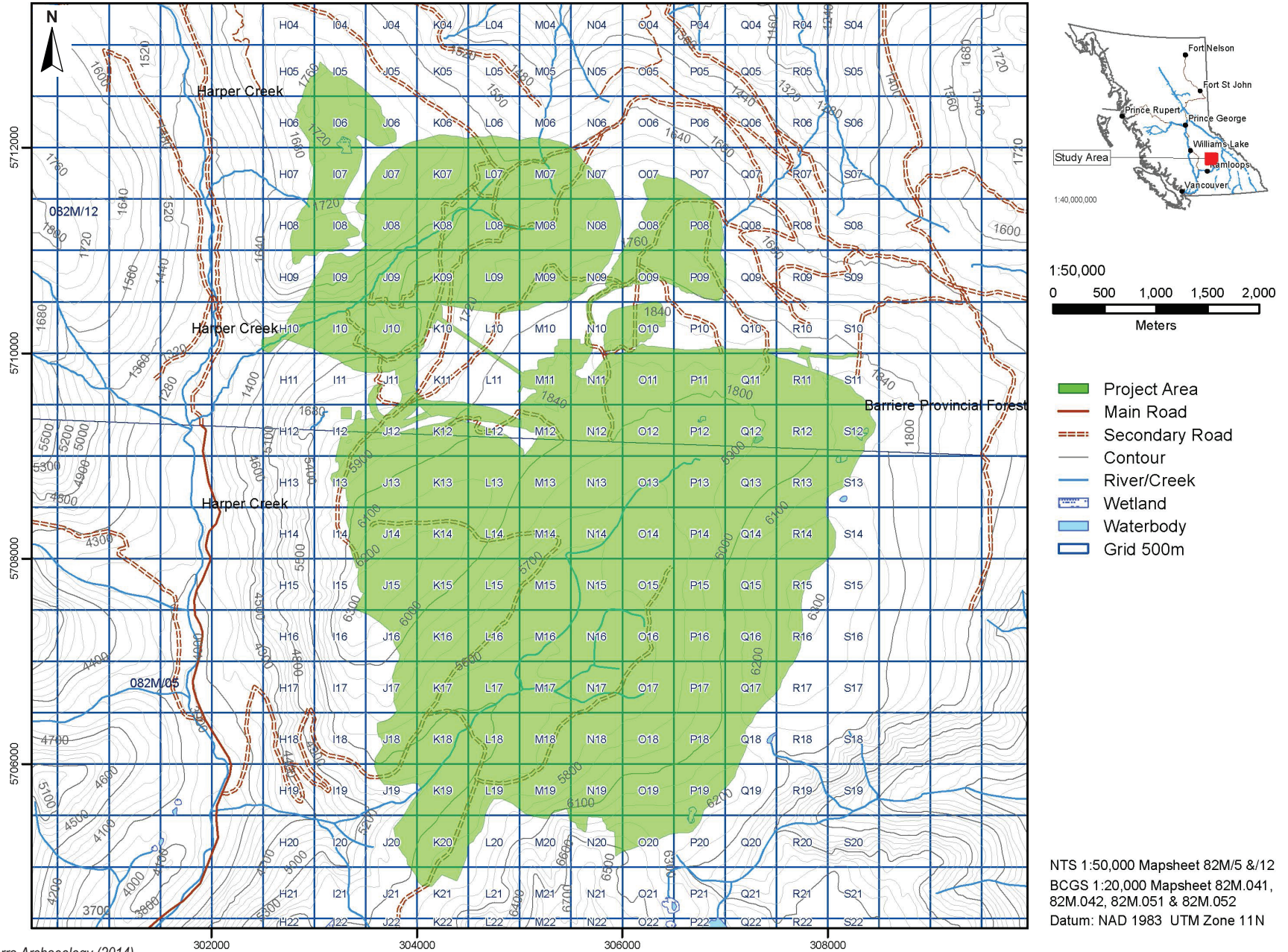
20.4.3 Existing Conditions

This section provides an overview of the existing conditions related to archaeological sites within the RSA and LSA.

20.4.3.1 *Archaeological Sites*

There are 32 known archaeological sites within the RSA (Table 20.4-1). Due to the sensitive nature of archaeological sites, locational information is not shown in the Application/EIS. The majority of the identified archaeological sites (n=25) within the RSA are located in the North Thompson River Valley, with three located along East Barrière Lake, and two along North Barrière Lake. Of the 32 known archaeological sites within the RSA, 28 are prehistoric and 4 are historic.

Figure 20.4-1
Archaeological Impact Assessment
Survey Coverage



Source: Terra Archaeology (2014).

Table 20.4-1. Archaeological Sites within the Regional Study Area

Borden Number	Antiquity	Site Type	Site Type Specific	Description	Permit Number
EhQw-1	Prehistoric	Lithic	Surface lithics	This site consists of basal debitage located on the beach sand. The lake level was raised from 1913 - 1945 and this may have destroyed the site.	1971-30
EhQw-2	Prehistoric	Habitation	House pit	A village site.	1971-30
EhQw-3	Prehistoric	Habitation	Cave; surface lithics	This site consists of two to three large caves that have been fire blackened at their mouths.	1971-30
EhQx-2	Prehistoric	Lithic	Surface lithics	This site consists of approximately 10 cm of cultural deposit.	1971-30
EiQw-1	Prehistoric	Lithic	Subsurface lithics	This site consists of 10 basalt flakes.	2009-0266
EiQw-2	Prehistoric	Petroform	Cairn	This site consists of a cairn, approximately 2.8 m by 1.2 m, oriented north-south.	2011-0209
EjQw-1	Historic	Historic debris	Surface refuse	This site consists of a homestead including a log cabin, a workshop, and three historic scatters.	1989-0060
EjQw-2	Prehistoric	Petroform	Cairn	This site consists of a cairn, approximately 2.5 m by 1.5 m, oriented north-south.	2011-0209
EjQx-1	Prehistoric	Habitation	House pit; cache pit	The site consists of one house pit and at least 23 cache pits.	Archaeological Sites Advisory Board (ASAB)
EjQx-2	Prehistoric	Habitation	House pit, cache pit	This site consists of house pits and a cache pits.	ASAB
EjQx-3	Prehistoric	Lithic	Surface lithics	This site consists of a lithic scatter including points and flakes.	ASAB
EjQx-4	Prehistoric	Habitation	House pit	This site consists of a single rectangular house pit.	1971-0030
EjQx-5	Prehistoric	Habitation	House pit; cache pit	This site consists of house pits and 15 cache pits.	1974-0001
EjQx-7	Historic	Habitation	Building; surface historic material	This site consists of a historic railway construction camp.	n/a

(continued)

Table 20.4-1. Archaeological Sites within the Regional Study Area (continued)

Borden Number	Antiquity	Site Type	Site Type Specific	Description	Permit Number
EjRa-1	Prehistoric	Burial	Human remains; house pit; cache pit; hearth; lithics	This site consists of at least 37 cultural depressions identified as house pits and a culturally modified tree. Excavations were undertaken. At Locality A, 31 artifacts and one hearth feature were recorded. The artifacts included 10 net sinkers, two basalt chipped stone projectile points (one side notched and one corner notched), a discoidal scraper, two split cobbles, two hammerstones, and one anvil stone. At locality B, a hearth, four postholes, five large pits, and what are identified as house beams of interwoven wood. Artifacts recovered from locality B include three complete basalt projectile points (two small side notched and one larger barbed point with a parallel stem and concave base), nine biface (seven basalt, one chert, and one sandstone), nine utilized flakes, one antler wedge, and one copper bead.	1968-0018
EjRa-2	Prehistoric	Habitation	House pit	This site consists of 25 round, square, and oval cultural depression identified as house pits from 3 - 10 m in diameter.	1968-0018
EjRa-3	Prehistoric	Habitation	House pit	This site consists of cultural depressions identified as house pits.	1968-0018
EjRa-4	Prehistoric	Habitation	House pit; cache pit	This site consists of house pits and a cache pits.	1974-0001
EjRa-5	Prehistoric	Burial	Human remains; house pit; surface lithics	This site consists of burials and a house pit. The site was encountered during clearing in 1968 and was heavily disturbed in 1968. Two basalt flakes, fire-altered rock, and charcoal-stained soils were also identified at the site.	ASAB
EjRa-6	Prehistoric	Habitation	House pit	This was a house pit village site; however, it has been destroyed by cultivation and subdivision development.	ASAB
EjRa-9	Prehistoric	Habitation	House pit; cache pit; cairn; surface faunal	This site is a large house pit village with house pits (probably Kamloops Horizon), cache pits, a cairn, and faunal material.	1988-0025
EjRa-10	Prehistoric	Habitation	House pit; cache pit	This site consists of a house pit and a cache pit.	1974-0001

(continued)

Table 20.4-1. Archaeological Sites within the Regional Study Area (completed)

Borden Number	Antiquity	Site Type	Site Type Specific	Description	Permit Number
EjRa-11	Prehistoric	Habitation	House pit; cache pit	This site consists of six house pits and six cache pits.	1974-0001
EjRa-12	Prehistoric	Habitation	House pit; cache pit	This site consists of a house pit and a cache pit	1974-0001
EjRa-15	Prehistoric	Cultural depression	Cache pits; surface lithics	This site consists of six cultural depressions interpreted as cache pits and one isolated lithic find of a fine-grained basalt retouched flake.	1999-0091
EjRa-16	Prehistoric	Lithic	Surface lithics; subsurface lithics	This site consists of 909 lithic artifacts including a Kamloops side-notched point, two other point fragments, one scraper, two biface fragments, and 903 pieces of debitage. This site is interpreted as a single use tool fabrication/use site or a temporary camp.	2009-0379
EkQu-1	Prehistoric	Habitation	Rock shelter; pictograph	This site consists of pictographs. The pictographs include 2 - 3 figures about 6 m above base of road bed, three nearly obscured about 3 - 4 m above base of road bed, and 8 - 10 figures, one level with the top of the road, and the others about 3 m higher. Seven of the figures are coated with a white calcium deposit about 2 - 5 feet above the base of the road bed. There is also evidence of smoke soot on the rocks. Culturally modified trees were reported in the picnic area. Illustrated in <i>Pictographs in the Interior of British Columbia</i> (Corner 1969).	1969-0012, 1973-0028
EkQv-1	Historic	Habitation	Log cabin; surface historic material	This site consists of a cache pit and the presence of solder top cans and purple glass indicate a post-World War 2 age.	n/a
EkQv-2	Prehistoric	Cultural depression	Cache pit	This site consists of 11 cultural depressions.	n/a
EkQv-3	Historic	Habitation	Log cabin; barn	This site consists of a small homestead thought to pre-date the 1930s with a house, barn, stable, and shed.	1988-0025
EkQv-4	Prehistoric	Habitation	House pit	This site consists of seven cultural depressions identified as house pits.	Unknown
EkRa-1	Prehistoric	Lithic	Surface lithics	This site consists of surface lithic material found in close proximity to an old (pre-1930s) trail.	ASAB

The 28 prehistoric sites include six sites with only lithic material; two sites that have cultural depressions identified as cache pits; 18 sites that have at least one cultural depression identified as a house pit, with 2 of these having an associated burial site; and 2 sites identified as petroforms. The four historic sites contain habitation features, including two potential homesteads, a log cabin, and a railway construction camp. Of the 32 sites in the RSA, only the two petroform sites—EiQw-2 and EjQw-2, both cairns of undetermined function—are located within the LSA. Both sites were located during the AIA of the Project Site, along with several features including a historic corral, a historic trail, post-1846 culturally modified trees, and historic debris (Enns et al. 2014). The AOA identified five areas of archaeological potential in previously undisturbed areas extending from the Vavenby-Saskum forest service roads and along the two power line route options (Anderson 2014; [Appendix 20-B](#)). These areas are located immediately northeast of the Project Site north of the TMF and east of the Overburden Stockpile (AAP1) and along the two proposed power line route options near the North Thompson River and the Yellowhead Highway (AAPs 2 to 5).

20.5 EFFECTS ASSESSMENT AND MITIGATION

This section identifies and discusses the potential effects of the Project on the archaeology VC, including direct, indirect, or induced effects. Project activities associated with the movement, excavation, or disturbance of soil have the potential to cause direct effects on archaeological material, if present.

20.5.1 Screening and Analyzing Project Effects

Archaeological sites located within 50 m of ground-altering activity may be affected during the Construction phase. These effects will be mitigated prior to Construction by additional work under a HCA Section 14 Investigation Permit followed by a Section 12 Site Alteration Permit (Section 20.5.2.1). No effects are anticipated during the Operations, Closure, or Post-Closure phases as excavation or disturbance of soil is not proposed during these phases.

Indirect effects to archaeological sites due to increased human presence are not anticipated because there are currently no known archaeological sites between 50 and 1,000 m from the Project. If required, indirect effects will be managed with the mitigation measures for unknown archaeological sites (Section 20.5.2.2). Archaeological sites beyond 1,000 m (outside the LSA) are not anticipated to be affected by the Project. Table 20.5-1 assesses the level of risk as a result of interaction of the Project with known and unknown archaeological sites.

With respect to indirect environmental effects under the *Canadian Environmental Assessment Act* (1992), there are no known structures, sites, or things of historical, paleontological, or architectural significance within the Project footprint. Therefore there will be no indirect impacts to known structures, sites, or things of historical, paleontological, or architectural significance from air quality, terrestrial ecology, and accidents and malfunctions. If there are currently unknown structures, sites, or things of archaeological, historical, paleontological, or architectural significance identified within the Project footprint that may be indirectly effected from changes to air quality and terrestrial ecology, or accidents and malfunctions these will be managed using the mitigation measures provided for unknown archaeological sites (Section 20.5.2.2).

Table 20.5-1. Risk Ratings of Project Effects on Heritage Valued Components

Project Component/Activity and Potential Effects	Known Archaeological Sites	Unknown Archaeological Sites
Construction		
Concrete batch plant installation, operation, and decommissioning		●
Hazardous materials storage, transport, and off-site disposal		●
Spills and emergency management		●
Construction of fish habitat offsetting sites		●
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	●	●
Construction camp construction, operation, and decommissioning		●
Ditches, sumps, pipelines, pump systems, reclaim system and snow clearing/stockpiling		●
Water management pond, sediment pond, diversion channels and collection channels construction		●

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.

20.5.1.1 Potential Construction Effects

Construction activities that could have potential adverse effects on archaeological sites include clearing, grading, excavation, earth moving, and blasting. There are two known archaeological sites—EiQw-2 and EjQw-2—located within the Tailing Management Facility (TMF) that will interact directly with the Project. Both are petroforms (cairns) identified during the AIA carried out for the Project Site under HCA Section 14 Investigation Permit 2011-0209 (Enns et al. 2012; [Appendix 20-A](#)). Based on the checklist of criteria for site evaluation in the *BC Archaeological Impact Assessment Guidelines* (BC MFLNRO 1998), both sites have moderate-high scientific significance, low public and economic significance, and high ethnic significance (Enns et al. 2012; [Appendix 20-A](#)). These sites have also been identified as important in the TLU & EKS ([Appendix 22-A](#)). Both sites are described below.

EiQw-2

Archaeological site EiQw-2 consists of a cairn of undetermined antiquity located within a cluster of trees on gently sloping terrain overlooking a creek to the north and east and a marshy area to the west. Historic material is located in the marshy area to the east of the site. The cairn measures approximately 2.8 by 1.2 m and is approximately 0.3 m high. It is constructed of stone slabs with three cut logs laid over the south end of the feature. While the cairn was not disturbed at the request of the Aboriginal community, shovel testing in the vicinity was negative for cultural material (Enns et al. 2014; [Appendix 20-A](#)).

EjQw-2

Archaeological site EjQw-2 consists of a cairn of undetermined antiquity located on a break-in-slope. A historic road/trail likely associated with logging was noted in the vicinity of the site but does not appear to be associated with the cairn. The cairn measures 2.5 by 1.5 m and is approximately 0.5 m high (Plate 20.5-1). It is constructed from flat shale slabs and covered in a thick layer of moss and several small trees. The established moss and the presence of the trees suggest that it is likely of early historic or prehistoric antiquity. While the cairn was not disturbed at the request of the Aboriginal community, shovel testing in the vicinity was negative for cultural material (Enns et al. 2012; [Appendix 20-A](#)).

Simpcw First Nation Interpretation of EiQw-2 and EjQw-2

Following identification of the cairns at EiQw-2 and EjQw-2, the Simpcw First Nation requested that the cairns be left undisturbed as they may be burials. Due to this request, HCMC has not applied for a HCA permit to investigate the rock cairns in order to determine the function and age of the cairns.

Moillet and Mitchell's Interpretation of EiQw-2 and EjQw-2

It was noted in interviews with members of families who have historically ranched in the LSA that two rock features and the remains of a coral were found within the Project Site (Simonsen 2014; [Appendix 20-C](#)). Ian Moillet “indicated that rock piles were often used as markers for land surveys and mineral exploration or could be fire pits and other features associated with old sheep camps” (Simonsen 2014; [Appendix 20-C](#)). Ian and Marge Mitchell “indicated that these are likely the remains of an old line camp used by Mitchell cowboys over the years and that this location was used every year up until fairly recently. Ian indicated that it may, in fact, have been the location of an old camp site used regularly by Mitchell Ranch hand, Harry Hagan, who spent much time in the Harp

Mountain area tending the herd” (Simonsen 2014; [Appendix 20-C](#)). This information suggests that the cairns may be related to historical ranching activity.



Plate 20.5-1. Cairn at archaeological site EjQw-2 (photo provided by Terra Archaeology Limited).

Additional Study of EiQw-2 and EjQw-2

Additional non-invasive work was undertaken in an attempt to clarify the function of the cairns. In 2012, a ground penetrating radar study was conducted and “found some anomalous features within the cairn but could not identify the features or determine the function of the cairns” (Forgeng 2013).

Unknown Archaeological Sites

There is the potential for unknown archaeological sites to be located prior to Construction in areas that have not yet been subject to an AIA, including construction of the power line and upgrading of a section of the mine access road (Anderson 2014). Measures to mitigate potential effects on unknown archaeological sites are discussed in Section 20.5.2.

20.5.1.2 *Potential Operation Effects*

No direct effects are anticipated during Operations because archaeological sites in conflict with the Project Site will have been identified and the effects mitigated prior to or during Construction. Changes to the Project Site will be subject to an archaeological review and, if necessary, an AIA will be conducted prior to disturbance. There are no currently known archaeological sites within the LSA that will be indirectly impacted during Operations. Measures to mitigate potential effects on unknown archaeological sites, if present, are discussed in Section 20.5.2.

20.5.2 Mitigation Measures

Mitigation measures are intended to reduce effects from interactions of the Project with archaeological sites EiQw-2 and EjQw-2 as well as currently unknown archaeological sites that may exist within the Project Site.

20.5.2.1 Mitigation Measures for EiQw-2 and EjQw-2

Archaeological sites EiQw-2 and EjQw-2 are both located within the TMF and will be impacted by the Project during Construction. Avoidance of archaeological sites is the preferred mitigation measure; however, impacts on the cairns are unavoidable. Therefore, the following measures need to be completed prior to Construction, which will reduce the effects (Table 20.5-2). Once the purpose of the cairns has been determined, and prior to disturbance, mitigation measures will be developed in consultation with local First Nations, and the BC Archaeology Branch.

Table 20.5-2. Proposed Mitigation Measures and their Effectiveness

Valued Component			
Potential Effects	Proposed Mitigation Measure	Effectiveness (Low/Moderate/High/Unknown)	Residual Effect (Y/N)
Disturbance of known archaeological sites	Avoidance or additional work under a HCA Section 14 Investigation Permit followed by a Section 12 Site Alteration Permit if required.	High	Y
Disturbance of unknown archaeological sites	Avoidance - Chance Find Procedure and education of Project personnel regarding protections afforded archaeological sites.	High	N

Prior to disturbance of the cairns, additional studies under a Section 14 Investigation Permit will be required to determine:

- the age of the cairns and if they pre- or post-date 1846; and/or
- the purpose of the cairns.

Prior to issuance of the Section 14 Investigation Permit, the Archaeology Branch will consult with First Nations about the permit. The intent of the permit is to determine the age and purpose of the cairns. If the cairns post-date 1846 and do not contain burials, they are not protected under the HCA (1996) and will not require additional permits prior to their removal. If the cairns pre-date 1846 and/or contain burials, they are protected under the HCA (1996) and will require additional work under a Section 14 Investigation Permit followed by a Section 12 Site Alteration Permit. Once this work has been carried out to the satisfaction of the Archaeology Branch the effects on the sites will have been mitigated. If they contain burials the provisions in the *Cremation, Interment and Funeral Services Act* (2004) would apply.

20.5.2.2 *Mitigation Measures for Unknown Archaeological Sites*

Measures to mitigate effects on unknown archaeological sites include the following:

- The five areas identified in the AOA as having moderate to high archaeological potential will be assessed by a qualified professional archaeologist prior to Construction.
- An Archaeology and Heritage Management Plan and a Chance Find Procedure will be implemented to provide a framework for the avoidance or mitigation of archaeological sites, if present, that were not identified during the AIA. Mine employees and contractors will be educated about the Chance Find Procedure.
- Where avoidance is not possible, any alteration to an archaeological site protected under the HCA (1996) will require a Section 12 Site Alteration Permit from the Archaeology Branch. Additional mitigation measures may be required prior to issuance of the Site Alteration Permit. These measures will be determined in consultation with local First Nations and the Archaeology Branch.

20.5.3 **Predicted Residual Effects and Characterization**

Following the mitigation measures instituted for known and currently unknown archaeological sites within the LSA, there will be anticipated residual effects on the VC archaeological sites. The assessment of the significance of the residual effects takes into account the mitigation measures that will be conducted prior to disturbance of the archaeological sites.

20.5.4 **Significance of Residual Effects**

The determination of the significance of residual effects on the VC archaeological sites is based on the descriptors in Appendix F of the *Archaeological Impact Assessment Guidelines* (Archaeology Branch 1998). These are used to describe aspects of potential residual effects resulting from the disturbance of archaeological sites.

20.5.4.1 *Disturbance of Known Archaeological Sites*

The magnitude of change to known archaeological sites was assessed to be moderate, as the two archaeological sites within the LSA will be potentially impacted during construction. The two sites potentially directly affected by the Project are cairns of unknown antiquity or purpose. Prior to disturbance mitigation measures including data recovery will acceptably offset any potential loss of archaeological data which would result in low magnitude of change, however if the cairns are determined to be burials there will be cultural effects that increase the magnitude of change to moderate. The geographic extent of the effect was determined to be local as the disturbance of an archaeological site has no effect on other archaeological sites in the area. The duration and frequency and reversibility of the effect is considered to be future, one time, and irreversible, as once the sites have been mitigated, they will have been effectively curated, and there will be no additional effects to the site through Project activity, and they cannot be rebuilt or reconstituted. The context or resiliency of the environment or population has been determined to be neutral as the disturbance to the site will be offset by the data collected during mitigation and, if burials are present, the cultural effects will be offset through their removal in accordance with the cultural practices of the effected

community. Disturbance to archaeological sites is highly likely to occur as there are two archaeological sites in direct conflict with the proposed developments, and it is anticipated that impacts to these archaeological sites cannot be avoided.

20.5.4.2 *Disturbance of Unknown Archaeological Sites*

The magnitude of change to unknown sites was assessed to be low as the AIA conducted for the Project were exhaustive and effectively covered area within the Project Site (see Figure 20.4-1), and any currently unknown sites in direct conflict with the Project are expected to be small, low-density lithic scatters in unstratified deposits. An AOA has been conducted for the transmission line and the site access roads and an AIA of areas area of high potential will be completed prior to construction of these developments. The processes outlined in a Chance Find Procedure for dealing with any site not discovered during the AIAs, including mitigation, will acceptably offset any potential loss of archaeological data.

The geographic extent of the effect to unknown archaeological sites was determined to be local as the disturbance of an archaeological site has no effect on other archaeological sites in the area. The duration, frequency, and reversibility of the effect is considered to be far future, one time, and irreversible, as once the site has been mitigated it has been effectively curated, there are no additional effects to the site through Project activity, and it cannot be rebuilt or reconstituted. The context or resiliency of heritage valued components has been determined to be neutral as the disturbance to the site will be offset by the data and knowledge collected during mitigation.

The probability of disturbance to unknown archaeological sites is low as an AIA has been conducted for the mine site developments and will be conducted for the transmission line and site access roads prior to development. However, there is always a possibility that currently unrecorded archaeological sites may be discovered during ground altering activity. As the effort expended during the AIA for the Project met the expectations of the Archaeology Branch, there is a high level of confidence that there is low probability of any disturbance to unknown archaeological sites.

20.5.4.3 *Overall Effect on Archaeological Sites*

By committing to site avoidance or mitigation through data recovery archaeological sites will be avoided or adequately curated. The effects on cultural heritage from disturbance of the known archaeological sites are currently unknown because the function of the archaeological sites is unknown. However, it is anticipated that these effects can be mitigated, if necessary, in accordance with the cultural practices of the effected community.

Residual effects of the Project on heritage VCs are therefore anticipated to be moderate but not significant following the appropriate mitigation measures to be carried out prior to construction.

20.5.5 Confidence and Uncertainty in Determination of Significance

The confidence level in the assessment is moderate as the requirements of the HCA (1996) to conduct site investigations provides a rigorous approach to understanding the effect of the Project on archaeological sites and if burials are present they will be dealt with in accordance with the cultural practices of the effected community. This would provide a confidence of high but the

determination of whether burials are present therefore mitigations for the cultural effects on communities have not been determined. This uncertainty results in a reduced confidence in the determination of significance.

20.5.6 Summary of the Assessment of Residual Effects for Heritage

Residual effects and their characterization criteria, significance determination, likelihood, and confidence evaluations are summarized in Table 20.5-3.

20.6 CUMULATIVE EFFECTS ASSESSMENT

20.6.1 Scoping Cumulative Effects

20.6.1.1 Valued Components and Project-related Residual Effects

The residual effects assessment of the Heritage VC archaeological sites determined that the effect would be moderate (not significant) due to the potential for cultural effects if the cairns at archaeological sites EiQw-2 and EjQW-2. The potential for cumulative effects are discussed below.

20.6.1.2 Defining Assessment Boundaries

Similar to the Project related effects, assessment boundaries define the maximum limit within which the cumulative effects assessment is conducted. Boundaries relevant to Heritage are described below.

The temporal boundaries for the identification of physical projects and activities have been categorized into past, present and reasonably foreseeable projects and are defined 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 activities¹.
- **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.

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.

Table 20.5-3. Summary of Key Effects, Mitigation, Residual Effects Characterization Criteria, Likelihood, Significance, and Confidence

Key Effect	Mitigation Measures	Summary of Residual Effects Characterization Criteria (<i>Magnitude, Geographic Extent, Duration, Frequency, Reversibility, Resiliency</i>)	Likelihood (<i>High, Moderate, Low</i>)	Significance of Adverse Residual Effects		Confidence (<i>High, Moderate, Low</i>)
				Scale (<i>Minor, Moderate, Major</i>)	Rating (<i>Not Significant; Significant</i>)	
Disturbance of Known Archaeological Sites	Data recovery under a Section 14 Site Investigation Permit and, if necessary, cultural measures in accordance with the cultural practices of the effected community.	Low/moderate magnitude, local, far future, one time, irreversible, neutral.	Moderate	Moderate	Not Significant	Moderate
Disturbance of Unknown Archaeological Sites	Avoidance - Chance Find Procedure and education of Project personnel regarding protections afforded archaeological sites.	Low magnitude, local, far future, one time, irreversible, neutral.	Low	Minor	Not Significant	High

20.6.1.3 *Projects and Activities Considered*

Past, present, and reasonably foreseeable future projects and activities within the boundaries described above were considered in the CEA. The project list was developed from a wide variety of information sources, including municipal, regional, provincial, and federal government agencies; other stakeholders; and companies’ and businesses’ websites. The projects and activities considered in the CEA are presented in Chapter 8 in Tables 8.7-1 and 8.7-2, respectively. The methodology used in the CEA is provided in Chapter 8, Section 8.7.

All project-related residual effects were considered for their potential to interact with the projects and activities identified within the CEA area. A map indicating the location of past, present, and reasonably foreseeable future projects within the Heritage CEA area is provided in Figure 20.6-1.

20.6.2 Screening and Analyzing Cumulative Effects

The development of additional projects, both past, present, and future, and other human land use within the RSA that involve ground disturbance have the potential to disturb or destroy additional archaeological sites. Past projects include the Weyerhaeuser Sawmill, present projects include the Trans Mountain Pipeline and the Vavenby Sawmill and reasonably foreseeable projects include the North Thompson Transmission Project and the Foghorn Project. Current land use activities considered include mining and mineral exploration, agriculture, and forestry.

Table 20.6-1 presents the projects and activities with the potential to interact cumulatively with the predicted residual effects for Heritage identified in Table 20.5-3.

Table 20.6-1. Impact Matrix for Screening and Ranking Potential Cumulative Effects

Residual Effects of the Harper Creek Project on VCs	Past Projects	Present Projects		Reasonably Foreseeable Future Projects		Activities		
	Weyerhaeuser Sawmill	Trans Mountain Pipeline	Vavenby Sawmill	North Thompson Transmission Project	Foghorn Project	Mining and Mineral Exploration	Agriculture	Forestry
Heritage								
Disturbance of Known Archaeological Sites	●	●	●	●	●	●	●	●
Disturbance of Unknown Archaeological Sites	●	●	●	●	●	●	●	●

Notes:

- = Negligible to minor risk of adverse cumulative effect; will not be carried forward in the assessment.
- = Moderate risk of adverse cumulative effect; will be carried forward in the assessment.
- = Major risk of adverse cumulative effect or significant concern; will be carried forward in the assessment.

20.6.3 Mitigation Measures

The mitigation measures that can be implemented by HCMC to minimize their contribution to the cumulative effect were identified and considered for their effectiveness in accordance with the methodology described in Chapter 8, Section 8.7.3. Table 20.6-2 outlines the means by which mitigation of cumulative effects was considered in the assessment.

Table 20.6-2. Proposed Mitigation Measures for Potential Cumulative Effects and their Effectiveness

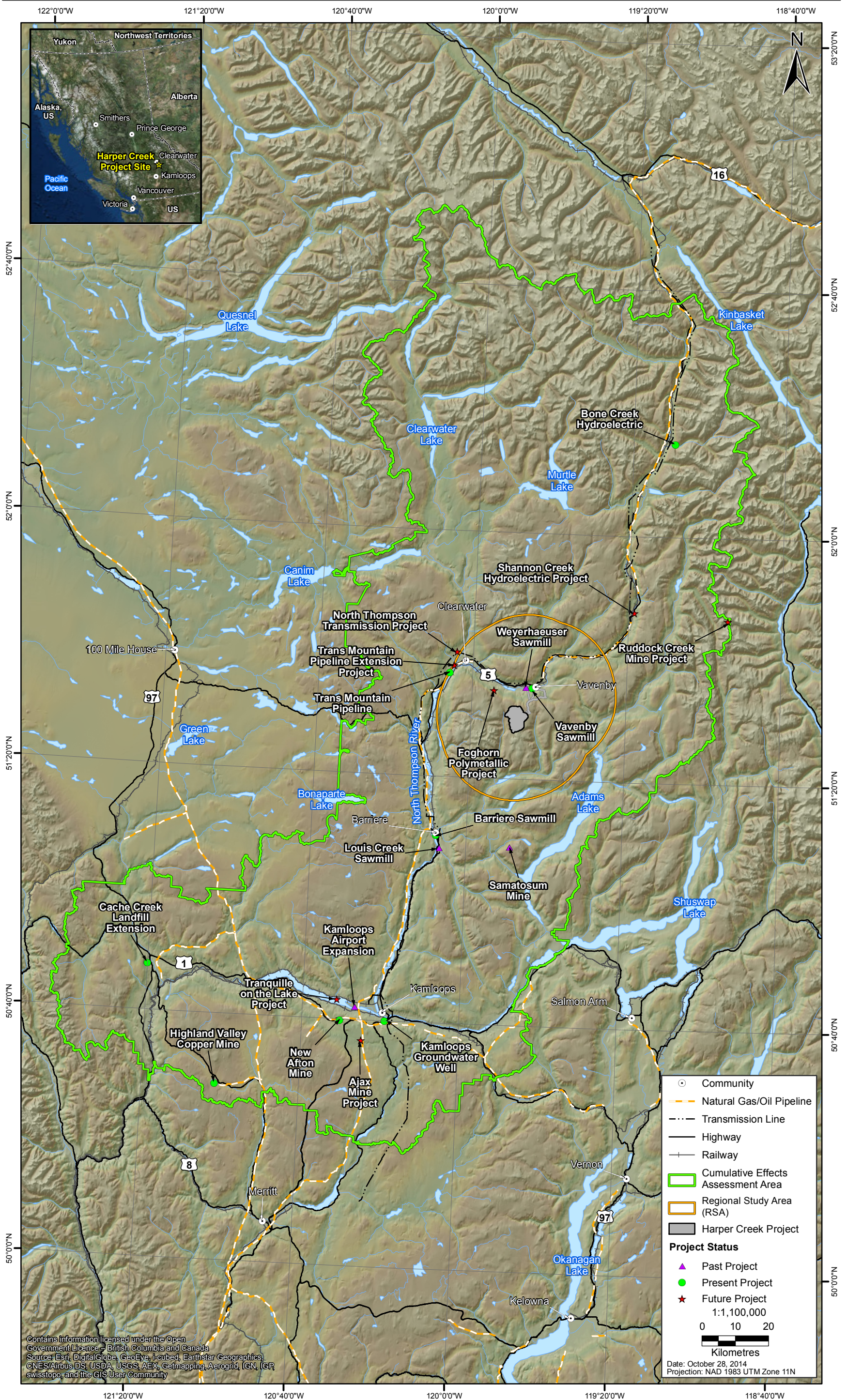
Potential Cumulative Effect	Proposed Mitigation Measure	Mitigation Effectiveness (<i>Low/Moderate/High/Unknown</i>)	Cumulative Residual Effect (Y/N)
Disturbance of Archaeological sites protected by the HCA.	Avoidance or mitigation measures approved by the Archaeology Branch and, if necessary affected First Nations community(s).	High	N

20.7 CONCLUSIONS FOR HERITAGE

Heritage resources are non-renewable, can be very susceptible to disturbance, and are finite in number. They are considered to be important resources that are protected for their historical, cultural, scientific, and educational value to the general public, local communities, and Aboriginal groups. In BC, both recorded and as-yet unrecorded archaeological sites are protected by the HCA (1996), and such sites may be affected by the Project.

Potential effects of the Project on known protected archaeological resources EiQw-2 and EjQw-2 within the Project Site will be managed through mitigation under a Section 14 Investigation Permit followed by a Section 12 Site Alteration Permit or site avoidance. With the application of mitigation and management measures prior to Project impacts, residual effects on known protected archaeological resources are not anticipated and as a result will be negligible and not significant. Similarly, implementation of the Project's Archaeology and Heritage Management Plan and Chance Find Procedure will facilitate the protection of any as-yet undiscovered protected heritage resources within the Project Site, which may be identified during Construction and/or Operation. Therefore, as-yet undiscovered protected heritage resources will be avoided and/or properly mitigated and managed, and residual effects are not anticipated. As residual effects to protected archaeological sites are not anticipated, cumulative effects to protected archaeological sites are also not anticipated.

Figure 20.6-1
Cumulative Effects Assessment Scoping, Harper Creek Project



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Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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