Heritage Resource Impact Assessment: BMC Minerals Proposed Kudz Ze Kayah Mine 2017 (16-04ASR)

(To Be Included in YESAA Materials – No Sensitive Site Data)

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EXECUTIVE SUMMARY

On behalf of BMC Minerals (No. 1) Ltd., Ecofor Consulting Ltd. (Ecofor) conducted a Heritage Resource Impact Assessment (HRIA) for the proposed BMC Minerals Kudz Ze Kayah Mine. This study was undertaken to: 1) conduct follow-up assessment at archaeological site JiTp-1 based on recommendations made during a previous phase of assessment conducted under permit 15-10ASR (see Mooney and Bennett 2016), and 2) to assess for the first time revised components of the BMC Kudz Ze Kayah Mine project footprint. The results of x-ray fluorescence (XRF) analysis conducted on obsidian artifacts recovered under permit 15-10ASR aimed at determining the quarry source of the obsidian used in stone tool manufacture are also presented in this report. **Note: All specific geographic references to heritage site locations, photographs, and some site details have been removed from this YESAA ready version of this report so that it can be issued publicly while protecting sensitive site data.**

Follow-up work at JiTp-1 included additional shovel testing (n=43) and 6 m^2 of excavation divided between two blocks (4 m^2 and 2 m^2) centered on positive shovel tests. Three of the 43 shovel tests excavated in 2016 were positive for heritage resources (each containing a single lithic flake), and the excavation blocks yielded 88 lithic artifacts. All recovered artifacts were associated with areas where finds were made during a previous phase of HRIA work conducted under permit 15-10ASR, and were all in keeping with the nature of artifacts recovered during that pervious work. As such, it is maintained that the site is well understood at this point and that a representative sample of artifacts has been recovered and analysed. Based on these results, **no further heritage resource work is recommended at JiTp-1 prior to the commencement of development activities**.

Assessments of revised components of the BMC Kudz Ze Kayah Mine project footprint began with pedestrian survey aimed at identifying areas of elevated potential for heritage resources, then moved on to shovel testing in identified areas of elevated potential. Areas surveyed included those associated with access roads, ditching, revised overburden stockpile areas, Class A, B, and C storage facilities, open pits, topsoil stockpiles, drill holes, a mill site, potential construction laydown areas, a water management pond, and a settling pond. The pedestrian survey led to the identification of five additional areas of elevated heritage resource potential that were subsequently shovel tested. These shovel test location (STLs) are referred to in this report as Dirty Rock STL, Split Rock STL, Small Whale STL, Caribou Antler STL, and Beaver Lodge STL. In total, 186 shovel tests were excavated at these STLs, but all were negative for heritage resources. Based on these results, **no further heritage resource work is recommended in these localities.**

If any additional development areas are added to the project, then those new areas should also be reviewed for possible impacts to heritage resources. This follow-up heritage review may be conducted through desktop overview and/or field study.

CREDITS

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Report Author:	Tim Bennett, MA
Field Crew:	Tim Bennett, MA (Ecofor) James Mooney, MA (Ecofor) Alex Gunn, BA (Ecofor) Sheila Caesar (LFN) Terry Ollie (BMC Minerals; RRDC)
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1.0 INTRODUCTION

On behalf of BMC Minerals (No. 1) Ltd., Ecofor Consulting Ltd. (Ecofor) conducted a Heritage Resource Impact Assessment (HRIA) for the proposed BMC Minerals Kudz Ze Kayah Mine (Figure 1). The Kudz Ze Kayah project is located approximately 260 km northwest of Watson Lake, 110 km southeast of Ross River and 24 km south west of the Robert Campbell Highway near Finlayson Lake. The project components are located within NTS mapsheets 105G/07, 105G/08, 105G/09 and 105G/10, and are located within the traditional territory of the Liard First Nation (LFN) and the Ross River Dena Council (RRDC), which are both members of the Kaska Nation. The north end of the access road, represents the lowest elevation, while proposed exploration drilling represents the highest elevation in the south. **Note: All specific geographic references to heritage site locations, photographs, and some site details have been removed from this YESAA ready version of this report so that it can be issued publicly while protecting sensitive site data.**

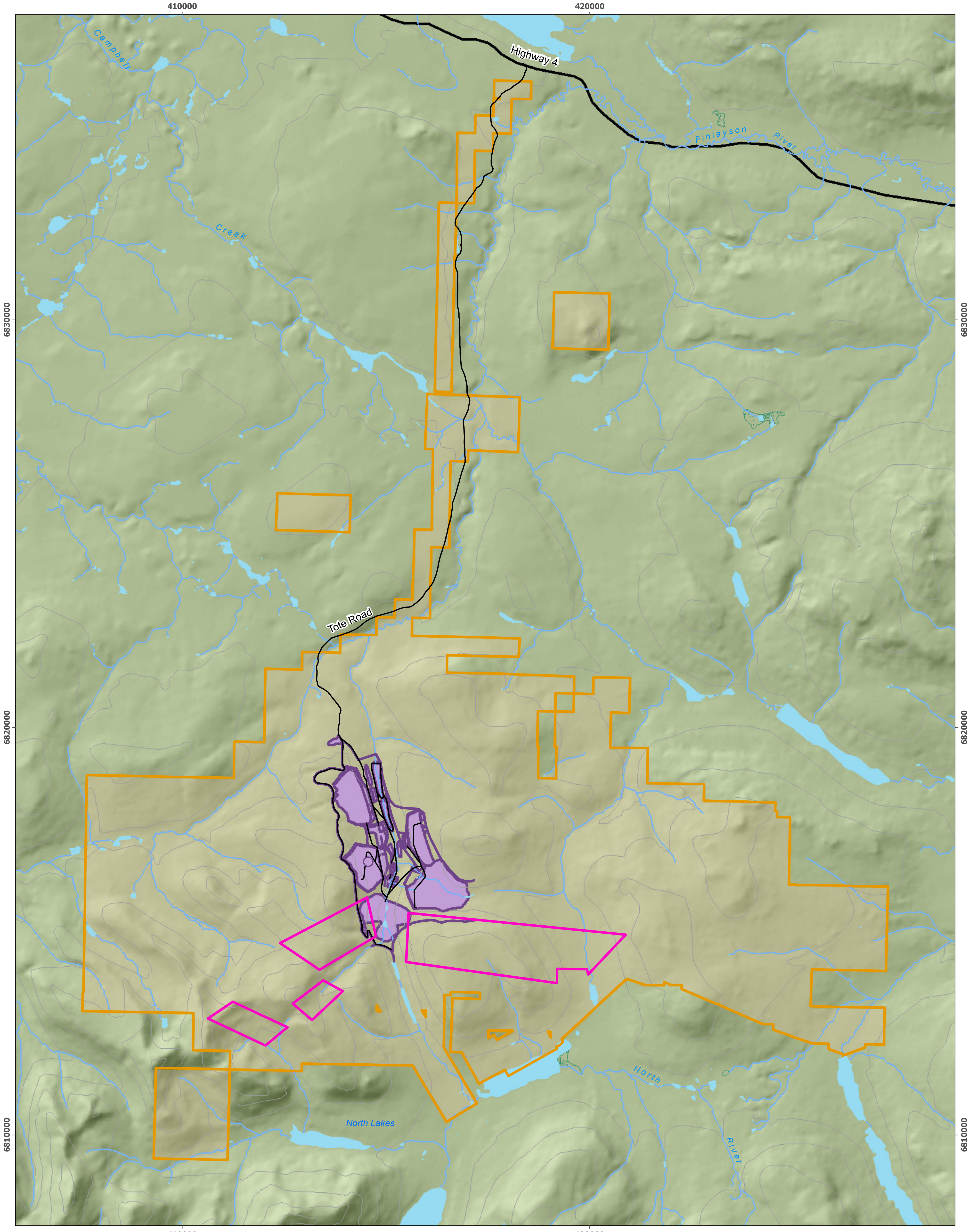
1.1 Project Overview

The project proposes to develop an open pit mine and ancillary components including waste rock dumps, organic storage areas, tailings facility, mill, accommodations, and improvements to road access. Impacts to heritage resources could include ground disturbances such as earth moving, heavy equipment operation, infrastructure, erosion, and other activities. At this time, project planning includes a waste rock dump area that would impact JiTp-1.

This study was undertaken to: 1) conduct follow-up assessment at archaeological site JiTp-1 based on recommendations made during a previous phase of assessment conducted under permit 15-10ASR (see Bennett and Mooney 2016), and 2) to assess for the first time revised components of the BMC Kudz Ze Kayah Mine project footprint. The results of x-ray fluorescence (XRF) analysis conducted on obsidian artifacts recovered under permit 15-10ASR aimed at determining the quarry source of the obsidian used in stone tool manufacture are also presented in this report.

1.2 Personnel

The project area was assessed by Ecofor employees Tim Bennett (permit holder), James Mooney, and Alex Gunn. Sheila Caesar from the LFN and BMC employee Terry Ollie from the RRDC also participated in the fieldwork.



BMC MINERALS

FIGURE 1
KUDE ZE KAYAH PROPERTY OVERVIEW MAP

ECOFOR
natural and cultural resource consultants
Ecofor Consulting Ltd.
February-11-17 (MM)

Base Features

- Contour (500 ft)
- Watercourse
- Waterbody
- Wetland

Access

- Highway
- Road

Assessment Features

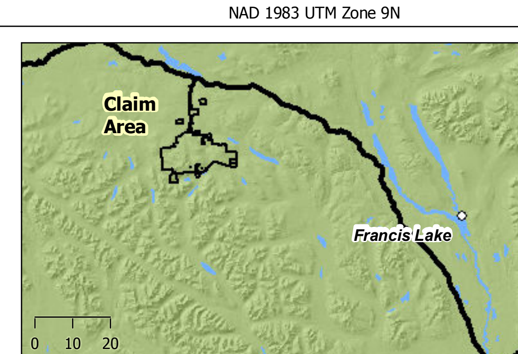
- Kude Ze Kayah Claim Area
- 2016 Drilling Areas
- 2016 Proposed Footprint

N

1:90,000

0 2,000 4,000 6,000m

NAD 1983 UTM Zone 9N



Disclaimer:
This product is for informational purposes only and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. The base data layers have been obtained from the National Topographic Database (NTDB), and GeoYukon.

1.3 Report Format

Following this introduction in Section 1.0, Section 2.0 provides a discussion of the environmental setting that the study area is located within, Section 3.0 discusses the culture history of the area in which the proposed development is located, Section 4.0 details the methodologies employed in completing this work, Section 5.0 presents the results of this HRIA, Section 6.0 provides a summary and recommendations for the ongoing management of heritage resources within the assessed project area, and Section 7.0 closes the report with a listing of references cited. Seven appendices are included at the end of this report[1]. Appendix A shows project mapping, Appendix B provides project photographs, Appendix C contains a Yukon Archaeological Site Record form for JiTp-1, Appendix D illustrates the excavation blocks and artifact distributions at JiTp-1, Appendix E provides the artifact catalog for JiTp-1, Appendix F presents the results of the XRF analysis conducted on obsidian artifacts recovered during the 2015 phase of the BMC Minerals Kudz Ze Kayah Mine under permit 15-10ASR, and Appendix G includes the project field notes.

[1] Note: These appendices have been removed from this YESAA ready version of this report so that it can be issued publicly while protecting sensitive site data.

2.0 ENVIRONMENTAL SETTING

The study area is located within Boreal Cordillera Ecozone in the Yukon Plateau – North Ecoregion (see Smith et al. 2004 for full discussion). The Boreal Cordillera Ecozone is characterized by mountain ranges, high peaks and extensive plateaus, separated by wide valleys, lakes, and lowlands. Further detail regarding the Yukon Plateau – North Ecoregion is presented below.

2.1 The Yukon Plateau – North Ecoregion

The Yukon Plateau – North Ecoregion is the largest ecoregion entirely inside the Yukon and contains a large portion of the Tintina Trench. The ecoregion generally consists of relatively rolling highlands with an east-west orientation. It includes the Stewart Plateau, the Macmillan Highland, and the Ross Lowland (Matthews 1986). Terrain ranges from 320 m a.s.l. to 2,160 m a.s.l., with an average elevation of 995 m a.s.l. (Smith et al. 2004). Rivers within the ecoregion include the Pelly, Ross, Macmillan, Stewart, Hess, McQuesten and Klondike (Smith et al. 2004).

The mean annual temperature in the Yukon Plateau – North Ecoregion is near -5°C, but seasonal variability is pronounced (Smith et al. 2004). Mean temperatures for January range from below -30°C in the lower valleys to above -20°C in higher terrain (Smith et al. 2004). This is drastically different by July as mean temperatures in the lower valleys are 15°C and close to 8°C in higher terrain (Smith et al. 2004). Frost can occur at any time of the year, but is less likely from mid-June to late July (Smith et al. 2004). Precipitation is moderate with an increase in higher elevation sections in the eastern part of the ecozone. Annual precipitation ranges from 300 to 600 mm (Smith et al. 2004). The winter months have mean precipitation of 20 to 30 mm while the summer months can expect 40 to 80 mm of rainfall (Smith et al. 2004). Winds are generally light, however they may increase to moderate/high during unusually active weather systems or thunderstorms (Smith et al. 2004).

The bedrock geology of this ecoregion includes sections of two geological provinces of metamorphosed sedimentary rock. In the northern half of the ecoregion, variably deformed sedimentary rocks have been deposited on the outer continental shelf of ancestral North America, the Selwyn Basin. The bedrock geology in the southeast part of the ecoregion includes siliceous sedimentary and volcanic rocks of the Yukon-Tanana terrane and metabasaltic flows of the Slide Mountain terrane. The origin of these materials is not well-known due to deformation before and during transportation onto the Selwyn Basin strate (Smith et al. 2004). The southeast section of the ecoregion between Faro and Ross River also includes exposed river and stream cut banks along the Tintina Trench (a 450 km fault) that contains rhyolite and olivine basalt which may have provided materials for prehistoric stone tool making. Also of interest in the northern

Anvil Range are jet-black or gun steel-blue weathering siliceous siltstone and conglomerate containing chert pebbles. These materials may also have been used for making stone tools.

Soils in the valleys of this ecoregion tend to be underlain by glacial parent materials. Soil development also reflects the presence of extensive discontinuous permafrost and a strong continental climate (Smith et al. 2004). Of interest is the presence of the Wounded Moose and the Diversion Creek palaeosols. These two palaeosols are buried soils formed a great deal of time before the current environmental conditions and may reflect past stable ground surfaces. The Wounded Moose palaeosol developed on glacial surfaces of pre-Reid age and the Diversion Creek palaeosol developed between the Reid and the McConnell glaciations. Both of these palaeosols would predate the known cultural history in the Yukon.

The glacial history of the Yukon Plateau – North Ecoregion was dominated by the actions of the Cordilleran ice sheet and local glaciers. More recent glaciations were less extensive. Most current glacial features are remnants from the McConnell glaciation (Smith et al. 2004), however some older features and glacial erratics are present from the older Reid and pre-Reid glaciations. Some uplands and valley floors were extensively eroded into "whalebacks" or rock drumlins by the glacial flow. The western edge of the ecoregion was approximately the terminus for the ice sheet of the McConnell glaciation. As the ice retreated through regional stagnation and wasting it left behind kame and kettle topography and glacial lake deposits in many valleys (Smith et al. 2004).

The vegetation of the Yukon Plateau – North ranges from boreal to alpine. Northern boreal forest exists at elevations up to 1500 m a.s.l. (Smith et al. 2004). Open black spruce with a moist moss, or drier lichen understory is the dominant forest type in the boreal zone (Smith et al. 2004). Shrub and lichen tundra dominate the higher elevations (Smith et al. 2004). The alpine vegetation is characterized by low ericaceous shrubs, prostrate willows, and lichens. In the subalpine areas, shrub birch, with scattered pine, white spruce, subalpine fir, and a lichen understory is extensive (Smith et al. 2004). Extensive shrub lands exist at mid-elevations and on valley bottoms that are subject to cold air drainage. Black spruce is the dominate tree type in the ecoregion, however white spruce, occasionally with aspen or lodgepole pine, occur in warmer, better-drained areas and in forest fire burn areas (Smith et al. 2004).

The Yukon Plateau–North Ecoregion supports wildlife populations typical of Yukon's boreal forest. Moose, woodland caribou, Stone sheep, Dall sheep, grizzly bear, black bear, wolverine, and marten are all abundant. This ecoregion supports the greatest proportion of brown-coloured black bears in the Yukon, occurring between the Stewart and Pelly rivers (Yukon Department of Renewable Resources 1988). Lynx, beaver, chestnut cheeked vole, mule deer, coyotes, and red fox are also present in some sections of the Yukon Plateau – North (Smith et al. 2004). Of particular interest in the larger area are the Tay River Caribou herd, and an overlap of Stone and Dall Sheep, while mountain goats are uncommon. The Tintina Trench forms an important part of a migration corridor for Sandhill Crane and waterfowl (Smith et al. 2004). Wetlands provide habitat for Pacific, Red-throated and Common Loons, Trumpeter Swan, Canada Goose, American Widgeon, Green-winged Teal, scaup, and scoters (Dennington et al. 1983; Dennington 1985; McKelvey and Hawkings 1990). Osprey and Bald Eagle also breed around lakes (Dennington et al. 1983). Forested areas host Ruffed, Blue, and Sharptailed Grouse, Common Nighthawk, Yellow-bellied Sapsucker, Hairy Woodpecker, Western Wood-Pewee, Hermit Thrush, Townsend's Warbler, Spruce Grouse, Great Horned Owl, Three-toed Woodpecker, Black-capped and Boreal Chickadees, Gray Jay, Common Raven, Red-tailed Hawk, Northern Flicker, Olive-sided Flycatcher, Ruby-Crowned Kinglet, Swainson's Thrush, Varied Thrush, Yellow-Rumped Warbler, Blackpoll Warbler, and Dark-eyed Junco (W. H. Osgood 1909; Rand 1946; Johnston and McEwen 1983; Frisch 1987). And finally, in alpine areas Gyrfalcon, Rock and White-tailed Ptarmigan, Wandering Tattler, Gray-Crowned Rosy Finch, American Pipits, Willow Ptarmigan, Wilson's Warbler, American Tree Sparrow, and Golden-Crowned Sparrow can be found (W. H. Osgood 1909; Beckel 1975).

3.0 CULTURAL HISTORY

The following is an overview of the culture history for the broader region surrounding the study area including south-central and southwestern Yukon, and northern British Columbia. Many researchers have reviewed the cultural history of this broader area and have presented the information using a variety of terms and temporal ranges (Clark 1981; West 1996; Workman 1978; J. V. Wright 1995, 1999).

3.1 Precontact Period (ca. 11,000 BP to ca. AD1700s)

The earliest Precontact occupation, which dates to early post-glacial times, is known as the Northern Cordilleran Tradition (Clark 1983; Hare 1995). The earliest Northern Cordilleran Tradition occupation known at present is a site located near Beaver Creek, dated to 10,670 radiocarbon years before present (BP) (Heffner 2002). The majority of sites associated with this tradition appear to date older than 7,000 to 8,000 BP. The Northern Cordilleran Tradition, with some overlap, predates the introduction of microlithic technology from Alaska into the interior of the central and southern Yukon (Clark 1983; Hare 1995).

The Northern Cordilleran Tradition is followed by the Little Arm Phase which dates from approximately 7,000 BP to 4,500 BP (Clark and Gotthardt 1999; Workman 1978), and can be defined by the use of microlithic technologies. After about 4,500 BP, there is less evidence of microblade use in the Yukon, and an increase in the use of notched projectile points, and a variety of scraping and carving tools, labeled the Taye Lake Phase in southwest Yukon, or more broadly in Yukon and Alaska, the Northern Archaic Tradition (Hare 1995; Workman 1978).

The most recent archaeological culture of southern Yukon is that of the Aishihik Phase (Workman 1978). This phase is thought to be a cultural development from the earlier Taye Lake culture, although there are some significant differences in technology. Key amongst these technological innovations are native copper tools, small stemmed Kavik points, end- and sidescrapers, and ground adzes (Hare 1995), but perhaps most notable is the introduction of the bow and arrow which replaced a type of throwing spear known as an atlatl as the primary hunting weapon (Hare et al. 2004). This transition from atlatl to bow and arrow technology has been clearly documented by recent finds from high elevation ice patches in the southern Yukon (Hare at al. 2004). These Aishihik Phase sites are found above the White River Volcanic ash layer (also known as Tephra) that is dated to about 1,250 radiocarbon years BP (Clague et al. 1995), and are correlated with the appearance of Athabaskan peoples who are thought to be the direct ancestors of the current Liard First Nation and Ross River Dena Council peoples (see Section 3.4 below).

3.2 Protohistoric Period (ca. AD1700s to ca AD1840s)

The Protohistoric Period overlaps with late Precontact Period. It is defined by the appearance of non-native goods, other early trade items, and foreign (western or eastern) influences, but not the documented accounts of contact between indigenous North American peoples and European/Russian/Asian peoples themselves. Other indicators of the Protohistoric Period are the arrival of the first non-native diseases and information concerning non-natives. This period spans the time between the first introduction of non-native influences or artifacts, and the recording of first hand or primary written accounts. Unlike other cultural periods with more specific temporal ranges it is difficult and perhaps impossible to determine when the first 'outside' influences of European, Russian, Asian, or other cultures began to impact First Nations people in the Yukon interior.

Some of these far reaching effects may have been passed along from Russian exploration in the early and mid-1700s (Veniaminov 1984) and other Asian and European (Andreev 1944, Quimby 1985) exploration and contact with coastal communities. The Chilkat Tlingit from the Northwest Coast travelled and traded with many interior First Nation peoples throughout this Protohistoric Period including the Kaska and the Northern Tutchone from the Dawson and Mayo areas, and occasionally the Mountain Dene people from as far away as Fort Norman on the Mackenzie River. The Tlingit protected and controlled the trading routes into the interior and fiercely defended those routes when they were threatened. News of early non-native explorers and traders would have travelled inland along with foreign items such as metals, cloths, glass beads, and later tobacco and other goods.

In some of the earliest cases, the impacts of these foreign cultures could have had significant impacts even without the presence of the foreigners themselves. Such is the case for what is called 'drift-iron' whereby metals and other materials from Asian or European shipwreck wash ashore. Historical accounts of shipwrecks have been reported in the mid-1700s, but much earlier wrecks were possible. Metals and other foreign trade items have been derived from shipwrecks off what is now British Columbia, Southeast Alaska, and perhaps the Northwest Alaska as well.

3.3 Historic Period (post ca. AD1840s)

During the early years of this period the Russians were expanding their exploration and trade network along the Pacific coast and up the major rivers of the Alaskan interior, while the British were exploring eastward into what would become Canada's Northwest and Yukon Territories, as well as Alaska. In the 1840s, representatives of the Hudson's Bay Company (HBC) established trading posts near the study area. Frances Lake Post was established by the narrows of Frances

Lake in 1840 while Fort Pelly Banks was constructed in the winter of 1842-43 on the Pelly River at the mouth of Campbell Creek. Fort Yukon was established by John Bell at the confluence of the Yukon and the Porcupine Rivers in 1847. The next year Robert Campbell established Fort Selkirk on the upper Yukon River and then relocated to an improved location in 1851. The Frances Lake post functioned primarily as a meat post and then as a staging post enroute to Fort Selkirk. These posts were plagued by starvation, poor supply, and poor trade due to hostilities and feuding.

The location of Fort Selkirk was known to upset the Chilkat Tlingit who controlled the trade routes from the coast to the central Yukon. In 1852, a Chilkat Tlingit raiding party travelled inland and forced Robert Campbell and his crew to leave the trading post, which was consequently burned by the Northern Tutchone (Castillo 2012). The posts at Frances Lake and the Fort at Pelly Banks were abandoned by the Hudson's Bay Company by 1851-1852, while Fort Halkett, on the Upper Liard River near what would become the BC-Yukon border, remained open until 1865.

In 1867, US Secretary of State William Seward was able to focus increasing American interests, and he convinced the United States Senate to purchase Alaska from Russia. Soon after the purchase, the US Army sent Captain Raymond up the Yukon River on the first stern-wheel steamer to reach Fort Yukon (Grauman 1977). Raymond surveyed the location of Fort Yukon and proved that it was within US territory. The British sold the Fort to the US Government and relocated east across the 141st Meridian.

The inland fur industry continued to drive exploration and settlement into the late 1800s, but mining would shift the focus to the placer gold found in streams and alluvial deposits. Mining in the second half of the 19th century was a risky but often very lucrative enterprise. The impacts of mining would spread quickly and drastically change the project area.

Mineral prospecting and mining efforts in the second half of the 19th century were largely dependent on the existing infrastructure of the fur trading and missionary efforts. As the competition for the inland fur trade grew, so would the number of stern-wheelers on the Yukon River. These steamers could better supply the small number of trading posts along the Yukon and its tributaries and reduce the risk of prospectors running short of supplies. Therefore, more of the fur traders and other explorers turned their attention to search for gold and other minerals. Three key prospectors in the north were L.S. (Jack) McQuesten, Al Mayo, and Arthur Harper. They wrote to miners in the United States to encourage them to come north. They also established outposts along the Yukon River, including Fort Reliance, established in 1874 near the confluence of the Klondike River (what would become Dawson City) (A. A. Wright 1976).

Harper and another man may have been the first to travel up the Fortymile in search of gold in 1881 (Buzzell 2003). They collected a very rich sample, but were unable to relocate the exact location of their original find. In 1886, McQuesten, Harper, and Mayo built a post on the confluence of the Stewart and Yukon Rivers which provided supplies for additional prospectors. Also in 1886, Howard Franklin made a richer find on the Fortymile River. Others rushed in and these claims along the Fortymile River attracted miners from across central and eastern Alaska, and even southeast Alaska. Fortymile was the first town to grow to over a thousand people by the mid-1890s (Buzzell 2003), and in 1887 the Stewart River post was deserted. Some prospectors that did not find easy success in Fortymile returned to the Stewart River and continued work in the area. In 1890, Harper re-established a trading post at the site of the old HBC post at Selkirk as interest in the area grew. This was followed by Jack Dalton who developed a series of existing First Nation trails beginning at tide water at Haines Alaska, into Fort Selkirk.

On August 16, 1896, George Carmack, Skookum Jim, and Tagish Charlie discovered a very rich claim on Bonanza Creek, a tributary to the Klondike River near Dawson. This discovery sparked one of the largest gold rushes in history. It would take almost a year for the news of the Klondike gold fields to spread south, even to places relatively close by in southeast Alaska. Most of the prospectors and traders in the Alaskan and Yukon interior had already converged on the Dawson area during the winter and spring, and supplies ran dangerously low. That would quickly change in the summer of 1897 and spring of 1898 as new towns and supply posts sprang up along the Gold Rush routes to cash in on the increased demand.

The population of Dawson City grew very fast and in 1898 reached a peak of over 30000. However, the boom period did not last long and the vast majority of the population moved on very quickly with the news of other discoveries. The Gold Rush period saw greatly increased steamer traffic on the entire Yukon River drainage basin and across the interior. Just prior to the Gold Rush there were only a few steamers, while at its peak there were hundreds of vessels working the rivers. These shallow draft steamers were supported by a network of wood camps, shipyards, and a large workforce which kept the river traffic moving. This network provided the infrastructure backbone for trading posts, fish camps, missionaries, and mail routes, while meeting the needs of the growing number of prospectors and traders.

As the world's attention was drawn to growing concerns in Europe in 1939, the Canadian Government began building a chain of airfields across the northwest under the Northwest Staging Route Program. Following the bombing of Pearl Harbor there was no doubt that Alaska and the Yukon would play a key role in the war, and a road was required to link Alaska to the contiguous United States. It was quickly decided that the "Prairie Route" would be used, whereby key airfields would be linked from Great Falls, Montana to Fairbanks, Alaska. As part of the agreement Canada agreed to build and improve airstrips along the way, including Watson Lake. In February 1942, the US War Department issued the directive to begin construction. These actions spurred on the building of approximately 2446 km of new road through British Columbia and the Yukon Territory. Following the completion of the Alaska Highway the Canol Pipeline and Canol Road (North and South) were completed to allow the flow of oil from Norman Wells, NWT to Whitehorse in 1944. These two events increased access to the Traditional Territory of the Ross River Dena Council and were largely responsible for commercial and mining/industrial activities in recent decades, including construction of the Robert Campbell Highway (Tungsten Road) in 1961.

3.4 Modern First Nations

The project falls within the traditional territories of the Liard First Nation (LFN) and Ross River Dena Council (RRDC). Both First Nations are part of the larger Kaska Nation. The Kaska Nation's traditional territory covers a large area of northwestern British Columbia, southeastern Yukon, and southern Northwest Territory. Within the Kaska traditional territory there are five First Nations communities: the Dease River First Nation, the Kwadacha Nation, the Ross River Dena Council, the Liard First Nation, and the Daylu Dena Council. Each Kaska First Nation is represented by an elected Chief and Council, as well as a Hereditary Chief.

Prior to European contact, traditional subsistence activities typically featured a seasonal round of winter hunting and summer fishing covering vast areas. In summer, families congregated at lakes and rivers, where fish and plants were collected, dried and stored. In late summer, small groups dispersed throughout the uplands and higher valley systems to hunt in clan-owned territories. Temporary camp sites, situated within a variety of ecological zones, were often reoccupied year after year in order to exploit seasonally available resources (Honingmann 1981).

Contact with neighbouring Nations was vital to First Nations' economies. Interior bands traded hides, furs, and obsidian to coastal groups for fish oil, dentalium, woodwork and blankets. Trails were an intrinsic part of this economy and traditional subsistence as a whole. The principal ethnographic descriptions of the Kaska Dena are available in Black (1955), Jenness (1937), and

Morice (1893, 1903, 1905). Additional information on past lifeways can be found in Honigmann (1981).

Watson Lake, Upper Liard, and the adjoining settlements are home to the Liard First Nation. The amount of activity near Watson Lake was greatly increased when its airfield was established in 1939. This was part of the Canadian government's construction of a chain of airports across northeastern British Columbia and the Yukon as part of the lend-lease program. The new community was soon after used as a supply centre for the construction of the Alaska Highway in 1942.

Ross River, near the confluence of the Ross and Pelly Rivers, is the modern focal point of the Ross River Dena Council. Originally, First Nations people used the area as a seasonal camp and gathering place. By 1903, a trading post was established nearby and later when the American army completed the Canol Pipeline and Canol Road in 1944, they connected Ross River by road to the rest of the Yukon (Cohen 1992). In 1962, Ross River was relocated to its current site close to the Campbell Highway (Yukon Community Profiles 2012).

3.5 Previous Heritage Investigations

In 1995, a heritage impact study was conducted in collaboration with the RRDC as part of the Initial Environmental Evaluation of the proposed BMC Minerals Kudz Ze Kayah Mine. That study identified no cultural materials or features (Rutherford, 1995a). However, a review of the oral history provided by Kaska Nation members indicates that the project area was used for subsistence hunting, trapping and fishing, and as an access route to the North Lakes (Rutherford, 1995b). In 1996, an additional study for cultural materials was undertaken at a proposed airstrip location near the Robert Campbell Highway (Rutherford 1996), but again no heritage resource sites were identified.

Most recently, the proposed mine area was assessed again under permit 15-10ASR to facilitate the development of a number of mine features, including the proposed pit, main waste rock dump, western waste rock dump, organic storage areas, mill site, accommodations area, explosive area, access roads, 2015 exploration targets, and improvements to an existing access road (see Bennett and Mooney 2016). This HRIA led to the identification of subsurface archaeological sites JiTp-1 and JjTp-1 and two wooden artifacts recovered from the surface at three high elevation ice patch edge locations. Obsidian samples recovered from JiTp-1 were submitted for X-Ray Fluorescence analysis aimed at determining the quarry source of the obsidian used in obsidian stone tool manufacture at the site. The results of this analysis were not available by the time that the 15-10ASR final report was submitted. As such, they are being included in this report for the 2016 HRIA work at the proposed BMC Minerals Kudz Ze Kayah Mine.

4.0 METHODOLOGY

4.1 Field Methodology

Field efforts were separated into three phases. The first phase included preliminary field reconnaissance (PFR) within previously unassessed portions of the project area. During the PFR areas of high and moderate potential were recorded with photographs and GPS waypoints so they could be returned to for further testing. The second phase included returning to these high and moderate potential areas to conduct shovel testing. The third phase, conducted concurrently with phases 1 and 2, included additional shovel testing and small scale excavation at the previously identified archaeological site JiTp-1.

Areas of elevated potential along the proposed exploration and development footprints were transected at intervals of 5 to 15 m apart. Areas deemed to have potential for subsurface heritage resources were shovel tested, with approximately 3-10 m test spacing. Shovel tests measured approximately 35 by 35 cm and were excavated with shovel and trowel into sterile sub soils. All excavated sediments were screened through ¼" mesh. Artifacts identified were collected and bagged according to the shovel test unit and stratum, or arbitrary 10 cm vertical interval. The profile of positive shovel tests was recorded by depth below surface and natural and cultural soil strata. All shovel tests were backfilled and returned to as close to natural conditions as possible. When cultural materials were encountered, additional shovel testing was conducted to assess the vertical and horizontal limits of the site, and to recover a sample of the material culture to assist in the assessment of the site use and cultural affiliation. All sites, isolates, and heritage resources were photographed, the site location will be recorded using a hand-held GPS unit, and a sketch map were prepared in the field.

Excavation units dug at JiTp-1 were excavated by 50 cm quads and in arbitrary 10 cm vertical levels. As with shovel tests, all excavated sediments were screened through ¼" mesh, and all artifacts were bagged according to the provenience in which they were found. Excavation continued downward until two sterile levels were encountered. Upon completion of these units, stratigraphic wall profiles were recorded and the finished excavation blocks were photographed before being backfilled.

4.2 Artifact Analysis

All artifacts recovered were analyzed by Ecofor archaeologists in our Whitehorse laboratory. Only lithic artifacts were recovered during this HRIA. All artifacts were washed, counted, labeled, and a detailed set of quantitative and qualitative observations were made and documented in an artifact catalog (see Appendix E).

4.3 X-Ray Fluorescence Analysis of Obsidian Artifacts Recovered During 2015 HRIA (15-10ASR)

Non-destructive x-ray fluorescence (XRF) analyses were conducted by Jeff Rasic at the National Park Service Fairbanks Administrative Facility using a portable Bruker Tracer III-V portable XRF analyzer (serial #510) equipped with a rhodium tube and a SiPIN detector with a resolution of ca. 170 eV FHWM for 5.9 keV X-rays (at 1000 counts per second) in an area of 7 mm^2. Methods follow those described by Phillips and Speakman (2009). Analyses are conducted at 40 keV, 15 µA, using a 0.076-mm copper filter and 0.0305 aluminum filter in the X-ray path for a 200 second live-time count. Ten elements are measured: Potassium (K), Manganese (Mn), Iron (Fe), Gallium (Ga), Thorium (Th), Rubidium (Rb), Strontium (Sr), Yttrium (Y), Zirconium (Zr), and Niobium (Nb). Peak intensities for these elements are calculated as ratios to the Compton peak of rhodium, and converted to elemental concentrations using linear regressions derived from the analysis of 15 well-characterized obsidian samples analyzed by NAA and/or XRF and are reported in parts-per-million (ppm). Source assignments are made by comparing the composition of analyzed samples to a catalog of source samples. Correlations between artifacts and source signatures were considered meaningful when key elements fall within two standard deviations of mean source values (Hughes 1998).

5.0 RESULTS

Work conducted for the 2016 HRIA of the BMC Minerals Kudz Ze Kayah mine included further assessment of previously recorded archaeological site JiTp-1 and PFR in new areas related to proposed access roads, ditching, revised overburden stockpile areas, Class A, B, and C storage facilities, open pits, topsoil stockpiles, drill holes, a mill site, potential construction laydown areas, a water management pond, and a settling pond. This PFR work resulted in the identification of five additional areas of elevated heritage resource potential that were subsequently shovel tested. These shovel test locations (STLs) are referred to in this report as Dirty Rock STL, Split Rock STL, Small Whale STL, Caribou Antler STL, and Beaver Lodge STL. The details of this work are presented below.

5.1 Further Assessment at JiTp-1

Work at JiTp-1 during the 2016 HRIA efforts focused on additional shovel testing in areas with positive shovel tests identified during the 2015 HRIA (see Bennett and Mooney 2016) and excavating evaluative units centered on the richest concentrations of positive shovel tests (Appendix A – Figure 2 and Figure 3). Under permit 16-04ASR, 43 new shovel tests (40 negative, 3 positive) were added to the 240 shovel tests (232 negative, 8 positive) that were excavated on the JiTp-1 landform under permit 15-10ASR. Sediment profiles observed in these tests consisted of organic soils with lichen and roots from 0-5 cm, grey White River Tephra deposits from 5-12 cm, then orange sandy silt with pebbles and cobbles from 15-40 cm below surface (Photo 1). The three positive shovel tests resulting from this testing program each yielded a single milky quartz flake (note: one flake from a shovel test was lost in the field, making the total reported in the catalog two flakes from shovel tests).

Upon the completion of the shovel testing program, 6 m^2 of evaluative excavation units were opened at JiTp-1. These units were focused in two blocks (see Appendix A and Appendix D). Block 1 consisted of 4 m^2 of excavation, and expanded on an evaluative 1 x 1 m excavation unit dug under permit 15-10ASR (Photo 2; see Bennett and Mooney 2016). The sediment profile observed in the excavation walls was consistent with that described for the shovel tests above, but had a few larger cobbles beyond 20 cm below surface (Photo 3). In total, 88 artifacts, all unmodified obsidian debitage, were recovered from Block 1 (Photo 4). The block layout and distribution of these artifacts is detailed in Appendix D.

Block 2 is a 2 x 1 m excavation block that incorporates positive shovel tests s/t 5 and s/t 8 from the previous HRIA work under permit 15-10ASR (Photo 5; see Bennett and Mooney 2016). The sediment profile observed in the excavation walls was generally consistent with that described for the shovel tests above, but had a few larger cobbles beyond 20 cm below surface (Photo 5). Only one artifact, a grey chert flake, was recovered from Block 2. The block layout and distribution of these artifacts is detailed in Appendix D.

5.2 New STLs identified during 2016 HRIA

5.2.1 Dirty Rock STL

The Dirty Rock STL is named for blackened rocks on the surface near the testing area (see Appendix A – Figure 2 and Figure 4). It consists of three flat benches on a slope above the main road through the BMC Kudz Ze Kayah claim (Photo 6). In total, 40 shovel tests were excavated here; 11 on the highest bench, 17 on the middle bench, and 12 on the lower bench. Typical sediment profiles observed in shovel tests consisted of organic soils with roots and lichen from 0-5 cm, followed by grey silt (possible White River Tephra) from 5-12 cm, brown silt from 12-25 cm, then platy degraded bedrock in a brown silty matrix from 25-40 cm below surface (Photo 7). Some shovel tests, especially upslope on the highest bench, reached bedrock and/or large cobbles immediately below the surface (Photo 8). All shovel tests were negative for heritage resources.

5.2.2 Split Rock STL

The Split Rock STL is named for a large split boulder near the testing area (Photo 9; see Appendix A – Figure 2 and Figure 5). It consists of two flat benches high up on the slope above the main road through the BMC Kudz Ze Kayah claim (Photo 10). In total, 32 shovel tests were excavated here; 18 on the higher bench, and 14 on the lower bench. Typical sediment profiles observed in shovel tests on the upper bench consisted of organic soils with roots and lichen from 0-5 cm, followed by brown/grey silts with degraded bedrock pebbles from 5-22 cm, then tabular degraded bedrock cobbles in a silty matrix beyond 22 cm below surface (Photo 11). A few shovel tests in this area were considerably shallower, with bedrock appearing immediately below the surface (Photo 12). The majority of shovel tests on the lower bench showed similar sediment profiles, although some located on a small mount in the lower portion of the STL had a much thicker organic layer (Photo 13), and some near the break in slope down to the road had bedrock immediately below the surface (Photo 14). All shovel tests were negative for heritage resources.

5.2.3 Small Whale STL

The Small Whale STL is named for the shape of the landform it is located upon which resembles a “whale’s back” (similar geomorphology to the landform upon which JiTp-1 was identified; Photo

15; see Appendix A – Figure 2 and Figure 6). In total, 51 shovel tests were excavated on the flat area atop the Small Whale STL landform, however all were negative for heritage resources.

5.2.4 Caribou Antler STL

The Caribou Antler STL is named for a caribou antler that was found near the testing area (Photo 16; see Appendix A – Figure 2 and Figure 7). It consists of an elevated landform that rises above a small pond/wetland (Photo 17 and Photo 18). In total, 59 shovel tests were excavated here. Typical sediment profiles observed in shovel tests on the upper bench consisted of organic soils with roots and lichen from 0-5 cm, followed by silt that grades from light brown to medium brown to olive with depth (Photo 19). All shovel tests were negative for heritage resources.

5.2.5 Beaver Lodge STL

The Beaver Lodge STL is so named because it is located on the edge of a small pond/wetland and looks like an old overgrown beaver lodge (only a visual affinity; not an actual old beaver lodge; Photo 20; see Appendix A – Figure 2 and Figure 8). In total, four shovel tests were excavated here. Typical sediment profiles observed in shovel tests on the upper bench consisted of organic soils with roots and lichen from 0-5 cm, followed by a well defined White River Tephra layer from 5-10 cm, then brown silt that becomes darker and has greater pebble content with depth from 10-35 cm below surface (Photo 21). All shovel tests were negative for heritage resources.

5.3 X-Ray Fluorescence Results from 2015 HRIA Obsidian Samples

Two obsidian samples from JiTp-1, recovered during the 2015 phase of the BMC Minerals Kudz Ze Kayah Mine HRIA under permit 15-10ASR, were submitted to the National Park Service Fairbanks Administrative Facility for XRF analysis on behalf of Ecofor by Greg Hare of the Yukon Government Heritage Resource Unit to determine the provenance of the source from which the raw materials used in stone tool production at the site. The results returned showed that the obsidian in both samples originated from Mount Edziza (Group E) in British Columbia, approximately 425 km south of JiTp-1. The presence of obsidian from such a distant source provides further evidence that long distance trade networks were operating between Precontact First Nations people at the time the site was occupied.

The full results of this analysis are presented in Appendix F.

6.0 SUMMARY AND RECOMMENDATIONS

On behalf of BMC Minerals (No. 1) Ltd., Ecofor Consulting Ltd. conducted a Heritage Resource Impact Assessment (HRIA) for the proposed BMC Minerals Kudz Ze Kayah Mine. Work conducted for the 2016 HRIA of the BMC Minerals Kudz Ze Kayah mine included further assessment of previously recorded archaeological site JiTp-1 and PFR in new areas related to proposed access roads, ditching, revised overburden stockpile areas, Class A, B, and C storage facilities, open pits, topsoil stockpiles, drill holes, a mill site, potential construction laydown areas, a water management pond, and a settling pond.

Work at JiTp-1, including the excavation of 43 new shovel tests and 6 m^2 of evaluative test units, resulted in the recovery of 91 pieces of lithic debitage (obsidian, n=88; milky quartz, n=3; no formal tools), all of which were associated with areas where finds were made during a previous phase of HRIA work conducted under permit 15-10ASR, and were all in keeping with the nature of artifacts recovered during that previous work. As such, it is maintained that the site is well understood at this point and that a representative sample of artifacts has been recovered and analysed. **No further heritage resource work is recommended at JiTp-1 prior to the commencement of development activities**.

PFR throughout the newly added development areas led to the identification of five areas deemed to have potential for heritage resources: Dirty Rock STL, Split Rock STL, Small Whale STL, Caribou Antler STL, and Beaver Lodge STL. In total, 186 shovel tests were excavated at these STLs, but all were negative for heritage resources. As such, **no further heritage resource work is recommended in these localities**.

If any additional development areas are added to the project, then those new areas should also be reviewed for possible impacts to heritage resources. This follow-up heritage review may be conducted through desktop overview and/or field study.

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APPENDIX A: Project Mapping – NOT INCLUDED IN YESSA READY/PUBLIC VERSION OF REPORT

APPENDIX B: Photographs – NOT INCLUDED IN YESSA READY/PUBLIC VERSION OF REPORT

APPENDIX C: Archaeological Site Data – NOT INCLUDED IN YESSA READY/PUBLIC VERSION OF REPORT

APPENDIX D: JiTp-1 Excavation Blocks and Artifact Distribution – NOT INCLUDED IN YESSA READY/PUBLIC VERSION OF REPORT

APPENDIX E: Artifact Catalog – NOT INCLUDED IN YESSA READY/PUBLIC VERSION OF REPORT

APPENDIX F: X-Ray Fluorescence Analysis of Obsidian Artifacts Recovered During 2015 HRIA (15-10ASR) – NOT INCLUDED IN YESSA READY/PUBLIC VERSION OF REPORT

APPENDIX G: Project Field Notes – NOT INCLUDED IN YESSA READY/PUBLIC VERSION OF REPORT