19. ASSESSMENT OF HERITAGE EFFECTS

19.1 INTRODUCTION

This section describes the assessment of Project effects on heritage resources. Heritage resources include a broad range of resources representing the region's cultural and natural history, such as archaeological, built heritage, and paleontological sites. Heritage resources are typically discrete locations where there are physical remains of past human presence (archaeological/built heritage sites) or physical remains like fossils or trace fossils of flora or fauna (paleontological sites). These are non-renewable resources and, if present, can be easily and irreparably disturbed or damaged by development activities. Heritage resources are managed, and in some cases protected, through statutory and policy tools. Archaeological sites that pre-date 1846 CE are automatically protected by the provincial *Heritage Conservation Act* (1996; HCA) and cannot be disturbed in any way without a permit. Built heritage and paleontological sites may be protected by law, and are identified as requiring consideration in the BC EAA and CEAA.

A cumulative baseline report describing the heritage investigations conducted for the Project is located in Appendix 19-A. As this application is a public document, maps showing the locations of archaeological sites that are protected under the HCA are not included.

19.2 REGULATORY AND POLICY FRAMEWORK

Legislation, regulations, policies, standards and guidelines pertaining to the protection of heritage resources mainly fall under provincial legislation, as listed in Table 19.2-1.

The primary legislation pertaining to heritage resource management in BC is the HCA. The HCA automatically protects all archaeological sites that predate 1846 and can be used to protect other significant heritage sites. This includes as-yet unrecorded sites and archaeological materials from disturbed contexts. Burial sites and rock arts sites are protected regardless of age, and ship and aircraft wreckage becomes protected two years after abandonment. Archaeological sites are non-renewable resources that are finite in number and can be very susceptible to disturbance. They are protected for their historical, cultural, scientific and educational value to the general public, local communities and First Nations. Developments that involve excavation, movement, or disturbance of ground surface or removal of vegetation have the potential to negatively impact archaeological sites, if present. Impacts to archaeological sites must be avoided or managed by development proponents. Additional provincial legislation with sections that pertain to the protection of heritage resources are the *Mines Act* (1996) and the *Local Government Act* (1996). In addition, the *Dawson Creek Land and Resource Management Plan* (1999) outlines cultural heritage resource management objectives for the region.

Although the province owns fossils found on Crown Land, paleontological sites are not managed or protected by one specific piece of legislation, but rather are covered by several provincial acts. Acts with provisions for managing fossils include the HCA, *Land Act* (1996), *Park Act* (1996), *Ecological Reserve Act* (1996), *Mineral Tenure Act* (1996), *Ecological Reserve Act* (1996), *Protected Areas of British*

Columbia Act (2000), *Wildlife Act* (1996), and *Environmental and Land Use Act* (1996). The Land Tenures Branch of the BC Ministry of Forests, Lands and Natural Resource Operations has implemented a fossil management framework in the province (Land Tenures Branch 2013), with fossil management principles that recognize the importance of fossils as heritage resources and that makes their scientific value the most important factor when making management decisions about fossils (Deputy Ministers' Committee on Environment and Resource Development 2004). The province has several mechanisms under these acts through which it can protect fossil sites.

Table 19.2-1. Heritage Legislation, Regulations, Policy, Standards, and Guidelines

Name	Year	Type	Level of Government	Description
Heritage Conservation Act	1996	Act	Provincial	Section 13 prohibits disturbance of archaeological sites and significant heritage sites. Section 36 describes the range of penalties for contraventions of the Act. Sections 12 and 14 give the BC Archaeology Branch authority to issue permits authorizing archaeological studies and archaeological site alterations.
Mines Act	1996	Act	Provincial	Section 10(1) of the Act 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(4) 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.
Local Government Act	1996	Act	Provincial	Section 967(1) gives local governments the power to pass bylaws designating properties, buildings, and/or features within their jurisdiction as protected. The heritage designation protection is then formally given to the heritage site by the minister responsible for the HCA (1996). No sites designated under the *Local Government Act* are located within the RSA.
Dawson Creek Land and Resource Management Plan	1999	LRMP	Provincial	The plan identifies three objectives for managing cultural heritage resources: to "recognize and conserve cultural heritage resources," "provide opportunities for the enjoyment of spiritual and cultural values," and "recognize and conserve significant natural heritage resources" (BC Ministry of Forests, Lands and Natural Resource Operations 1999)
Fossil Management Framework	2014	Framework/ Guideline	Provincial	The Land Tenures Branch of the BC Ministry of Forests, Lands and Natural Resource Operations is currently implementing a fossil management framework in BC (Land Tenures Branch 2013). Currently, mineral tenure holders who discover fossils during the course of their activities are encouraged by the province to report the discovery to a local museum, university or paleontology organization.

19.3 REGIONAL OVERVIEW

This section presents a summary of the Project's setting as it pertains to heritage resources, and a summary of the literature review conducted during the baseline study. The study areas considered are defined in Section 19.6.2.

19.3.1 Natural Setting

The Project is within the Rocky Mountain Foothills physiographic region of BC (Holland 1976). During the Late Wisconsinian Glaciation (c. 22,000 to 13,000 BP) the eastern slopes and foothills of the Rocky Mountains were covered by the Cordilleran Ice Sheet (Jackson et al. 1989). As the Project is near the Cordilleran Ice Sheet's point of coalescence with the eastern Laurentide Ice Sheet, deglaciation may have occurred relatively early, between c. 12,000 and 11,500 BP (Jackson et al. 1989). By c. 9,900 BP a coniferous forest of spruce and pine had become established (Clague 1989; Beaudoin, Wright, and Ronaghan 1996). The Hypsithermal interval (c. 7,400 BP) marked a warmer period and an increase in pine, which was followed by a period of wetter climatic conditions during which the previously seasonal sloughs, ponds, and muskegs became permanent (White 1983; MacDonald 1987). Environmental conditions close to the boreal forests present today were established by c. 7,000 to 5,500 BP, which resulted in a decrease in bison and an increase in moose and elk (White 1983; MacDonald 1987; Fladmark 1996).

The area is classified as part of the Central Canadian Rocky Mountain Ecoregion, the Sub-Boreal Interior Ecoprovince, and the Hart Foothills Ecosection (Demarchi 1995). The Hart Foothills are situated on the east side of the Rocky Mountains and consist of rounded mountains and wide valleys generally lower than the Rocky Mountains to the north and south. Immediately northeast of the Project is the Boreal Plains and Peace River Lowlands physiographic region, characterized by a more gentle topography of rolling hills and plateaus of between 800 and 1,100 masl.

Currently the Boreal White and Black Spruce biogeoclimatic zone covers most of northeastern BC (DeLong, Annas, and Stewart 1991). Upland forests are characterized by trembling aspen, white spruce, lodgepole pine, subalpine fir, birch, and balsam poplar. Large expanses of low-lying terrain are muskeg (peat wetlands) characterized by scrub forest of black spruce and tamarack (DeLong, Annas, and Stewart 1991). The climatic conditions are continental, with low precipitation and long, cold winters. Average temperatures at Chetwynd, about 100 km north of Tumbler Ridge, range from -10.7°C in the winter to 15.3°C in the summer, and annual precipitation is 447.5 mm, approximately 38% of it falling as snow (Environment Canada 2011). Mammalian fauna observed in the Tumbler Ridge region include woodland caribou, Rocky Mountain elk, moose, mountain goat, mountain sheep, wolverine, fisher, marten, hoary marmot, black bear, grizzly bear, wolf, coyote, snowshoe hare, beaver, lynx, red fox, white-tail deer, mule deer, and cougar (Rescan 2011). A number of bird species are also present, including ptarmigans, raptors, songbirds, and ducks (Rescan 2011).

The Project is located within the Arctic Ocean drainage system, and unlike the Pacific drainages immediately south and west of the Rocky Mountains, there are no anadromous fish such as salmon in the Project area. Fish species present in the Murray River include mountain whitefish, Arctic grayling, bull trout, northern pike, burbot, longnose sucker, slimy sculpin, longnose dace, finescale dace, and lake chub (Diversified Environmental Services 2011).

19.3.2 Cultural and Historical Setting

The Project is located within the area covered by Treaty 8, the treaty between the Crown and First Nations of northern Alberta, northeastern BC, northwestern Saskatchewan, and a southern portion of the Northwest Territories near Great Slave Lake (Treaty 8, 1966). During the late precontact period, the Peace River region was used by Sekani (*TseK'ehne*) and Beaver (*Dunne-za*; Denniston 1981; Ridington 1981). The Sekani and Beaver are two closely related cultural and linguistic groups; both part of the Athapaskan language family, whose speakers inhabited a wide swath of the Canadian sub-arctic at the time of European contact (Krauss and Golla 1981). Simon Fraser's journals describe encountering a group of "Meadow Indians" at Rocky Mountain Portage, near present-day Hudson's Hope, in 1806 AD (Fraser 1960). The cultural affiliation of this group is not certain, but survivors from Sekani bands expelled from the North Thompson River area by Shuswap (*Secwepemc*) bands are thought to have been in this region between the 1790s and 1820s (Denniston 1981).

The cultural setting in the Peace River region changed rapidly during the late precontact and early contact periods (mid-1700s to 1900 AD) as the westward expansion of the fur trade proceeded across Canada. The earliest Euro-Canadian presence in the upper Peace River was Alexander Mackenzie's 1793 AD expedition, the purpose of which was to find a route to the Pacific Ocean to facilitate the North West Company's expanding fur trade enterprise. Fur trading posts were quickly established along the Peace River: Rocky Mountain Portage House in 1804; Rocky Mountain Fort in 1794, near the Moberly-Peace River confluence; and Fort D'Epinette in 1806, near present day Fort St. John (Burley, Hamilton, and Fladmark 1996).

The impact of the fur trade on the lives of Aboriginal peoples was profound. Preceding the actual arrival of the fur trade to the upper Peace River was the rapid westward expansion of the Cree peoples during the mid-to-late 1700s AD and the resulting displacement of the Beaver and Sekani from their previous territories westward toward the Rocky Mountains (Burley, Hamilton, and Fladmark 1996). During the 1800s, the social and economic organization of Beaver and Sekani bands became increasingly oriented towards exploiting opportunities presented by the fur trade (Brody 1981; Burley, Hamilton, and Fladmark 1996).

The late 1800s AD saw an influx of would-be miners, headed for the Klondike, travelling through the Peace River region. Beginning in 1899, the Dominion government began negotiating Treaty 8 with the Aboriginal peoples of the region, initially as an attempt to prevent conflicts with miners. When the Canadian Pacific Railway was built to the west coast in the mid-1880s, the province allowed the Dominion Government to take control of 3.5 million acres of land north and east of the Rocky Mountains, known as the Peace River Block (Calverley 1980). In 1911, the Peace River Block, centred on present-day Fort St. John, was subdivided into quarter sections, and large scale and permanent agricultural settlement began (Leonard 1995).

By the early 1900s AD, Métis living at Lac Ste. Anne and Flying Shot Lake, Alberta, had established traplines in the Murray, Flatbed, Redwillow, Wapiti, and Kistkatinaw river valleys (Andrews 1985). Around 1910, two Métis families, led by Narcisse Belcourt and St. Pierre Gauthier, moved permanently to Kelly Lake, located just inside the BC border, approximately 65 km northeast of Tumbler Ridge. They were soon followed by several other families from Lac Ste. Anne, and today their descendants form the Métis and Cree community of Kelly Lake.

Several exploratory expeditions of the Tumbler Ridge region were undertaken in the early 1900s AD, including timber-cruising by Spencer Tuck in 1907 (Calverley 1980; Helm 2000), surveys for the United States Biological Survey by Prescott Fay in 1914 and John Holzworth in 1923 (Holzworth 1923; Helm 2000), and survey for oil and gas resources by Professor J. C. Gwillim in 1919 (Gwillim 1920). Between 1937 and 1938, the Monkman Pass Highway Association, an organization based in northwestern Alberta, attempted to construct a road over the Rocky Mountains via Monkman Pass. However, after the onset of World War II, the government opted to construct the highway and rail route to the north through Pine Pass instead, due to its proximity to the communities of Dawson Creek and Fort St. John (Robinson and Hocking 1982; Truax and Sheehan 1988; Helm 2000).

The recent history of the region has been largely driven by the development of coal mining, which resulted in the construction of the town of Tumbler Ridge in the early 1980s. Tumbler Ridge was purpose-built to serve the Bullmoose and Quintette mines. Today, the oil and gas, forestry, wind energy, and tourism industries are also important economic drivers (Helm 2000, 2008).

19.3.3 Archaeological Setting

Early post-glacial radiocarbon dates of organic material in northeastern BC confirm that the area was ice-free and potentially available to humans by approximately 12,000 to 11,000 BP (White 1983). Archaeological site HbRf-39, near Charlie Lake, 140 km north of the Project, is the earliest radiocarbon dated human occupation in BC, dated to approximately 10,500 BP. Archaeological sites dating to the early Holocene have also been found near Pink Mountain (Wilson 1989) and Prince George (Burford et al. 2008). Artifacts found in secondary contexts in Williston Reservoir (Eldridge et al. 2008), the Lone Prairie, Fellers Heights, and Dawson Creek areas (Ball 1978), the Grande Prairie area (Beaudoin, Wright, and Ronaghan 1996), the Smoky and Wapiti river watersheds (Bussey 1987), and the Fort St. John area (Fladmark 1981) are also thought to represent early post-glacial settlement of this region.

19.3.4 Paleontological Setting

Northeastern BC contains the best record of fossil vertebrates in the province, with the Peace Region laying claim to both the largest marine reptile in the world, and one of the best records of fossil tracks in the world. The Tumbler Ridge Museum Foundation and the Peace Region Palaeontology Research Centre, along with other partners, have prepared an Expression of Interest to apply to UNESCO to have the area designated as a Global Geopark (Tumbler Ridge Aspiring Geopark Steering Committee 2013).

The geological formations within the Local Study Area (LSA) date to the late Jurassic and Cretaceous periods. The major sedimentary divisions include the Boulder Creek Formation, Hulcross Formation, Cruiser Formation, and Dunvegan Formation. These primarily consist of marine and terrestrial sedimentary strata. These strata are well known as sources of "important fossil vertebrate, invertebrate, and plant specimens" (McCrea 2013); however, some types of plant and invertebrate fossils are commonly found in the region and are less significant. The Dunvegan Formation has yielded a variety of bird, reptile, and dinosaur fossil tracks, including those of theropods, ornithopods, and ankylosaurs. Vertebrate bone fossils have also been recovered, although this is rare (McCrea 2013).

19.4 RECENT HISTORICAL ACTIVITIES

Several recent historic and current human activities have taken place in proximity to the proposed Project area. These include mining exploration and production, oil and gas, forestry, tourism/ recreation, and hunting/trapping.

The Quintette Coal Mine, about 20 km south of Tumbler Ridge, was an open pit mine that operated between 1982 and 2000. The mine consisted of five open pits in three discrete areas: Sheriff (Wolverine and Mesa Pits), Frame (Shikano Pit) and Babcock (Windy and Window Pits). Mine permits for the Wolverine and Mesa Pits were issued in December 1982 and mining commenced from 1983 until 1998 (Wolverine) and 2000 (Mesa). Raw coal was transported via an overland conveyor from the Mesa and Wolverine Pits to the Quintette plant site for processing. The coal processing plant has been under care and maintenance since the end of mining in 2000; the overland conveyor, which previously crossed through a portion of HD Mining's Decline Site, was decommissioned by Teck in 2011. Teck is currently securing the necessary approvals to re-initiate mining in the Babcock area.

The Bullmoose Coal Mine operated from 1983 to 2003 and was the largest open pit coal mine at the time, producing about 3 million tons of metallurgical coal. The 1.7-million-tonne-per-year operation consisted of an open-pit mine, a plant facility in the Bullmoose Creek valley below the mine, and a separate rail loadout facility on the B.C. Rail branchline.

The Project is located near two provincial parks and protected areas. Bearhole Lake Provincial Park and Protected Area is located approximately 17 km east of the Project, and Monkman Provincial Park is located approximately 27 km south of the Project.

19.5 BASELINE STUDIES

The heritage resources baseline studies for the Project began in 2010 and continued into 2014. The studies consisted of desk based research on the Regional Study Area (RSA; Figure 19.5-1) and Local Study Area (LSA; Figure 19.5-2), and archaeological impact assessments (AIAs). These studies focused on various potential Project infrastructure areas that were under consideration between 2010 and 2014, as the design of the Project was being refined and finalized. The AIAs were conducted under HCA Heritage Inspection Permits 2010-0279, 2012-0099, and 2013-0180. The heritage resources baseline report summarizing all of the studies for the Project is appended to this document (Appendix 19-A).

19.5.1 Data Sources

As part of the heritage resources baseline studies, a desk based review of heritage data sources was conducted for the RSA. The data sources accessed included ethnographic, historic, archaeological, paleontological, and environmental literature, and topographic maps and satellite imagery literature from publically available sources. Searches of the BC Archaeological Site Inventory using the Remote Access to Archaeological Data (RAAD) online application and permit reports from the Archaeology Branch's online library were conducted. The Canadian Register of Historic Places was searched for registered heritage sites near the RSA, and the Peace Regional Palaeontological Research Centre was contacted regarding paleontological resources within the LSA.

Figure 19.5-1
Regional Study Area for Assessment of Heritage Effects

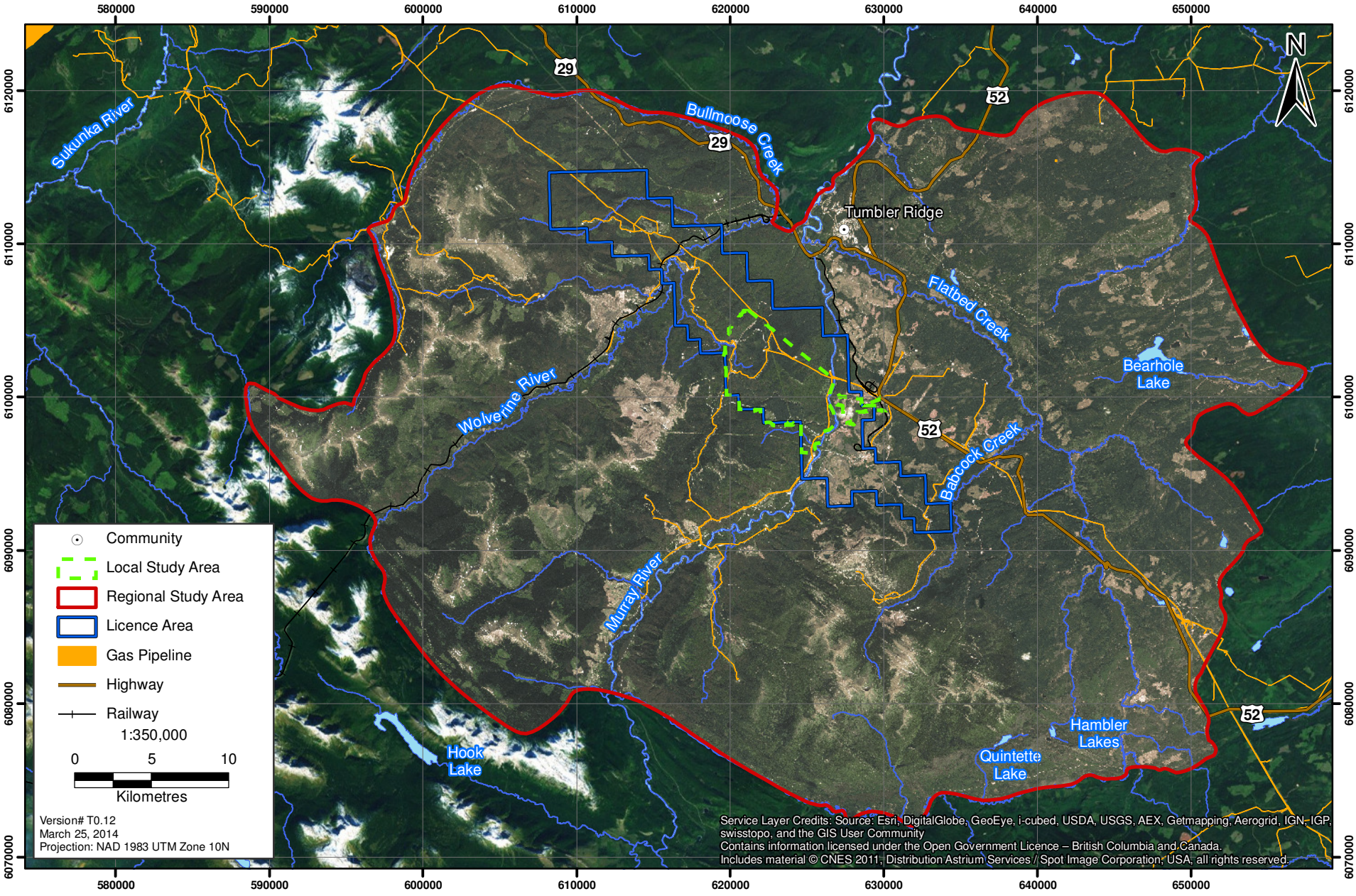
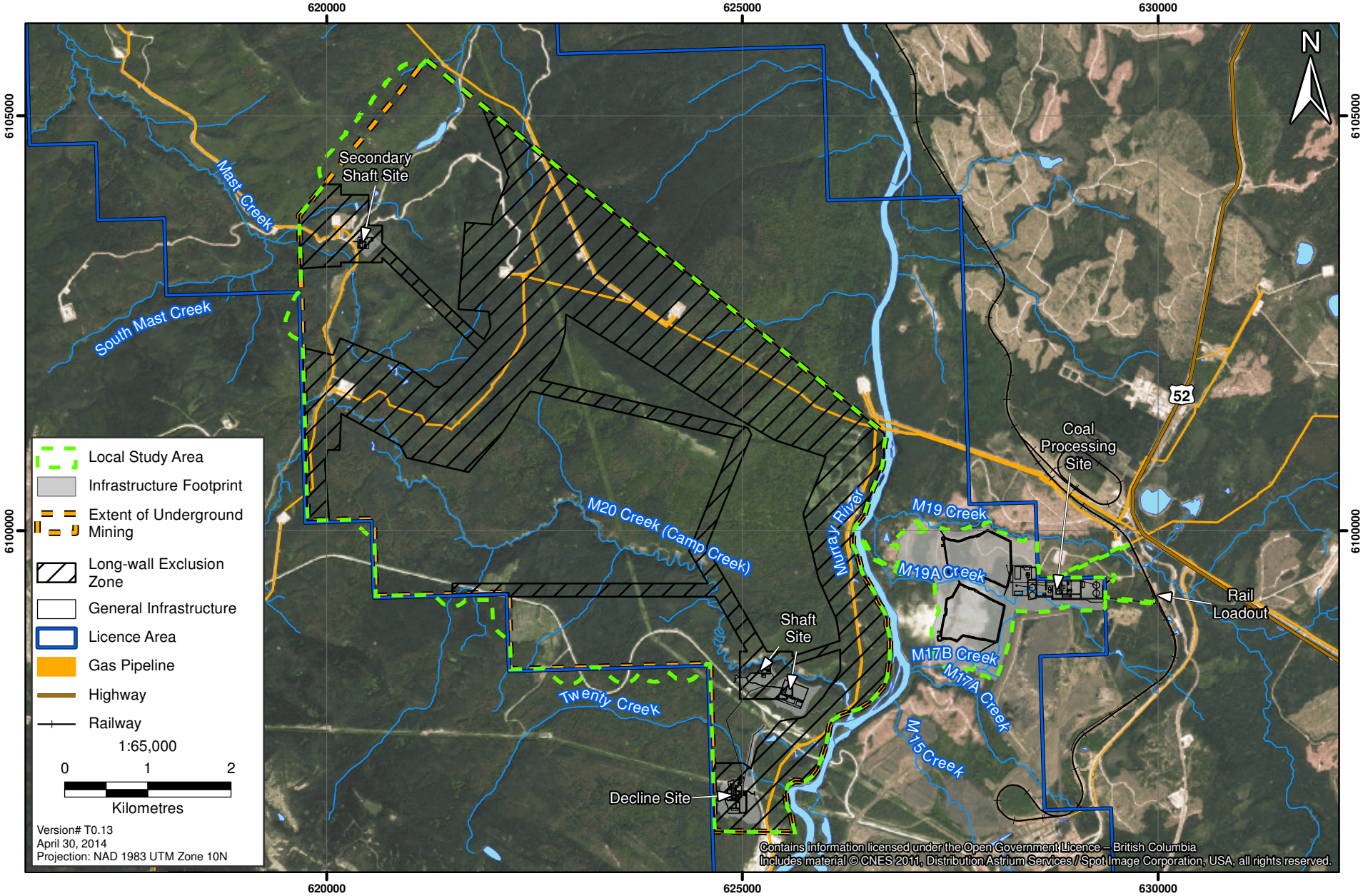


Figure 19.5-2
Local Study Area for Assessment of Heritage Effects



19.5.2 Methods

19.5.2.1 Baseline Study Area

The RSA is the overall study area for which baseline data on heritage resources was sought (Figure 19.5-1). The RSA is intended to encompass an area beyond which any cumulative effects of the Project would not be expected. It is consistent with the RSA used in the Wildlife, Terrestrial Ecology and Land Use effects assessments and is based primarily on watershed boundaries and topography. It is approximately 22,615 ha, measuring 60 km east-west and 40 km north-south.

The LSA is defined as the Project's "infrastructure footprint" area where ground disturbance may occur and the area above the longwall mining within which subsidence of the land surface could occur during Operation (Figure 19.5-2). The LSA is the area where direct effects may take place and was the focus of the baseline study.

19.5.2.2 Archaeological Impact Assessments

Three AIAs were conducted for the Project under Heritage Inspection Permits 2010-0279, 2012-0099, and 2013-0180. The methodology employed during the AIAs was approved by the Archaeology Branch and is described in the permit applications and in Appendix 19-A. Copies of the final permit reports for the Heritage Inspection Permits are on file at the Archaeology Branch.

During the AIAs, intensive field investigations were conducted in areas of the proposed development identified as having potential for the presence of archaeological resources during in-field assessment. Investigations consisted of a combination of systematic and/or judgementally selected pedestrian survey traverses and subsurface testing. Ground surfaces were examined for trails, structures, artifacts, depressions, and other evidence of past human settlement and land use. Tree throws were examined for cultural materials. Bedrock exposures and boulders were inspected for pictographs and petroglyphs for the possible presence of seams of flakeable lithic raw materials.

Shovel testing was conducted in areas identified during the in-field assessment as having potential for buried archaeological remains. The number and location of shovel tests was judgementally determined on a case-by-case basis, dependent on ground cover, terrain and density of bush/forest, and development boundaries. Back dirt from tests was examined manually or screened through 6 mm mesh. Site boundaries were defined using a combination of observed, natural, and arbitrary limits.

The significance of archaeological sites was determined using the checklist of criteria for site evaluation in the *British Columbia Archaeological Impact Assessment Guidelines* (Apland and Kenny 1998).

All collected artifacts were catalogued, described, and compared to existing regional typologies. Appropriate metric attributes of artifacts were recorded. Lithic debitage was quantified and classified according to raw material, stage of manufacture and technological attributes. Sites received descriptive and functional interpretations where possible, based on a typological and comparative analysis of observed artifacts and/or features. Analysis focused on a culture-historical

framework and the functional and seasonal use of a site. All artifacts collected have been curated by the Royal BC Museum.

19.5.2.3 Historic Resources Review

The methodology employed to identify any possible significant, protected historic features included a literature review (described in Appendix 19-A), a search of the BC Integrated Land and Resource Registry, and a visit to the Tumbler Ridge Museum. In addition, a search of the Canadian Registry of Historic Places (Parks Canada 2013) was conducted to identify the closest Designated Heritage Sites to the Project, and the District of Tumbler Ridge's Official Community Plan was reviewed to determine whether a Community Heritage Register had been established for the district. In addition, during the AIA field assessment, the proposed infrastructure footprint area was surveyed for heritage features.

19.5.2.4 Paleontological Resources Review

In 2013 a desk-based review of the LSA was conducted by Richard McCrea (2013), a paleontologist with the Peace Region Palaeontology Research Centre in Tumbler Ridge to assess the potential for the Project to encounter fossils during construction and operation. The review included a literature review, a discussion of geological formations found in the LSA, and a preliminary assessment of the potential for fossil discoveries in the LSA.

19.5.3 Characterization of Heritage Baseline Condition

The heritage baseline condition for the Project is characterized for the three main heritage concerns within the RSA: protected archaeological sites; protected paleontological sites, and protected historical sites.

Previous exploration in the RSA included seismic lines and drilling for oil and gas wells which helped target areas for coal exploration. Twelve cutblock licenses exist within the LSA; three of these are held by the proponent. Large portions of the LSA have been recently harvested to remove pine-beetle affected timber.

Subsistence activities, such as trapping, hunting, and fishing are common land uses regionally. Three trapping tenures and four guide-outfitting tenures overlap the RSA. Multiple recreation tenures, as well as temporary and permanent residences exist within the RSA area. The nearest trapline cabin is 1.7 km from the Project on the west bank of Murray River, the nearest campground is 9.5 km north from the Project (near Tumbler Ridge), the nearest hunting camp is 26 km west from the Project, and the nearest residential area (Tumbler Ridge) is 12.4 km north from the Project.

19.5.3.1 Protected Archaeological Sites within the Regional Study Area

There are 86 known archaeological sites within the RSA (Table 19.5-1). Of these, 72 are prehistoric sites, 12 are historic sites, and 2 contain both prehistoric and historic features. The prehistoric archaeological sites show a range of past activities. Most of these sites have low artifact density and few features and are related to use of the landscape for activities such as hunting and resource gathering.

Table 19.5-1. Archaeological Sites within the Regional Study Area

Borden Number	Site Class	Site Type	Site Information	Potential Effect	Permit Number
GeRe-1	Prehistoric	Lithic Scatter; Fire Altered Rock; Faunal Remains	Temporary campsite	None	1980-011; 1981-011
GeRe-2	Prehistoric	Fire Altered Rock	Four pieces of fire cracked rock	None	1980-011
GeRe-7	Prehistoric	Lithic Scatter; Fire Altered Rock	Temporary campsite	None	1980-011; 1981-011
GeRe-8	Historic	Trail	Transportation trail	None	1982-015
GeRe-9	Prehistoric	Faunal Remains	Burnt bone fragments	None	1981-11
GeRe-10	Prehistoric	Hearth	Hearth	None	1981-011
GeRe-11	Prehistoric	Lithic Scatter; Faunal Remains	Flakes; Faunal	None	2005-406
GeRe-15	Prehistoric	Lithic Scatter	Flakes	None	2006-173
GeRe-16	Prehistoric	Lithic Scatter	Flakes	None	2006-173
GeRe-17	Prehistoric	Lithic Scatter; Hearth	Flakes; Fire cracked rock	None	2008-349
GeRf-1	Prehistoric	Isolated Lithic Find	End scraper	None	1976-004
GeRf-2	Historic	Cabin	Hambler Cabin Site	None	1982-015
GeRf-3	Historic	Trail	CMT	None	1982-015
GeRf-4	Prehistoric	Lithic Scatter	Retouched flakes; Flakes	None	1982-015
GeRf-5	Historic	Trail	CMT	None	1982-015
GeRf-6	Historic	Trail	CMT	None	1982-015
GeRf-7	Historic	Trail	Hambler Pack trail	None	1982-015
GeRf-8	Prehistoric	Lithic Scatter; Faunal Remains	Flakes; Faunal	None	2005-406
GeRf-9	Prehistoric	Lithic Scatter	Flakes; Hammerstone	None	2005-406
GeRf-10	Prehistoric	Isolated Lithic Find	Flake	None	2005-406
GeRf-11	Prehistoric	Isolated Lithic Find	Unifacial tool	None	2006-173
GeRf-12	Prehistoric	Lithic Scatter	Flakes	None	2008-349
GeRg-1	Prehistoric	Lithic Scatter	Flakes	None	1976-004
GeRg-2	Prehistoric	Lithic Scatter	Flakes	None	2006-173
GfRe-1	Prehistoric/Historic	Habitation Site; Faunal Remains	Trapper's cabins	None	1977-007
GfRe-2	Prehistoric	Faunal Remains	Bone awl	None	1977-007
GfRe-3	Prehistoric	Cultural Depression	Teepee camp	None	1977-007
GfRe-4	Historic	Habitation Site	Callahaison Flats Trapper's Cabins	None	1982-015

(continued)

Table 19.5-1. Archaeological Sites within the Regional Study Area (continued)

Borden Number	Site Class	Site Type	Site Information	Potential Effect	Permit Number
GfRe-5	Historic	Burial	Maggie Thomas' grave	None	1982-015
GfRe-6	Historic	CMT site	CMT	None	1982-015
GfRe-7	Prehistoric	Isolated Lithic Find	Flake	None	1982-015
GfRe-8	Prehistoric	Lithic Scatter	Biface fragment; Flake	None	1982-015
GfRe-9	Prehistoric/Historic	Lithic Scatter; Trail	Flakes; Trail	None	1982-015
GfRe-10	Prehistoric	Lithic Scatter	Retouched flake; Flakes	None	1982-015
GfRe-11	Historic	Trail	Hambler Trail (Northeast)	None	1982-015
GfRe-12	Prehistoric	Isolated Lithic Find	Flake	None	2008-303
GfRe-13	Prehistoric	Lithic Scatter	Flakes	None	2008-303
GfRe-14	Prehistoric	Isolated Lithic Find	Flake	None	2008-303
GfRf-1	Prehistoric	Isolated Lithic Find	Chopper	None	1977-034; 2009-174
GfRf-2	Prehistoric	Lithic Scatter	Flakes	None	1977-034; 2009-174
GfRf-3	Prehistoric	Lithic Scatter	Scraper; Flakes	None	1977-034; 2009-174
GfRf-4	Prehistoric	Lithic Scatter	Flakes	None	1981-019
GfRf-5	Prehistoric	Isolated Lithic Find	Flake	None	1981-019
GfRf-6	Prehistoric	Lithic Scatter	Flakes	None	1992-018; 2009-174
GfRf-7	Prehistoric	Lithic Scatter	Utilized flakes; Retouched flakes; Flakes	None	2004-310
GfRf-8	Prehistoric	Isolated Lithic Find	Flake	None	2004-310
GfRf-9	Prehistoric	Lithic Scatter	Scraper; Utilized flake; Core; Flakes	None	2004-310; 2009-174
GfRf-10	Prehistoric	Isolated Lithic Find	Utilized chopper	None	2004-310
GfRf-11	Prehistoric	Lithic Scatter	Knife; Flakes	None	2004-310
GfRf-12	Prehistoric	Lithic Scatter	Flakes	None	2004-310
GfRf-13	Prehistoric	Petroform	Cairn or cache	None	2007-320
GfRf-14	Prehistoric	Lithic Scatter	Utilized flake; Retouched flake	None	2007-320
GfRf-15	Prehistoric	Lithic Scatter	Chopper; Retouched flakes;	None	2007-320
GfRf-16	Prehistoric	Rock Shelter; Isolated Lithic Find	Rock shelter; Utilized flake	None	2007-320
GfRf-17	Prehistoric	Lithic Scatter	Retouched flakes; Flakes	None	2007-320

(continued)

Table 19.5-1. Archaeological Sites within the Regional Study Area (completed)

Borden Number	Site Class	Site Type	Site Information	Potential Effect	Permit Number
GfRf-18	Prehistoric	Lithic Scatter	Flakes	None	2007-320; 2009-174
GfRf-19	Prehistoric	Isolated Lithic Find	Utilized flake	None	2007-320
GfRf-20	Prehistoric	Isolated Lithic Find	Utilized flake	None	2007-320
GfRf-21	Prehistoric	Isolated Lithic Find	Retouched flake	None	2007-320
GfRf-22	Prehistoric	Lithic Scatter	Retouched split pebbles	None	2011-015
GfRf-24	Prehistoric	Isolated Lithic Find	Modified split pebble	None	2011-0015
GfRf-26	Prehistoric	Sub-surface Lithics	Unknown	None	2011-015
GgRe-1	Prehistoric	Isolated Lithic Find	Split, worked pebble	None	2008-303
GgRe-2	Prehistoric	Lithic Scatter	Retouched flakes; Flakes	None	2008-375
GgRf-1	Historic	CMT site	CMT's	None	1998-299
GgRf-2	Prehistoric	Lithic Scatter	Flakes	Indirect	2004-310
GgRf-3	Prehistoric	Isolated Lithic Find	Flake	Indirect	2004-310
GgRf-4	Prehistoric	Isolated Lithic Find	Flake	Indirect	2004-310
GgRf-5	Prehistoric	Lithic Scatter	Flakes	Indirect	2004-310, 2008-346
GgRf-6	Prehistoric	Isolated Lithic Find	Flake	None	2004-310
GgRf-7	Prehistoric	Isolated Lithic Find	Flake	None	2006-076
GgRf-8	Prehistoric	Lithic Scatter	Flakes	None	2006-076
GgRf-9	Prehistoric	Isolated Lithic Find	Flake	None	2006-076
GgRf-10	Prehistoric	Lithic Scatter	Flakes	Indirect	2004-310, 2007-0188
GgRg-1	Historic	Arbourglyph	Historic carvings	None	1976-004
GgRg-2	Prehistoric	Isolated Lithic Find	Flake	None	1981-023
GgRg-3	Prehistoric	Isolated Lithic Find	Flake	None	1987-006
GgRg-4	Prehistoric	Isolated Lithic Find	Flake	None	2005-158
GgRg-5	Prehistoric	Lithic Scatter	Biface; Retouched flakes; Flakes	Direct	2007-062
GgRg-6	Prehistoric	Isolated Lithic Find	Flake	Indirect	2007-072
GgRg-7	Prehistoric	Lithic Scatter	Flakes	None	2007-072
GgRg-8	Prehistoric	Isolated Lithic Find	Flake	Direct	2007-072
GgRg-9	Prehistoric	Lithic Scatter; Trail	Flakes; Utilized flake; Trail; CMT	Indirect	2012-099
GgRh-1	Prehistoric	Isolated Lithic Find	Unifacially retouched tool	None	1981-019
GgRh-2	Prehistoric	Isolated Lithic Find	Flake	None	2005-158
GgRh-3	Prehistoric	Lithic Scatter	Flakes	None	2005-158

Lithic scatters (scatters of stone tools and stone waste chips) are the most common archaeological site types found in the RSA, with 67 sites containing lithic material. These sites range in size from isolated lithic finds to sites containing over 500 artifacts. At twenty-five of the lithic sites formed tools or expedient tools (e.g., retouched flakes) were identified, while at the rest only debitage was located. Materials typically used for making stone tools in the region are chert, obsidian, quartzite, chalcedony, and basalt. One of these lithic sites was located beneath a rock-shelter, which could have been used as a campsite or as protection from the elements. Two of the lithic scatter sites were found in association with trails.

There are two sites within the LSA (GgRg-5 and GgRg-8) located above the underground mine area. There are no sites within the infrastructure footprint portion of the LSA.

In addition to the GgRg-5 and GgRg-8, there are seven archaeological sites located within 500 m of the LSA (GgRf-2, GgRf-3, GgRf-4, GgRf-5, GgRf-10, GgRg-6, and GgRg-9). These nine sites (two within the LSA and seven within 500 m of the LSA) are described below.

GgRf-2

Archaeological site GgRf-2 is a prehistoric lithic scatter consisting of four pieces of chert and siltstone debitage (GgRf-2 site inventory form). It measures 16 m by 10 m and is located on a gently sloping ridge approximately 205 m north of the proposed rail loadout. As it is situated on the opposite (east) side of the CN rail grade from the Project, the site will not be directly affected and is at low risk of indirect impacts from increased human presence during the Construction and Operation phases.

GgRf-3

Archaeological site GgRf-3 is a prehistoric lithic isolated find consisting of one piece of chert debitage (GgRf-3 site inventory form). It measures 12 m by 12 m and is located on the edge of a moderately steep-sloped ridge approximately 210 m north-northeast of the rail loadout. As it is situated on the opposite (east) side of the CN rail grade from the Project, the site will not be directly affected and is at a low risk of indirect impacts from increased human presence during the Construction and Operation phases.

GgRf-4

Archaeological site GgRf-4 is a prehistoric lithic isolated find consisting of one piece of quartzite debitage (collected; GgRf-4 site inventory form). It measures 18 m by 14 m and is located on a ridge near a moderately steep, southern slope approximately 280 m east-southeast of the rail loadout. As it is situated on the opposite (east) side of the CN rail grade from the Project, the site will not be directly affected and is at a low risk of indirect impacts from increased human presence during the Construction and Operation phases.

GgRf-5

Archaeological site GgRf-5 is a prehistoric lithic scatter consisting of two pieces of debitage (one white quartzite flake and one tertiary retouched flake of grey siltstone) is located on a low knoll approximately 495 m southeast of the rail loadout. At the time it was originally recorded it measured 32 m by 32 m. A road was built under Site Alteration Permit 2008-0346 on west side of the

site, impacting a 4 m by 10 m area of the site. No additional artifacts or features were located during the site alteration and the remaining site area was reported to be in good condition (Riswold 2009). As it is situated on the opposite (east) side of the CN rail grade from the Project, the site will not be directly affected and is at a low risk of indirect impacts from increased human presence during the Construction and Operation phases.

GgRf-10

Archaeological site GgRf-10 is a prehistoric lithic scatter consisting of three black chert flakes collected from one subsurface test (GgRf-10 site inventory form). It measured 22 m by 18 m and is located on a low rise approximately 300 m northeast of the rail loadout. The site was altered by road construction under Site Alteration Permit 2007-0188. This resulted in impacts to the west side of the site. Additional archaeological materials may be present in the unimpacted eastern portion of the site. As it is situated on the opposite (east) side of the CN rail grade from the Project, the site will not be directly affected and is at a low risk of indirect impacts from increased human presence during the Construction and Operations phases.

GgRg-5

Archaeological site GgRg-5 is a prehistoric lithic scatter consisting of one grey siltstone flake, three grey chert flakes, one grey siltstone biface, and one grey chert retouched flake. A site revisit in 2008 under Heritage Inspection Permit 2008-0245 yielded an additional basalt flake. The site measures 22 m by 18 m and is located on a small knoll overlooking an unnamed drainage (Wondraseck, Lewis, and Kasstan 2008). GgRg-5 is located above the underground mine area; however, HD Mining has built buffer areas into their mine plan where longwall mining will be restricted. The site is within such a buffer area, and as such is at low risk of direct effects from disturbance due to subsidence during the Operation phase.

GgRg-6

Archaeological site GgRg-6 is a prehistoric isolated find consisting of one grey chalcedony flake. The site measures 15 m by 10 m and is located on the western bank of the Murray River (Cogswell, Farvacque, and MacDonald 2009). GgRg-6 is located approximately 100 m northeast of the underground mine area. HD Mining has built buffer areas into their mine plan where longwall mining will be restricted. The site is northeast of a buffer area, and is at low risk of indirect effects from disturbance due to subsidence during the Operation phase.

GgRg-8

Archaeological site GgRg-8 is a prehistoric lithic isolated find consisting of one tertiary green translucent obsidian flake observed on the surface (GgRg-8 site inventory form). The site boundaries are listed on RAAD as 120 m by 20 m and appear to be based on the size of the landform, a fluvial terrace immediately west of the Murray River and 475 m northwest of the Coarse Coal Rejects area. GgRg-8 is located above the underground mine area; however, HD Mining has built buffer areas into their mine plan where longwall mining will be restricted. The site is within such a buffer area, and as such is at low risk of direct effects from disturbance due to subsidence during the Operation phase.

GgRg-9

Archaeological site GgRg-9 consists of two prehistoric surface and subsurface lithic scatters connected by a trail. The first lithic scatter was identified by the presence of two grey basalt flakes exposed along the trail furrow; subsequent shovel testing identified nine positive tests with eleven grey basalt flakes and one grey basalt utilized flake. The second lithic scatter consists of two dark grey basalt flakes exposed along the trail furrow (Rescan 2013). The site measures 470 m by 5 m and is located on a bluff on the east side of the Murray River approximately 360 m west-southwest of the proposed water well and 140 m east of the underground mining area. The site was avoided by HD Mining during the design of the Project and is at low risk of indirect effects from increased human presence during the Construction and Operation phases.

19.5.3.2 Protected Built Heritage Sites within the Regional Study Area

There are no protected built heritage sites within the RSA; however, 14 of the 86 archaeological sites recorded in the RSA have a historic component. Of the 14 sites seven are historic trails, three are historic cabins, two are historic CMTs, one is a historic arbourglyph, and one is a historic burial. As these are already included in the description of protected archaeological sites within the RSA (Section 19.5.3.1) they will not be discussed further. There are no additional protected historical sites within the RSA.

19.5.3.3 Significant Paleontological Sites within the Regional Study Area

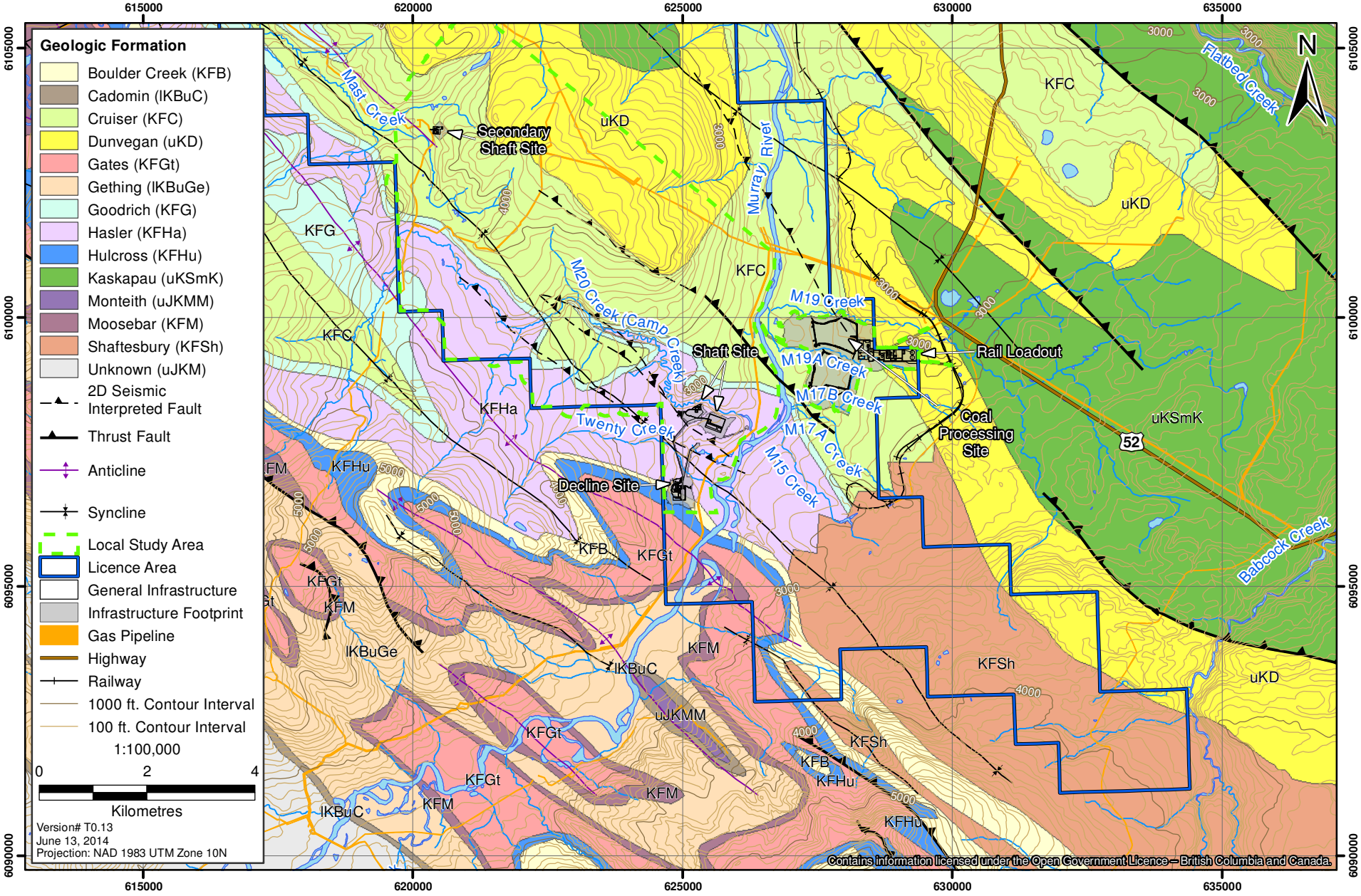
There are no legally protected paleontological sites within the RSA; however, within the RSA, Flatbed and Wolverine creeks have yielded a variety of dinosaur fossil tracks, including those of theropods, ornithopods, and ankylosaurs). The geological formations date to the late Jurassic and Cretaceous periods. The major sedimentary divisions include the Boulder Creek Formation, Hulcross Formation, Cruiser Formation, and Dunvegan Formation (Figure 19.5-3). These primarily consist of marine and terrestrial sedimentary strata. These strata are well known as sources of "important fossil vertebrate, invertebrate, and plant specimens" (McCrea 2013).

19.6 ESTABLISHING THE SCOPE OF THE EFFECTS ASSESSMENT FOR HERITAGE RESOURCES

This section provides a description of the scoping process used to identify potentially affected Valued Components (VCs), select assessment boundaries, and identify the potential effects of the Project that are likely to arise from the Project's interaction with a VC. Scoping is fundamental to focusing the Application/EIS on those issues where there is the greatest potential to cause significant adverse effects. The scoping process for the assessment of Heritage Effects consisted of the following steps:

- Step 1: conducting a desk-based review of available scientific data, technical reports, and other project examples to compile a list of potentially affected VCs in the vicinity of the Project;
- Step 2: carrying out detailed field baseline studies to fill information gaps and confirm presence/absence of VCs;
- Step 3: considering feedback from the EA Working Group on the proposed list of VCs included in the AIR and the EIS Guidelines;

Figure 19.5-3
Geology in the Local Study Area



- Step 4: defining assessment boundaries for each VC; and
- Step 5: identifying key potential effects on VCs.

These steps are described in detail below.

19.6.1 Selecting Valued Components

VCs are components of the natural and human environment that are considered to be of scientific, ecological, economic, social, cultural, or heritage importance (CEAA 2006; EAO 2013). To be included in the EA, there must be a perceived likelihood that the VC will be affected by the proposed Project and of recognized importance to society, the local community, or the environmental system. Valued components are scoped into the environmental assessment based on issues raised during consultation on the draft AIR (dAIR) and EIS Guidelines with Aboriginal communities, government agencies, the public and stakeholders. Consideration of certain VCs may also be a legislated requirement, or known to be a concern because of previous project experience.

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. Heritage resources can be protected by provincial legislation, as described in Section 19.2.

Archaeology and heritage resources was identified as a receptor VC and further refined into the following indicators sub-components:

- archaeological resources;
- protected historical or architectural resources; and
- significant paleontological resources.

The heritage VCs were identified by evaluating the results of the baseline studies (Appendix 19-A) as well as the protection status of identified heritage resources. Interest in heritage resources and issues that governments (Aboriginal and non-Aboriginal), local interest groups, and the public identified during the engagement process were also considered.

19.6.1.1 Summary of Valued Components Selected for Assessment

For purposes of this assessment the heritage resources considered during VC selection were defined to be consistent with both federal (CEAA) and provincial (BC EAA) requirements. Included are "physical and cultural heritage, including structures, sites, or things of historical, archaeological, paleontological or architectural significance" (CEAA 2006), and archaeological sites protected by the provincial HCA. Excluded from the archaeology and heritage resources VC is Aboriginal and First Nations current use of lands and resources, which is considered separately in Chapter 17.

The heritage resources baseline study and AIAs for the Project identified previously recorded archaeological sites within the RSA and areas of archaeological potential within the LSA, as well as geological strata with potential for paleontological finds. Based on this, two VCs were identified for consideration in the assessment of heritage effects: 1) archaeological sites; and 2) significant

paleontological sites (Table 19.6-1). All archaeological sites, both known and as-yet unknown, are protected under the provincial HCA. For purposes of this assessment, significant paleontological sites are defined as rare and/or well preserved fossils and trace fossil that are likely candidates for protection based on the Fossil Management Framework.

Table 19.6-1. Heritage Effects Valued Components Included in the Effects Assessment

Valued Components	Identified by*			Rationale for Inclusion
	AG	G	P/S	
Archaeological Sites	X	X		*Heritage Conservation Act*
Significant Paleontological Sites	X	X	X	Fossil Management Framework

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

As the baseline studies did not identify any protected historical /architectural sites or structures within the RSA other than those historic elements included within recorded archaeological sites, these are excluded as a VC and not considered further (Table 19.6-2).

Table 19.6-2. Heritage Effects Valued Components Excluded from the Effects Assessment

Valued Components	Identified by*			Rationale for Exclusion
	AG	G	P/S	
Historical Archaeological Sites / Structures		X	X	None were identified within the RSA that are not already protected as Archaeological Sites
Aboriginal Traditional Use Sites	X	X		Addressed separately in Chapter 17

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

19.6.2 Selecting Assessment Boundaries

Assessment boundaries define the maximum limit within which the effects assessment is conducted. They encompass the areas within, and times during which, the Project is expected to interact with the VCs, as well as the constraints that may be placed on the assessment of those interactions due to political, social, and economic realities (administrative boundaries), and limitations in predicting or measuring changes (technical boundaries). The definition of these assessment boundaries is an integral part in scoping for heritage effects, and encompasses possible direct, indirect, and induced effects of the Project on heritage effects, as well as the trends in processes that may be relevant.

19.6.2.1 Spatial Boundaries

This section describes the local and regional study areas used in the heritage effects assessment. These differ from the study areas used in the baseline study and AIAs (Appendix 19-A), which were based on the several iterations of the Project footprint as the engineering and Project design were refined from 2010 to 2013.

Regional Study Area

The RSA is intended to encompass an area beyond which Project effects would not be expected (Figure 19.5-1) and to reflect changes in the biophysical environment. The RSA spans elevations from approximately 730 masl along the Murray River to 1,900 masl at the peak of Mount Babcock.

Local Study Area

The LSA is the area within which direct Project effects to archaeological and heritage resources could occur through activities such as clearing trees and vegetation, ground disturbance or ground subsidence. It includes the infrastructure footprint area where surface infrastructure could be built, as well as the area above the underground longwall mining where potential subsidence of the land surface could occur as a result of mining. The LSA is shown on Figure 19.5-2.

19.6.2.2 Temporal Boundaries

The assessment of heritage effects considers potential effects during each of the Project's four temporal phases:

- Construction: 3 years;
- Operation: 25-year run-of-mine life;
- Decommissioning and Reclamation: 3 years (includes project decommissioning, abandonment and reclamation activities, as well as temporary closure, and care and maintenance); and
- Post Closure: 30 years (includes ongoing reclamation activities and post-closure monitoring).

19.6.2.3 Administrative Boundaries

No administrative boundaries were identified that are relevant to the assessment of archaeology and heritage resources.

19.6.2.4 Technical Boundaries

The magnitude and extent of subsidence above the underground mining area is a technical boundary that limits the assessment of potential effects to as-yet unknown archaeology and heritage resources.

19.6.3 Identifying Potential Effects on Archaeology and Heritage Resources

Potential effects on archaeology and heritage resources can occur where there is disturbance to the ground or trees at or near the resource, or where a project results in increase human presence around the resource.

19.6.3.1 Summary of Potential Effects to be Assessed for Heritage Resources

The most significant potential direct effect to archaeology and heritage resources is the direct disturbance during Construction. Project activities associated with the movement, excavation, or disturbance of soil have the highest potential for interactions between the Project and archaeology and heritage resources. Table 19.6-3 identifies the Project components and activities which may involve ground disturbance that could impact archaeology and heritage resources.

Table 19.6-3. Ranking Potential Effect on Archaeology and Heritage Resources

	Project Activities	Potential Effects on Archaeology and Heritage Resources			
		Direct Effects on Known Archaeological Sites	Indirect Effects on Known Archaeological Sites	Disturbance of Unknown Archaeological Sites	Disturbance of Significant Paleontological Sites
CONSTRUCTION	**Underground Mine**				
	Construction of Big Decline (2 headings - surface and underground)	L	L	M	L
	Haul of waste rock from Big Decline portal to North Site	L	L	L	L
	Ventilation during construction	L	L	L	L
	Development mining of underground service bays, sumps, conveyor headings, etc.	L	L	L	L
	Construct underground conveyor system	L	L	L	L
	Coal Processing Site				
	Surface Preparation				
	Establish site drainage and water management	L	L	M	L
	Site clearing and stripping (CPP site, CCR #1)	L	L	M	L
	Soil salvage for reclamation	L	L	M	L
	Upgrade access roads, parking and laydown areas	L	L	M	L
	Heavy machinery use	L	L	M	L
	Buildings and Services				
	Install domestic water system	L	L	M	L
	Install sanitary sewer system	L	L	M	L
	Install natural gas and electricity distribution network	L	L	M	L
	Construct main fuel station	L	L	M	L
	Construct buildings (e.g., maintenance, administration, warehouse)	L	L	M	L
	Construct raw coal and clean coal stockpile areas	L	L	M	L
	Construct coal preparation plant buildings and install/commission equipment	L	L	M	L
	Construct surface conveyor system	L	L	M	L
	Construct rail load-out facilities	L	L	M	L

(continued)

Table 19.6-3. Ranking Potential Effect on Archaeology and Heritage Resources (continued)

	Project Activities	Potential Effects on Archaeology and Heritage Resources			
		Direct Effects on Known Archaeological Sites	Indirect Effects on Known Archaeological Sites	Disturbance of Unknown Archaeological Sites	Disturbance of Significant Paleontological Sites
CONSTRUCTION (*cont'd*)	**Shaft Site**				
	Upgrades to infrastructure within existing site	L	L	L	L
	Addition of waste rock within existing storage area	L	L	L	L
	Management of runoff from waste rock pile and release to receiving environment (M20 Creek)	L	L	L	L
	Decline Site				
	Upgrades to infrastructure within existing site	L	L	L	L
	Management of water from underground activities and release by exfiltration to ground	L	L	L	L
	Traffic and Transportation				
	Transportation of materials to and from site	L	L	L	L
	Recycling and solid waste disposal	L	L	L	L
	Shuttling workforce to and from site	L	L	L	L
	Workforce and Administration				
	Hiring and management of workforce	L	L	L	L
	Taxes, contracts and purchases	L	L	L	L
OPERATION	**Underground Mine**				
	Longwall panel mining, and development mining	L	L	L	L
	Ventilation from underground	L	L	L	L
	Methane management	L	L	L	L
	Secondary shaft construction	L	L	L	L
	Underground seepage collection and water management				
	Surface subsidence	M	M	M	L

(continued)

Table 19.6-3. Ranking Potential Effect on Archaeology and Heritage Resources (continued)

	Project Activities	Potential Effects on Heritage Sites			
		Direct Effects on Known Archaeological Sites	Indirect Effects on Known Archaeological Sites	Disturbance of Unknown Archaeological Sites	Disturbance of Significant Paleontological Sites
OPERATION (*cont'd*)	**Coal Processing Site**				
	Coal Processing Plant				
	Stockpiles of raw coal	L	L	L	L
	Operation of coal preparation plant and conveyor system	L	L	L	L
	Stockpiles of clean coal and middlings	L	L	L	L
	Operation of rail loadout	L	L	L	L
	CCR				
	CCR Pile development	L	L	M	L
	Site clearing and stripping (expansion of CCR #1, construction of CCR #2)	L	L	M	L
	Seepage collection system	L	L	L	L
	Water Management				
	Management of water brought to surface from underground	L	L	L	L
	Management of seepage from CCR	L	L	L	L
	Management of other site contact water	L	L	L	L
	Maintenance of site ditching and water management infrastructure	L	L	L	L
	Release of excess contact water to receiving environment	L	L	L	L
	Shaft Site				
	Maintenance of infrastructure within existing site	L	L	L	L
	Progressive reclamation of waste rock pile	L	L	L	L
	Management of runoff from waste rock pile and release to receiving environment (M20 Creek)	L	L	L	L

(continued)

Table 19.6-3. Ranking Potential Effect on Archaeology and Heritage Resources (continued)

	Project Activities	Potential Effects on Archaeology and Heritage Resources			
		Direct Effects on Known Archaeological Sites	Indirect Effects on Known Archaeological Sites	Disturbance of Unknown Archaeological Sites	Disturbance of Significant Paleontological Sites
OPERATION (*cont'd*)	**Decline Site**				
	Maintenance of infrastructure within existing site	L	L	L	L
	Secondary Shafts Site				
	Site preparation and construction of shafts	L	L	L	L
	Maintenance of infrastructure within existing site	L	L	L	L
	Utilities, Power and Waste Handling				
	Electrical power use	L	L	L	L
	Natural gas use	L	L	L	L
	Domestic water use	L	L	L	L
	Domestic sewage handling	L	L	L	L
	Recycling and solid waste disposal	L	L	L	L
	Heavy Machinery, Traffic, and Transportation				
	Shuttling workforce to and from site	L	L	L	L
	Transportation of materials to and from site	L	L	L	L
	Surface mobile equipment use	L	L	L	L
	Road maintenance	L	L	L	L
	Fuel storage	L	L	L	L
	Workforce and Administration				
	Hiring and management of workforce	L	L	L	L
	Taxes, contracts and purchases	L	L	L	L

(continued)

Table 19.6-3. Ranking Potential Effect on Archaeology and Heritage Resources (continued)

	Project Activities	Potential Effects on Archaeology and Heritage Resources			
		Direct Effects on Known Archaeological Sites	Indirect Effects on Known Archaeological Sites	Disturbance of Unknown Archaeological Sites	Disturbance of Significant Paleontological Sites
DECOMMISSIONING AND RECLAMATION	**Infrastructure Removal and Site Reclamation**				
	Facility tear down and removal	L	L	L	L
	Reclamation of plant site	L	L	L	L
	Reclamation of on-site roads and rail lines	L	L	L	L
	Recycling and solid waste disposal	L	L	L	L
	Heavy Machinery, Traffic, and Transportation				
	Shuttling workforce to and from site	L	L	L	L
	Transportation of materials to and from site	L	L	L	L
	Surface mobile equipment use	L	L	L	L
	Fuel storage	L	L	L	L
	CCR				
	Reclamation of CCR	L	L	L	L
	Seepage collection system	L	L	L	L
	Site water management and discharge to receiving environment	L	L	L	L
	Underground Mine				
	Infrastructure tear down and removal	L	L	L	L
	Geotechnical and hydrogeological assessment and bulkhead installation	L	L	L	L
	Groundwater monitoring	L	L	L	L
	Workforce and Administration				
	Hiring and management of workforce	L	L	L	L
	Taxes, contracts and purchases	L	L	L	L

(continued)

Table 19.6-3. Ranking Potential Effect on Archaeology and Heritage Resources (completed)

	Project Activities	Potential Effects on Archaeology and Heritage Resources			
		Direct Effects on Known Archaeological Sites	Indirect Effects on Known Archaeological Sites	Disturbance of Unknown Archaeological Sites	Disturbance of Significant Paleontological Sites
POST CLOSURE	**Shaft Site**				
	Waste rock pile seepage monitoring	L	L	L	L
	CCR				
	Seepage collection system	L	L	L	L
	Site water management and discharge to receiving environment	L	L	L	L
	Underground Mine				
	Groundwater monitoring	L	L	L	L

Notes:

L *Negligible to minor adverse effect expected; implementation of best practices, standard mitigation and management measures; no monitoring required, no further consideration warranted.*

M *Potential moderate adverse effect requiring unique active management/monitoring/mitigation; warrants further consideration.*

H *Key interaction resulting in potential significant major adverse effect or significant concern; warrants further consideration.*

Another potential direct effect to archaeology and heritage resources is subsidence occurring above the underground longwall mining areas. Subsidence will occur primarily during Operation.

Indirect effects to archaeology and heritage resources could also occur as a result of increased human presence in areas near the Project.

19.7 EFFECTS ASSESSMENT AND MITIGATION FOR HERITAGE RESOURCES

Potential direct effects to heritage VCs (archaeological and paleontological sites) will be contained within the LSA, while indirect effects related to increased human presence could occur surrounding the LSA (within 500 m; Figure 19.5-2). There are two archaeological sites within the LSA and no known paleontological sites.

Subsidence could occur during the Operation phase above the longwall mine area (Section 3.6.2.14, Figure 19.5-2). If it occurs it would be a direct Project effect that could affect archaeological and paleontological sites, if present. All subsidence is anticipated to be contained within the potential subsidence area and subsidence is not anticipated in areas identified as longwall exclusion zones (Figure 19.5-2).

There are two known archaeological sites (GgRg-5 and GgRg-8) within the potential subsidence area, and both are within the longwall exclusion zone (Figure 19.5-2). However, as the exact vertical and horizontal extent of subsidence within the potential subsidence area has not been determined, baseline data collection for this area was limited to a desk-based review and the area has not been subject to an AIA. The management of the potential direct effects due to subsidence on archaeological or paleontological sites is discussed below.

19.7.1 Key Effects on Protected Archaeological Sites

The heritage effects assessment considered potential effects to heritage VCs during all four temporal phases outlined in Section 19.6.2.2. Archaeological sites within surface development areas are most at risk of direct Project-related effects during Construction (Section 19.7.1.1) and are at risk of indirect effects during Construction, Operation, and Decommissioning and Reclamation phases (Section 19.7.1.2 and 19.7.1.3). Archaeological sites within the subsidence area are most at risk during Operation. Accordingly, identification of effects and mitigation measures focus on potential direct and indirect effects during Construction, Operation, and Decommissioning and Reclamation. Mitigation measures will be timed to occur prior to and/or during Construction and Operation. The Post-closure phase is not expected to result in any significant effects.

19.7.1.1 Direct Effects to Known Archaeological Sites Located within the LSA

Protected archaeological resources located within the LSA may be directly impacted by ground-altering activities during Construction and Operation with a high potential for adverse impacts. Protected archaeological sites located above the longwall mining area that will not be impacted by ground altering construction activity may be directly affected by subsidence during Operations. There are currently no known archaeological sites within the LSA that will be impacted by Construction and two (GgRg-5 and GgRg-8) that may be directly affected by subsidence.

19.7.1.2 Indirect Effects to Known Archaeological Sites Located within 500 m of the LSA

Protected archaeological resources located within 500 m of the LSA may be indirectly affected through increased human presence during Construction, Operation, and Decommissioning and Reclamation with a moderate potential for adverse effects.

There are seven archaeological sites (GgRf-2, GgRf-3, GgRf-4, GgRf-5, GgRf-10, GgRg-6, and GgRg-9) that fall within 500 m of the LSA; these sites may be indirectly affected by increased human presence during Construction, Operation, and Decommissioning and Reclamation.

19.7.1.3 Effects on Unknown Archaeological Sites

Unknown archaeological resources, if present, may be directly or indirectly affected during Construction and Operation from ground disturbance and subsidence within the LSA, and increased human presence within 500 m of the LSA. These potential effects will be analyzed further and mitigation measures that could offset adverse impacts are described below in Section 19.7.2.

19.7.2 Mitigation Measures for Protected Archaeological Sites

19.7.2.1 Mitigation Measures for Known Archaeological Sites

Archaeological sites GgRg-5 and GgRg-8 are located above the underground mining area and could be adversely affected due to subsidence; however, these two sites are both located above a longwall mining buffer area and therefore potential direct effects have been reduce to negligible through Project design. The archaeological sites will be marked as "No Work Zones" on Project maps. Project personnel will be educated on the protections afforded to archaeological sites.

Archaeological sites GgRf-2, GgRf-3, GgRf-4, GgRf-5, GgRf-10, GgRg-6, and GgRg-9 are located within 500 m of the LSA and may be indirectly impacted through increased human presence in the area. The archaeological sites will be marked as "No Work Zones" on Project maps. Project personnel will be educated on the protections afforded to archaeological sites.

If avoidance is not possible mitigation measures will be determined in consultation with the British Columbia Archaeological Branch and carried out by the Project Archaeologist under a *Heritage Conservation Act* Permit. Mitigation may involve detailed mapping and photography. Once mitigation and associated reporting are completed, approval to proceed will be given by the BC Archaeology Branch to allow for impacts within the site boundaries.

19.7.2.2 Mitigation Measures for As-yet Unknown Archaeological Sites

As-yet unknown protected archaeological resources, if present, may be directly affected by Project activities including ground disturbance associated with the construction of surface infrastructure and subsidence associated with longwall mining, and may be indirectly from increased human presence in the area. A Heritage Management Plan and a Chance Find Procedure have been developed for the Project to address the discovery and management of as-yet unknown protected archaeological sites during Project activities; the Chance Find Procedure has been briefly described in the Heritage Management Plan.

Within surface development areas that have been subject to archaeological impact assessments (AIAs) the potential for unknown archaeological sites to be discovered is considered to be low. The implementation of the Chance Find Procedure and education of Project personnel on the protections afforded archaeological sites is considered sufficient to address this potential effect. When following the above described mitigation and management strategies and implementing the Heritage Management Plan and Chance Find Procedure, it is anticipated that potential adverse effects will be reduced to a negligible level. In surface development areas that have not been subject to archaeological impact assessments, additional studies will be undertaken prior to Construction in order to identify archaeological sites and provide recommendations for mitigation measures prior to impact.

The AIAs undertaken within the longwall mining area focused only on locations where there were proposed surface developments. Any areas within the longwall mining area with potential to subside will be reviewed by a qualified professional archaeologist and additional studies will be undertaken if necessary in order to identify archaeological site and provide recommendations for mitigation measures prior to impact.

Mitigation measures for any sites located during additional studies will be developed in consultation with the Archaeology Branch and instituted prior to mining beneath the archaeological sites. Mitigation measures are anticipated to range from periodic monitoring to systematic data recovery dependent on the significance of the site and the potential magnitude of the subsidence such that any adverse effects are reduced to negligible levels.

19.7.3 Key Effects on Significant Paleontological Sites

The heritage effects assessment considered potential effects to significant paleontological sites during all four temporal phases outlined in Section 19.6.2.2. Any paleontological sites situated near the surface would be most at risk of direct effects during Construction while any buried paleontological sites would be most at risk from underground mining during Operation (Section 19.7.3.1). There is a risk of indirect effects to paleontological sites during Construction, Operation, and Decommissioning and Reclamation (Section 19.7.3.1 and 19.7.3.2). Accordingly, identification of effects and mitigation measures focus on potential direct and indirect effects during the Construction, Operation, and Decommissioning and Reclamation phases. Mitigation measures would be timed to occur prior to and/or during Construction and Operation. The Post Closure phase is not expected to result in any significant effects.

19.7.3.1 Direct Effects to Significant Paleontological Sites Located within the LSA

There are no known paleontological sites within the LSA (McCrea 2013). Based on the geology within the LSA there is a potential that as-yet unrecorded paleontological sites could be present within the LSA and, if present, could be directly affected during Construction when the surface and subsurface bedrock is exposed or impacted, or during underground longwall mining in Operation. This potential effect and mitigation measures that would offset any adverse effects are described below in Section 19.7.4 and in the heritage management plan (Section 24).

19.7.3.2 Indirect Effects to Significant Paleontological Sites Located within 500 m of the LSA

There are no known paleontological sites within 500 m of the LSA; however, based on the geology of the area there is the potential that as-yet unknown paleontological sites may be indirectly affected through increased human presence during the Construction, Operation, and Decommissioning and Reclamation with a low potential for adverse effects. This potential effect and mitigation measures that would offset any adverse effects are described below in Section 19.7.2.

19.7.4 Mitigation Measures for Significant Paleontological Sites

The use of the Heritage Chance Find Procedure along with monitoring and training of all employees and on-site personnel (Section 24) will reduce the adverse effects on significant paleontological sites, if present, to a negligible level.

19.8 RESIDUAL EFFECTS ON HERITAGE RESOURCES

The assessment of residual effects on archaeology and paleontological resources is based on the effects assessment described in Section 19.7 and takes into account mitigation and management measures that will be conducted in response to anticipated impacts. These mitigations and management measures include site avoidance, Project personnel education, additional AIAs within the subsidence area, additional AIAs of any areas of the Project infrastructure footprint that have not been previously assessed, implementation of the Heritage Management Plan (Section 24), and continued use of a Project Chance Find Procedure. Once mitigation and management measures have been conducted and/or established prior to Project effects, the residual effects on heritage resources will be reduced to negligible and not significant. Therefore residual effects on heritage resources are not discussed further.

19.9 CUMULATIVE EFFECTS ASSESSMENT

Once mitigation and management measures have been conducted and/or established prior to anticipated Project effects, the residual effects on heritage resources will be reduced to negligible and not significant and therefore there will be no cumulative heritage effects.

19.10 EFFECTS ASSESSMENT CONCLUSIONS FOR HERITAGE RESOURCES

There are two known archaeological sites within the LSA, and an additional seven within 500 m of the LSA. As both sites within the LSA are located within the underground mine exclusion zone, therefore the potential for adverse effects have been reduced through Project design. Additional mitigation measures for these two sites and the seven within 500 m of the LSA have been created to ensure avoidance and reduce the potential adverse effects to negligible levels. There are currently no known paleontological sites within the LSA. Potential effects to as-yet unknown archaeological and paleontological sites, if present, will be mitigated through the measures outlined in the heritage management plan including the education of Project personnel, the use of the heritage chance find procedure, and, if necessary, additional studies. Once mitigation and management measures have been conducted and/or established prior to anticipated Project effects, the residual effects on heritage resources will be reduced to negligible and not significant and therefore there will be no cumulative heritage effects.

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