7 HERITAGE EFFECTS ASSESSMENT

7.1 Archaeology Valued Component

7.1.1 Introduction

Archaeology is important for First Nations because it provides a physical link to their cultural history and demonstrates the long-term use of their traditional territories. In addition, archaeology is an important resource to the scientific and cultural communities as well as the public. Archaeological resources are protected under the *Heritage Conservation Act*. It is for these reasons that archaeology was selected as a Valued Component (VC) for the EA.

This section presents the effects assessment of the proposed Project on heritage features. It provides the spatial boundaries for the assessment and identifies potential interactions between archaeological factors and proposed Project components and activities (Figure 7.1-1). The assessment also identifies and assesses potential proposed Project effects, and proposes measures to avoid or mitigate the potential adverse effects of the proposed Project.

This section of the Application has been prepared in accordance with the requirements prescribed under the BCEAA as set out in the Section 11 Order and the AIR for the proposed Project.

7.1.2 Boundaries

The local study area (LSA) for the Archaeology VC is defined as the Archaeological Overview Assessment (AOA) polygons that overlapped the mineral tenure of the proposed Project (Choquette 2012; Figure 7.1-1). The resulting LSA includes four areas, identified as CKW-01, 02, 03, and 04.

The Regional Study Area (RSA) is defined as the LSA. The RSA is the same as the LSA because the proposed Project will not impact terrain outside the LSA (Figure 7.1-1).

The proposed Project footprint has been refined since the AOA and AIA were conducted (the mineral tenure boundary was used for these assessments). Therefore, one area- the AOA Polygon CKW-04, is considered within the LSA, but outside of the proposed Project footprint. This polygon will therefore not be impacted.

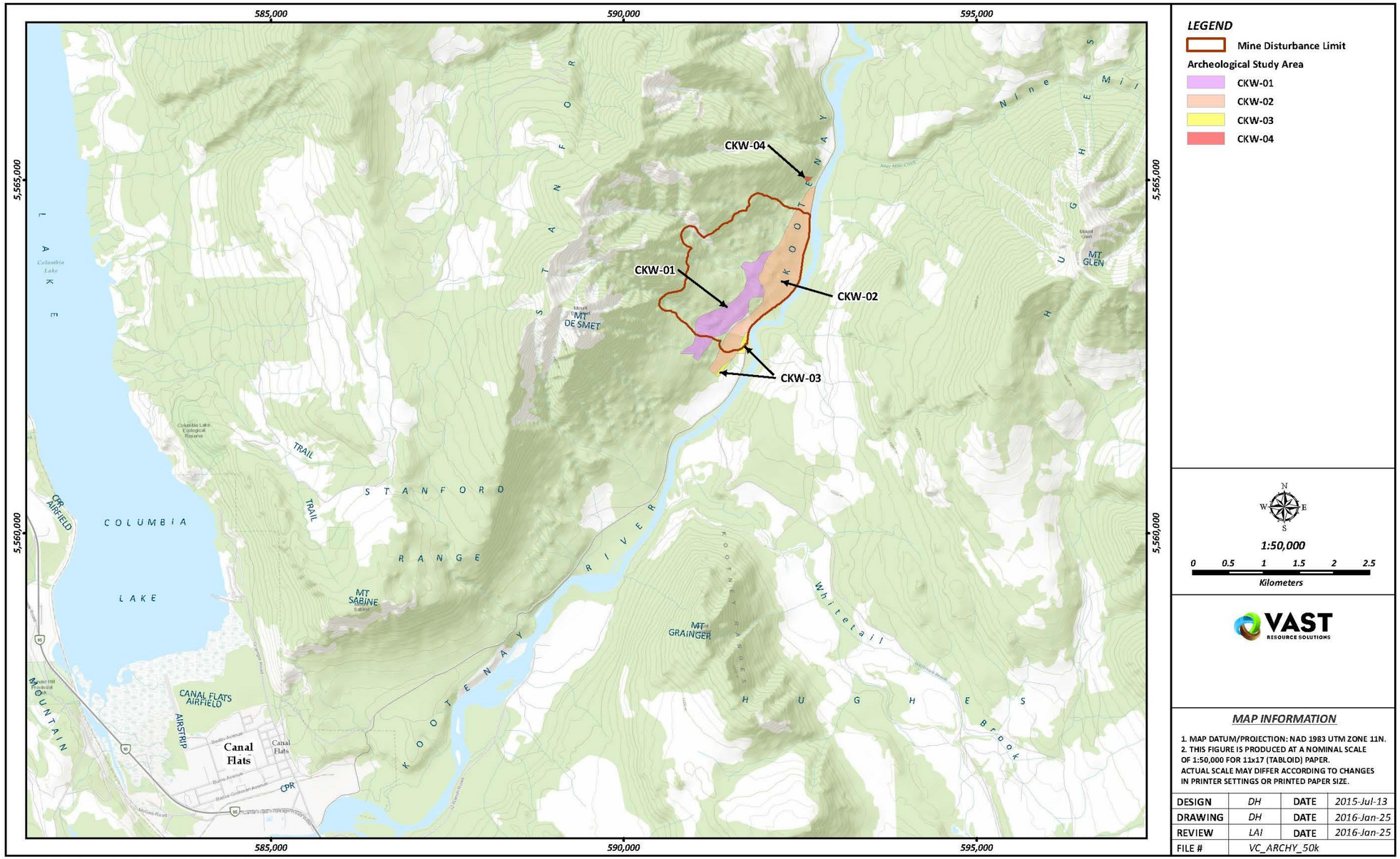
The temporal scope of the assessment includes potential impacts occurring during the construction and operation phases of the proposed Project.

Polygons produced specifically for this proposed Project represent the administrative boundaries.

Geospatial errors in the Remote Access to Archaeological Data (RAAD) application and minor deviations or inconsistencies in-field data acquisition standards during field assessments represent the technical limitations.

Figure 7.1-1 Overview map of the archaeological study area showing the four archaeological potential polygons and the outermost boundary of the proposed Project footprint. EbPw-21 is not shown in order to keep site location confidential. The proposed Project site boundary extends slightly beyond the mineral lease limit because the disturbance footprint is buffered by 100m. This small area is covered as Crown Grants with undersurface rights to the Proponent

Figure 8. Archaeological Sites Valued Component



LEGEND

- Mine Disturbance Limit

Archeological Study Area

- CKW-01
- CKW-02
- CKW-03
- CKW-04

1:50,000

0 0.5 1 1.5 2 2.5

Kilometers

MAP INFORMATION

1. MAP DATUM/PROJECTION: NAD 1983 UTM ZONE 11N.
2. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:50,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.

DESIGN	*DH*	DATE	*2015-Jul-13*
DRAWING	*DH*	DATE	*2016-Jan-25*
REVIEW	*LAI*	DATE	*2016-Jan-25*
FILE #	*VC_ARCHY_50k*		

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7.1.3 Existing Conditions

Baseline information for the Archaeology VC was compiled through the completion of an AOA, which included a review of previous work in the area. This work was then followed by an in-field AIA under a Section 14 Heritage Inspection Permit (Permit 2013-0077).

The four archaeological potential polygons (CKW-01, CKW-02, CKW-03, and CKW-04) described in the sections above occur on elevated terrain along the west-northwestern side of the Kootenay River (Figure 7.1-1). The polygons encompass a range of archaeologically significant landforms within irregular and variably-sloped terrain. Polygon CKW-01 extends diagonally northeast to southwest through the southeastern portion of the proposed Project area and captures elevated prominences and terraces. Polygon CKW-02 is situated immediately southeast of CKW-01 and extends along the length of the eastern boundary of the proposed Project area, encompassing a series of terrace levels stepping down towards the Kootenay River. Only a narrow portion (i.e. the northwestern border) of Polygon CWK-03 overlaps with the southeastern corner of the proposed Project area. Finally, the southernmost tip of Polygon CKW-04 overlaps with the northeastern corner of the LSA, but is now outside the proposed Project footprint. This polygon identifies cliff features associated with a small bedrock canyon that continues to the north beyond the LSA, and may have the potential to contain additional archaeologically significant features (Choquette 2012).

Data were collected according to the following regulatory guidelines:

- *Heritage Conservation Act* (RSBC 1996, Ch. 187);
- BC Archaeological Inventory Guidelines (BC Archaeology Branch 2000); and,
- BC Archaeological Impact Assessment Guidelines (BC Archaeology Branch 1998).

Wayne Choquette completed the AOA for the proposed Project in December 2012. Choquette's proprietary AOA methodology involves extensive research, and draws on over four decades of personal experience, background documents records of previous archaeological surveys in the region, and detailed analyzes of geological and bio-geographical maps. For additional methodological details, please refer to the AOA in Appendix 7.1-1. Following this work, a preliminary field reconnaissance was completed by Wayne Choquette on June 12 and August 24, 2012, to ground truth these previously delimited land use-based AOA polygons. These traverses resulted in the discovery of a narrow rock shelter containing a pictograph panel (i.e. site EbPw-21).

Tipi Mountain Ecological Cultural Services completed field inspections for the AIA, which consisted of a combination of visual surface inspections and subsurface testing for the purpose of locating, recording, and evaluating archaeological sites. Terrain in and immediately surrounding the proposed development areas were visually assessed to ensure that detrimental impact to areas of suspected archaeological potential would not occur if minor revisions to the development boundaries were later required by the Proponent. Development areas were examined using pedestrian survey traverses, with the field crew spaced anywhere between 5 m and 15 m apart depending on the local topography, visibility conditions and safety considerations. For methodological details, please refer to the AIA in Appendix 7.1-2.

During the in-field assessment, archaeological potential within the proposed Project area was perceived to be variable, with the landscape consisting of rocky, variably undulating ground surfaces amongst a general slope down to the south-southeast. The majority of the terrain within the proposed Project area overlaps with AOA polygons CKW-01, 02, 03 and 04 and was judgmentally traversed; this traverse was influenced by approximate development boundaries, topographic features and elevation contours.

Several pedestrian-based traverse routes were completed within and beyond the terrain encompassed within the AOA polygons, intended to ground truth the general landscape. Within and immediately adjacent to the boundaries of the proposed Project, 10 shovel test locations were identified with increased potential for subsurface archaeological material, all of which were subsequently inspected via intrusive methodology listed under Permit 2013-0077. All subsurface test locations (STL) were situated within or immediately adjacent to AOA polygons CKW-01, 02 and 03, and are described in detail within the AIA (Appendix 7.1-2).

Micro-topographic landforms that were identified with perceived archaeological potential were intrusively inspected for the presence of subsurface archaeological material; these areas were commonly found to be associated with prominent locations along the margins of terrace levels and on isolated benches, which were interspersed by several deeply-incised ephemeral drainages sloping down towards the Kootenay River.

Subsurface inspection (i.e. shovel test units) generally occurred in four to six metre intervals and was influenced by vegetation or tree stand density and ground surface constraints (e.g. bedrock or protruding clasts). The overall placement of test units (e.g. single transect, double transect or grid-like) was based on the shape and surface area of the landform being inspected.

In total, seven previously recorded archaeological sites are situated in close proximity (<5 km radius) to the proposed Project area (Table 7.1-1). These sites are labelled by their borden number (an archaeological numbering system used throughout Canada). Although not officially recorded with the Archaeology Branch prior to this inspection, site EbPw-21 was previously discovered by Wayne Choquette in 2012 and remains the only pre-contact archaeological site within the boundaries of the LSA. Of the listed previously recorded archaeological sites, only one (i.e. EbPw-5) is located on the western side of the Kootenay River, while the remaining site areas are located on the eastern side of the river valley, at or near the confluence area with Nine Mile Creek.

Table 7.1-1 A description of previously recorded sites within a 5 km radius of the proposed Project Area.

Borden Number	**Site Type**	**Location, Distance from Proposed Mine Site**
EbPw-4	Pre-contact transportation trail	Approximately 2.4 km NE, along the east side of the Kootenay River
EbPw-5	Pre-contact surface lithics, subsurface lithics and a quarry	Approximately 1.9 km N/NE, on the west side of the Kootenay River
EbPw-8	Pre-contact subsurface lithics	Approximately 3.7 km SE, on the east side of the Kootenay River
EbPw-9	Pre-contact subsurface lithics	Approximately 3.2 km S/SW, on the east side of the Kootenay River
EbPw-17	Pre-contact subsurface lithics, subsurface Fire Brocken Rock and subsurface faunal remains	Approximately 2.6 km NE, on the east side of the Kootenay River
EbPw-19	Pre-contact subsurface lithics	Approximately 2.6 km S/SE, on the east side of the Kootenay River
EbPw-20	Pre-contact subsurface lithics	Approximately 1.9 km NE, on the east side of the Kootenay River

Two archaeological sites were identified in the AIA: (1) the previously discovered archaeological site EbPw-21 (pictograph panel; Choquette 2012), and (2) archaeological site EbPw-22 (subsurface lithics). Both archaeological sites are located outside the boundaries of the proposed Project footprint where no physical disturbance of the ground will occur. Site EbPw-22 is situated just beyond (i.e. south of) the proposed Project footprint. Additional information on EbPw-22 and the negative STLs can be found in the AIA (Appendix 7.1-2). Due to the location and characteristics of site EbPw-22 type (i.e. subsurface lithics), it is not expected to be disturbed by the proposed Project, and is therefore not considered in this assessment.

Site EbPw-21 consists of a natural rock shelter with an associated panel of pictographs. The site is located at the southern terminus of a steep-walled northeast-southwest trending bedrock outcrop, northeast of an unnamed tributary drainage of the Kootenay River. The narrow, but deepest portion of the rock shelter measures approximately 10 m wide (SW-NE) with a 1.5-2.0 m overhang and is approximately 2.0-2.5 m in height with a sloped ground surface (with outcrop measuring approximately 7-8 m in height). The panel consists of a cluster of nine visible small (< 15 cm x 15 cm) remnant portions of images that include a tally mark, arches, and ochre smudges. All images have been heavily impacted by freeze-thaw spalling of the highly friable conglomerate material. A few of the images are older, faded, and appear to be painted over. A detailed analysis of these images was hampered in the field by the weathered state of the bedrock face. Site EbPw-21 is located outside the proposed Project footprint, however it is included in the assessment because of the potential effects of drilling and blasting activities on the physical integrity of the pictograph panel occurring on a vertical surface.

After the completion of the fieldwork component of the AIA, LIDAR imagery of the proposed Project area, including immediately adjacent terrain was supplied to Tipi Mountain Ecological Cultural Services. Preliminary analysis of this imagery revealed several depressions scattered within and adjacent to the proposed Project area. Although the majority of the depressions were identified as naturally occurring sink holes, a few locations on relatively low-lying terraces were suggestive of pre-contact cultural depressions. A field reconnaissance was completed on December 19, 2014 to confirm the context of these depressions, which determined that the depressions within and those immediately bordering the proposed Project area were sink holes.

Within the proposed Project footprint, archaeological potential was deemed to be low. Although situated outside the proposed Project area, the subsurface inspection program did result in the recording of archaeological site EbPw-22, and confirms that archaeological potential does exist beyond the proposed Project footprint, and additional inspection is required if the current mine plan is revised or expanded to include terrain beyond that which was assessed. A significant amount of ground disturbance has previously occurred within and immediately adjacent to the LSA, consisting of several eras of timber harvesting and the construction of access roads, skid trails and landing areas. Additionally, previous mineral exploration activity has occurred (e.g. test pits, drill sites and trenches) on the proposed Project site which altered several pockets of the landscape.

Despite the rigour of the AIA, it is impossible to be certain that all archaeological concerns have been identified within the LSA, and potential remains that previously unidentified archaeological sites may be inadvertently encountered during the proposed Project construction and operation phases. A ‘Chance Find Procedure’ has been produced to provide guidance to crews and supervisors in the event that a suspected archaeological site is encountered. The ‘Chance Find Procedure’ is included within the Archaeology Management Plan (Appendix 1 - Archaeology Management Plan).

7.1.3.1 Follow-up Work

An additional study measuring vibrations from blasting was completed by the Proponent. This information was reviewed and incorporated into this section. No additional follow-up work is being completed for this Valued Component.

7.1.3.2 Other Disturbances

The site EbPw-21 (i.e. pictograph panel) is in a state of slow decay from weathering (i.e. freeze and thaw cycle, precipitation run-off, etc.). This is a longstanding process that has been naturally impacting the site.

7.1.3.3 Feedback from First Nations, Public and Other Stakeholders

Both the KNC and the Shuswap Indian Band (SIB) expressed interest in participating in the AIA assessment, and representatives were included in the field crew. KNC and SIB were both provided an opportunity to review and comment on the archaeology permit application prior to the issuance of the *Heritage Conservation Act* Section 14 permit.

During the AIA, representatives of SIB and KNC requested that photographs of the pictographs not be published and that surrounding terrain not be subsurface tested out of respect for the high cultural significance of the site. Therefore, no images of the pictographs were included in the associated AIA Final Report (Heathfield et al. 2014), and potential remains high that undocumented subsurface archaeological material exists surrounding the site.

7.1.3.3.1 Ktunaxa Nation Council perspectives

The Ktunaxa Nation holds an active stewardship role and responsibility for ancestral and archaeological sites and related values within the Ktunaxa traditional land district of Spruce Grouse's Land (Kyawaȼ ʔamakʔis). Information specific to archaeological resources was not a focus of Ktunaxa knowledge and use interviews (see methods outlined in Ktunaxa Nation Council's Section C), however current and historic Ktunaxa use of the Kootenay River corridor within the Project area, as well as oral historical and archival information pre-dating 1846, highlight the importance of the area for the cultural heritage of Ktunaxa people, including the wider cultural landscape of the Columbia Lake east side.

For a further discussion of archaeology, including the cultural, traditional knowledge, and use components, please refer to the Ktunaxa Nation Council's Section C of this EA Application.

7.1.3.3.2 Shuswap Indian Band Perspectives

For a further discussion of archaeology, including the cultural, traditional knowledge, and use components, please refer to the Shuswap Indian Band's Section C of this EA Application.

7.1.4 Potential Effects

To support the identification of potential effects on archaeological resources, an interaction matrix was developed (Table 7.1-2). This matrix identifies specific proposed Project activities occurring in different proposed Project phases that may interact with the VC. This matrix was completed at the beginning of the environmental assessment process for the proposed Project prior to the completion of field investigations, data analysis, and evaluation (i.e. AIA).

Potential effects that were originally identified in the matrix but were subsequently omitted from this analysis because it was concluded there would be no adverse effect or a negligible adverse effect, based on an appropriate rationale, are denoted by NE* (negligible adverse effect).

Potential effects that were evaluated as having no adverse effect or a negligible adverse effect from the outset of the assessment process, and following investigation and review were still determined to be negligible, are denoted by NE (negligible adverse effect).

Potential effects that were evaluated and determined to have an adverse effect and requiring additional consideration and mitigation are denoted by PE (potential adverse effect).

These potential effects were identified through literature review, discussions with government and relevant technical experts, knowledge of comparable projects, professional judgment, and consultation with First Nations groups.

Table 7.1-2 Proposed Project Valued Component (VC) interaction matrix illustrating how the Archaeology VC was predicted to be potentially impacted from proposed Project activities.

Project Phase	Activity	Potential Effect
Construction	Transport of equipment and workers to site	NE
	Physical presence of materials and equipment	**NE***
	Vegetation clearing and overburden removal	**PE**
	Haul road and/or conveyor construction	**NE***
	Gypsum plant facility construction	**NE***
	Construction of ancillary services	**NE***
	Construction of sediment structures	NE
Operation	Drilling and blasting	**PE**
	Loading, crushing and hauling (on-site)	**NE***
	Product transportation (offsite)	**NE***
	Transport of operation/maintenance materials	NE
	Water use (well)	NE
	Solid and waste water management	NE
	Explosives storage and handling	NE
	Overburden storage	**NE***
	Fuel storage and handling	NE
Closure & Post-closure	Transport of materials and equipment	NE
	Physical removal of infrastructure	NE
	Disposal	NE
	Contaminated site remediation	NE

Project Phase	Activity	Potential Effect
	Reclamation	NE

NE = No or negligible adverse effect expected; no further consideration warranted
NE*= Potential effect that was originally identified as adverse but was later omitted because no/negligible effect was determined; no further consideration warranted.
PE = Potential adverse effect requiring additional mitigation; warrants further consideration

7.1.4.1 Description of Potential Effects

For the Archaeology VC, site EbPw-21 (i.e. pictograph panel) is the only known resource requiring consideration. All subsequent discussions within Section 7 will relate to EbPw-21 and any undiscovered sites which may be encountered.

It is anticipated that the potential adverse impact to archaeological site EbPw-21 is the accelerated deterioration of the pictograph panel because of ground disturbance and vibration during the construction and operation phases.

Construction

Potential Effect #1 Disturbance from physical presence of materials and equipment on ground surface.
Rank: NE*
Rationale: No machinery or materials will be placed, stored, or otherwise be present within the boundary of site EbPw-21, as it is outside the proposed Project footprint. Any undiscovered sites will be protected from any material or equipment by virtue of being underground, and will not be impacted.

Potential Effect #2: Disturbance from vegetation clearing and overburden removal.
Rank: PE
Rationale: Because site EbPw-21 occurs outside the proposed Project footprint, it will not be impacted by ground disturbance associated with clearing activities. Based on the assessment work completed in the archaeological polygons, no archaeological sites were located and hence will not be impacted by vegetation clearing and overburden removal. However, there is potential in this phase for unknown sites to be discovered.

Potential Effect #3: Disturbance from vibrations from haul road and/or conveyor belt construction.
Rank: NE*
Rationale: Due to the location of site EbPw-21 and the low level of vibrations associated with haul road and conveyor construction, it is anticipated that the site will not be impacted from vibrations from these activities.

Potential Effect #4: Disturbance due to vibrations from gypsum plant facility construction.
Rank: NE*
Rationale: Due to location of site EbPw-21 and the low level of vibrations associated with the mine site infrastructure, it is anticipated that the archaeological site will not be impacted from vibrations from these activities.

Potential Effect #5: Disturbance from vibrations from construction of ancillary services.
Rank: NE*
Rationale: Due to location of site EbPw-21 and the low level of vibrations associated with the construction of ancillary services, it is anticipated that the archaeological site will not be impacted from vibrations from these activities.

Operation

Potential Effect #1: Disturbance from drilling and blasting activities.
Rank: PE
Rationale: Site EbPw-21 is outside of the planned ground disturbance footprint. Provided no ground disturbance occurs within the buffered site boundary, the only potential effect on the site is increased vibrations from drilling and blasting activities. Effects of vibrations may include accelerated erosion due to nearby construction activities, and additional/accelerated spalling of the remaining pictographs, and/or create micro-fractures that may increase the rate of erosion due to freeze-thaw action.

Though a rigorous archaeological assessment has been completed, it is possible for previously undiscovered sites to be encountered inadvertently in the course of mine operation. In the event a suspected archaeological site is encountered, all work in the immediate vicinity will stop, and the 'Chance Find Procedure' (part of the Archaeology Management Plan) will be initiated. This procedure includes protocols for contacting the BC Archaeology Branch, local First Nations, and the Royal Canadian Mounted Police as appropriate.

Potential Effect #2: Disturbance from overburden storage.
Rank: NE*
Rationale: Based on the location of site EbPw-21, no known or suspected archaeology sites will be obscured or buried by overburden.

Closure and Post-closure

Potential Effect #1: Ground disturbance and vibration during decommissioning phase.
Rank: NE
Rationale: Ground disturbance and vibration impacts to site EbPw-21 are unlikely during the decommissioning phase of the proposed Project and have been identified as negligible.

7.1.5 Mitigation Measures

The following recommendations have been generated for the management of the archaeological site EbPw-21 and unknown archaeological sites that may be discovered in future as the proposed Project is developed.

The most effective way to preserve archaeological resources is to avoid disturbance of them altogether. The avoidance mitigation is consistent with accepted BC Archaeology Branch methodology, and should result in the preservation of the remains of what is considered by First Nations to be an extremely significant site. Mitigation measures for site EbPw-21 are limited due to the nature of the archaeological site (i.e. pictographs). Whereas effects to surface or subsurface archaeological materials may be mitigated through systematic excavation and recovery of artifacts with appropriate provenience data, pictographs are immovable. As a result, a feasible mitigation measure for the site is avoidance of any impacts through the implementation of a development buffer. In this case, the recommendation in the AIA report (Heathfield et al. 2014) was for a 50 m buffer, within which no development activity will take place.

Subsequent refinement to the proposed Project has resulted in site EbPw-21 being excluded from the proposed Project footprint, so no development will take place within this buffer.

Because the potential for an adverse impact to site EbPw-21 from blasting activities remains, an investigation into blasting effects was initiated by the Proponent. This technical report summarized the distance over which vibrations will travel through the substrate. At present, it has been determined that the level of vibrations is small and not anticipated to impact the pictograph panel. Regardless, the blasting design will be altered when operating in the South Pit (i.e. the pit nearest to the pictograph panel) to further minimize resulting vibrations. In addition, when working in that region of the South Pit, the Proponent will install a peak particle velocity (PPV) meter to monitor the level of actual vibrations that are produced from blasting. Depending on the resulting data, the blast designs can then be further altered.

The collective suite of mitigation measures described here; avoiding the site altogether, altering blasting design, and monitoring PPV, is designed to minimize potential adverse impact to site EbPw-21. Mitigation measures to address each potential effect are described below and summarized in (Table 7.1-3).

Mitigation Measure #1: Avoid mining activity around site EbPw-21.
Potential Effects being addressed: Operation (PE #1 & 2)
Rationale: The most effective way to preserve archaeological resources is to avoid disturbance of them altogether.
Description: The site area is no longer within the proposed Project footprint, and will not be directly impacted. A development buffer of at least 50 m will be constructed around the site.
Evaluation of success: Mining activity will not occur within the development buffer of site EbPw-21.

Mitigation Measure #2: Limit damage from drilling and blasting vibrations by altering blasting design.
Potential Effects being addressed: Operation (PE #1 & 2)
Rationale: The proposed Project may result in increased ground vibration or shock from blasting during the construction and operation phases. This may increase the rate of erosion and deterioration of the pictograph panel.
Description: The Proponent will alter the blasting design when working in proximity to the site and utilize a PPV meter on an ongoing basis to monitor the level of vibrations reaching the site.
Evaluation of success: No damage to site EbPw-21 will occur from drilling and blasting vibrations associated with mine development.

Mitigation Measure #3: Prevent damage to undiscovered archaeological sites.
Potential Effects being addressed: Construction (PE #2), Operation (PE #1 & 2)
Rationale: Unknown archaeological artifacts or sites may be discovered and then damaged during the course of the proposed Project.
Description: The Proponent will follow the 'Chance Find Procedure' if suspected archaeological sites are encountered.
Evaluation of success: The damage to undiscovered archaeological sites will be prevented.

Table 7.1-3 A summary of the potential effects expected by phase of the proposed Project along with the associated mitigation measures. A reference to where additional information can be found in the EA Application is also provided.

Potential Effect	Project Phase	Mitigation Measure	Location	Reference Documents
Ground vibration causing damage or destruction of site EbPw-21	Operation	Development buffer around the site Alter blasting design in proximity to site Monitor blasting when working in proximity to the site	Outside of but adjacent to the proposed Project footprint	Archaeology Management Plan
Damage or destruction of unknown archaeological sites	Construction Operation	Chance Find Procedure	Proposed Project footprint	Archaeology Management Plan

The above mentioned mitigations for site EbPw-21 and unknown archaeology sites will serve to protect the site from inadvertent impacts from proposed Project activities.

Natural erosion is affecting the site on an ongoing basis, but vibrations may contribute to the forming of micro-fractures in the rock face, which will speed the pace of freeze-thaw erosion. Initiating a monitoring program of this site prior to any activities associated with the proposed Project is important because a baseline condition level needs to be established in order to evaluate any increase in the rate of erosion.

7.1.6 Characterization of Residual Effects

Residual effects are those effects remaining after the implementation of all mitigation measures. Standard criteria were used to describe the residual effect on-site EbPw-21 and on any unknown sites. These criteria include context, magnitude, extent, duration, reversibility and frequency and are described and defined below (Table 7.1-4).

Table 7.1-4 A summary of definitions used to characterize residual effects along with their associated definitions for the Archaeology Valued Component (VC).

Criteria	Description	Qualitative/Quantitative Measure	Definition
Context	Refers primarily to the current and future sensitivity and resilience of the VC to change caused by the proposed Project. Consideration of context draws on the description of existing conditions of the VC, which reflects cumulative effects of other proposed projects and activities that have been carried out, and especially information about the impact of natural and	The qualitative significance of archaeological resources and sites are typically assessed in three categories: scientific, cultural (ethnic), and public. These categories are set out in the British Columbia Archaeological Impact Assessment Guidelines (BC Archaeology Branch 1998)	

Criteria	Description	Qualitative/Quantitative Measure	Definition
	human-caused trends in the condition of the VC.		
Magnitude	Refers to the expected size or severity of the residual effect. When evaluating magnitude of residual effects, the proportion of the VC affected within the spatial boundaries and the relative effect is considered (e.g. relative to natural annual variation in the magnitude of the VC or other relevant characteristic).	Negligible	No portion of the archaeological site is lost, and no increase in the rate of erosion is observable
		Low	No portion of the archaeological site is lost, but some increase in the rate of erosion is observable
		Medium	A small portion of the archaeological site is lost
		High	A large portion of an archaeological site is lost
Extent	Refers to the spatial scale over which the residual effect is expected to occur.	Archaeological Site Boundaries	Residual effects are restricted to the boundaries of any affected archaeological site
Duration	Refers to the length of time the residual effect persists (which may be longer than the duration of the physical work or activity that gave rise to the residual effect).	Chronic	Effects to archaeological sites are permanent
Reversibility	Pertains to whether or not the residual effect on the VC can be reversed once the physical work or activity causing the disturbance ceases.	Irreversible	Effects to archaeological sites are not reversible
Frequency	Refers to how often the residual effect occurs and is usually closely related to the frequency of the physical work or activity causing the residual effect.	Single event	Impacts to archaeological sites are one-time events (i.e. once damaged or destroyed the impacts are permanent)

Criteria	Description	Qualitative/Quantitative Measure	Definition
		Periodic	Impacts of lower magnitude may affect only portions of a site and therefore periodic impacts may over time impact entire sites

Using the criteria outlined above, the residual effect to EbPw-21 and to unknown archaeological sites are characterized below and summarized in Table 7.1-5.

Residual Effect #1: Potential disturbance to site EbPw-21.
Context: The site is considered archaeologically rare, and valuable for interpretation of its imagery and past lifeways. This classifies as highly significant archaeologically. Pictograph sites are considered extremely important by most First Nations, and cultural significance of this site is considered high. Archaeological sites in general are irreplaceable once disturbed, and this site is particularly sensitive since mitigation measures suitable for surface and subsurface sites are ineffective and/or inappropriate for pictograph sites.
Magnitude: Provided avoidance measures in the form of modified drilling/blasting plans and monitoring are maintained, no residual effects are anticipated, therefore the magnitude is negligible. As the site is already in a state of slow decay from weathering, the additional impacts of nearby blasting may be considered to be minimal (i.e. no impacts will be observable).
The site will be protected from "archaeological tourism", vandals, and looters by restricting detailed site information to the BC Archaeology Branch, the Ktunaxa Nation Council, the Shuswap Indian Band, and any other stakeholders deemed appropriate by the BC Archaeology Branch.
Extent: The spatial extent of any residual effects of the proposed Project will be limited to the location of the archaeological site.
Duration: The potential effects of vibrations due to blasting will be limited to the operational lifespan of the proposed Project. Any impacts will be chronic as effects to archaeology sites are permanent.
Reversibility: Archaeological sites are unique and non-renewable. Therefore, any residual effects to the site will be irreversible.
Frequency: After initial avoidance protection measures are in place (i.e. development buffer), it is anticipated that effects related to the proposed Project will be minimal, and therefore periodic.

Residual Effect #2: Potential disturbance to unknown sites.
Context: Unknown archaeological resources could have a range of scientific, cultural or public significance that would need to be evaluated on a case-by-case basis.
Magnitude: With a contingency plan in place (i.e. 'Chance Find Procedure') the residual effect of damage or disturbance to unknown archaeological resources is expected to be either negligible or low in magnitude, since chance discovery of unknown resources will trigger a stop work procedure.
Extent: The extent of the residual effect is expected to be restricted to the proposed Project footprint, which is entirely contained within the LSA, because this is the location where mining development and therefore potential damage to an unknown archaeological sites will occur.

Duration: The duration of the residual effect is expected to be chronic since if damage or destruction to a residual effect occurs it would be permanent.
Reversibility: Archaeological sites are unique and non-renewable. Therefore, any potential residual effect of damage or destruction to unknown sites would be irreversible.
Frequency: The frequency of the residual effect is expected to be a single event. If damage or destruction to an unknown archaeological resource occurs, contingency protocol would ensure that continued, repeated damage or destruction would not occur.

7.1.7 Likelihood

7.1.7.1 Definition of Likelihood

Likelihood refers to whether or not a residual effect is likely to occur based on a variety of factors, including the likelihood of a physical work or activity causing disturbance, and the likelihood of mitigation being successful (EAO 2013). Likelihood is described in terms of 'low', 'moderate', or 'high'. These terms have been defined qualitatively below.

- Low – the residual effect is unlikely to occur
- Moderate – the residual effect is likely to occur
- High – the residual effect will occur

7.1.7.2 Evaluation of Likelihood

Likelihood of residual effect for site EbPw-21: The likelihood of the residual effect of vibrations to site EbPw-21 is predicted to be low, because of mitigation and contingency measures that will be implemented in accordance with the Archaeology Management Plan (Appendix 1 - Archaeology Management Plan).

Likelihood of residual effect for unknown sites: The likelihood of the residual effect of damage or destruction to an unknown archaeological site is predicted to be low, because of the rigour of the AIA. Contingency measures will be implemented in accordance with the Archaeology Management Plan (Appendix 1 - Archaeology Management Plan) developed for the proposed Project if an unknown archaeological site is found.

7.1.8 Significance

This section describes how significance has been defined and how the significance of residual effects has been determined for archaeological resources.

7.1.8.1 Definition of Significance

All significance ratings of "high", "medium", and "low" are based on the definitions within Appendix D of the BC Archaeological Impact Assessment Guidelines (BC Archaeology Branch 1998). To determine significance the Checklist of Criteria for Pre-contact Site Evaluation (BC Archaeology Branch 1998) was used. These guidelines outline that when determining significance a site would be measured and valued based on the following key elements of significance: scientific public ethic, and economic.

7.1.8.2 Evaluation of Significance

EbPw-21

The consideration of 'significance' in regards to any archaeological site should be determined as to what would ultimately be lost if development is implemented and loss of the site, in part or in its entirety, was to occur. For archaeological site EbPw-21, the determination of the scientific, public, cultural, economic

and historic aspects of the site's significance utilized the information obtained during background research, in-field observations, and overall site interpretation, which was then compared with other regionally-applicable archaeological sites.

Archaeological site EbPw-21 is considered to have a high ranking for ethnic and public significance. As such, the local First Nations communities prefer to have the pictograph locations, photographs of the images and any associated oral histories kept private to ensure protection from vandalism and/or theft. This level of privacy has proven necessary in the past due to the level of public interest in pictograph sites and the tendency of individuals to loot the surrounding landscape of any cultural material and deface the images. As has been indicated by the Ktunaxa Nation Council and the Shuswap Indian Band, it will be important to keep information about this site confidential to mitigate vandalism and tourist activities.

While the cultural significance of the pictographs is considered to be high, the scientific value of the site is believed to be moderate bordering on low. Lithic artifacts were not recovered, which can often provide diagnostic information and an assignment to a cultural complex. Additionally, while the pictograph images portrayed at the site may provide a link to oral histories of the indigenous group who created them, the poor preservation of the site has severely impeded the identification of specific images.

The economic ranking of site EbPw-21 is considered to be low based on the cultural sensitivity of the location.

Unknown Sites
Site significance for any unknown sites cannot be evaluated using the British Columbia Archaeological Impact Assessment Guidelines (BC Archaeology Branch 1998) until after the discovery of the site.

7.1.9 Confidence and Risk

7.1.9.1 Definition of Confidence and Risk

Confidence and risk are defined based on the following criteria:

- Low – there is a low degree of certainty in the effects prediction
- Moderate – there is a moderate degree of certainty in the effects prediction
- High – there is a high degree of certainty in the effects prediction

7.1.9.2 Evaluation of Confidence and Risk

EbPw-21
Confidence related to potential residual effects from vibrations due to blasting activities is low to medium (i.e. the assessing archaeologists do not have the necessary expertise to evaluate the potential for blasting activities to affect the site). Recommendations include consulting a blasting engineer and/or structural geologist in order to analyze the likelihood of vibrations having a detrimental effect on the site.

Unknown Sites
The level of confidence associated with the potential residual effect of disturbance to unknown archaeological sites is high because of the thoroughness of the investigation that has been conducted by archaeologists on the proposed mine site to date. Furthermore, the proposed mitigation measures are expected to be effective as they have been assessed and recommended by archaeologists.

Table 7.1-5 A summary of the results of characterizing residual effects for the Archaeology Valued Component (VC).

Residual Effect	Project Phase	Context	Magnitude	Extent	Duration	Reversibility	Frequency	Likelihood	Significance	Confidence	Follow-up and Monitoring
Potential disturbance to EbPw-21	Operation	Rare and Valuable	Negligible to High	Adjacent to proposed Project Footprint	Chronic	Irreversible	Periodic	Low	Not Significant	Moderate to High	Professional archaeologist to regularly check the site for signs of adverse effects resulting from mining activity as outlined in Archaeology Management Plan
Potential disturbance to unknown sites	Construction Operation	Unknown	Negligible to High	Proposed Project Footprint	Chronic	Irreversible	Single event or Periodic	Low	Not Significant	High	Archaeological monitoring and/or assessment as appropriate, determined by the BC Archaeology Branch as outlined in Archaeology Management Plan

7.1.10 Cumulative Effects Assessment

The proposed Project is expected to have residual effects on the Archaeology Valued Component (VC). These residual effects of concern are as follows:

1. Potential disturbance to EbPw-21; and,
2. Potential disturbance to unknown sites.

Although these effects are not expected to be significant, the need for a cumulative effects assessment must be considered as per provincial government guidance (BC EAO, 2013). The regional study area (RSA) for the Archaeology VC represents the boundary for the cumulative effects assessment.

7.1.10.1 Cumulative Effects Assessment Methodology

The following process was used to determine the need for a cumulative effects assessment for the Archaeology VC:

1. A list of past, present, and reasonably foreseeable projects and activities within the vicinity of the proposed Project was identified through industry-specific knowledge, available databases, working group input, and in consultation with local and regional government staff;
2. Each project or activity was assessed to determine if there would be a potential cumulative interaction with the residual effects of the proposed Project on Archaeology. Projects that were likely to cause (or had caused) potential disturbance to EbPw-21 or the potential disturbance to unknown sites were considered. Projects that were unlikely to interact with these residual effects were not included in the next step of the assessment process.
3. If projects and activities interacted with the residual effects of the Archaeology VC, the need for a detailed cumulative effects assessment was determined by considering the following questions based on provincial government guidance (BC EAO, 2013):
    a) Would the residual effect of the proposed Project result in a measurable change in the cumulative effect?
    b) Would the residual effect of the proposed Project substantively change the characteristics of the cumulative effect? (e.g., substantive increase in magnitude, extent, duration, or frequency)?
    c) Is the VC already significantly adversely affected by other projects and activities?
    d) Is the VC so sensitive to additional disturbance that even a small incremental adverse effect may be sufficient to cause a significant adverse cumulative effect?
4. If a detailed cumulative effects assessment was warranted, the scope and description of these potential cumulative effects were described.
5. Additional mitigation activities were outlined.
6. If residual cumulative effects were identified, these were characterized and evaluated.

7.1.10.1.1 List of Past, Present, and Reasonably Foreseeable Projects and Activities

The residual effects of past, present, and reasonably foreseeable projects and activities were identified. For a future project to be meaningfully considered in a cumulative effects assessment, the project was

publicly announced, had sufficient project details and a timeline, and was actively advancing towards completion. Projects and activities that were identified through industry-specific knowledge, available databases, working group input, and in consultation with local and regional government staff. A general description of the projects and activities, the status of each (i.e., past, present, future), their spatial and temporal boundaries, and the information sources used to identify them is provided in Table 3.10-1.

7.1.10.1.2 Interactions with past, present, and reasonable foreseeable projects

A matrix approach was used to clarify potential interactions between the residual effects of the proposed Project on the Archaeology VC and the identified resource projects, forestry activities, human habitations, and land/water uses (Table 7.1-6). Of the identified projects and activities listed, no interactions with past, present, and reasonably foreseeable projects and activities were made for the Archaeology VC.

Table 7.1-6 Projects and activities potentially contributing to the residual effects of the proposed Project on the Archaeology Valued Component (VC).

Project/Activity	Description	Potential interaction with the Archaeology VC residual effects?	Rationale
Forest Management	Crown land forest license (FL) tenure are held by Canadian Forest Products Ltd. (Canfor) and BC Timber Sales (BCTS). The mine footprint of the proposed Project is entirely within Canfor's FL but not all of this area is within the Total Harvestable Landbase (THLB), the area within which forest licensees may harvest trees.	No	Forestry activities involve road building, harvesting, and log hauling. Site EbPw-21 occurs on a vertical rock surface and is unsuitable for harvesting due to the terrain, slope and lack of trees. The vibrations caused by machine use are unlikely to be of the magnitude and duration to impact site EbPw-21. Because of these reasons, it is not anticipated that forestry will interact with the residual effects of the Archaeology VC by causing damage to site EbPw-21. Any proposed cutblocks or roads that overlap an Archaeological Overview Assessment (AOA) polygon of 'Medium' or 'High' potential is subject to a more detailed Archaeological Impact Assessment (AIA) prior to logging or road construction. Because of these reasons, it is not anticipated that forestry will interact with the residual effects of the Archaeology VC by causing damage to unknown archaeological sites.
Recreation facility	Canal Flats Wilderness Club operates a shooting range at the 9.3 km mark of the Kootenay FSR, approximately 2.5 km to the southwest of the proposed Project.	No	The shooting range involves the original clearing/construction of the range, its ongoing use, and associated travel to/from the range by recreationalists. An archaeology assessment was completed prior to the construction of the shooting range to ensure no archaeological sites would be impacted. The noise created at the range is unlikely to produce vibrations of significant magnitude and duration to interact with site EbPw-21.

Project/Activity	Description	Potential interaction with the Archaeology VC residual effects?	Rationale
			Recreationalists travel along established roadways and interaction with unknown archaeological sites is unlikely. Because of these reasons, it is not anticipated that the original creation of the shooting range as well as its continued use will interact with the residual effects of the Archaeology VC by causing damage to site EbPw-21 or to potential unknown sites.
River rafting	Mountain High River Adventures Ltd., Bootleg Mountain River Adventures, Silver Spray Rafting, and Glacier Raft Company use the Kootenay River for rafting and each have licensed pull-out points.	No	River rafting involves travelling down the Kootenay River on a raft, having the option of using established pull-out spots along the river, and travelling up/down the Kootenay FSR if these pullout spots are used. Rafting, the use of pull-outs, and travel along the FSR does not occur near site EbPw-21 and these activities do not create vibrations that may impact this site. These activities do not involve the disturbance of land and so it unlikely that they will interact with unknown potential sites. Because of this, it is not anticipated that these activities will interact with the residual effects of the Archaeology VC by causing damage to site EbPw-21 or to unknown sites. The original creation of the pull-outs are unlikely to have caused damage to site EbPw-21 due to their proximity but could have caused damage to unknown archaeological sites. It is unknown if archaeology assessments were conducted prior to the creation of the four licensed pull-out spots that occur between the proposed Project and the Village of Canal Flats. Because these areas are very small and used infrequently (as far as can be determined in this assessment), it is not anticipated that there will be an interaction with the residual effects of the

Project/Activity	Description	Potential interaction with the Archaeology VC residual effects?	Rationale
			Archaeology VC by causing damage to unknown archaeological sites.
Trapping	Akisqnuk First Nation, a community of the Ktunaxa Nation Council, is the registered owner of a trapline that overlaps the proposed Project site. The trapline that overlaps the proposed Project is not currently active and it is unsure when it will be reactivated.	No	Trapping involves the setting, checking and killing of animals caught on a trapline. All trapping activities do not involve land disturbance and are not anticipated to interact with unknown archaeological sites. In addition, trapping does not occur near site EbPw-21 nor do trapping activities create vibrations that may impact this site. Because of these reasons, it is not anticipated that there will be an interaction between trapping and the residual effects of the Archaeology VC by causing damage to site EbPw-21 or to unknown archaeological sites.
Guide outfitting	Akisqnuk First Nation, a community of the Ktunaxa Nation Council, is the registered owner of a guide outfitting territory (425G001) that overlaps with the proposed Project. The territory does not currently have a registered outfitter and it is unknown when it will be reactivated.	No	Guide outfitting involves travel to/from the guiding territory, and hunting within the territory (RMBS is the primary species targeted for guide outfitting in the region.). No guide outfitting activities involve land disturbance and are not anticipated to interact with unknown archaeological sites. In addition, guiding does not occur near site EbPw-21 nor does it create vibrations that may impact this site. Because of these reasons, it is not anticipated that there will be an interaction between guide outfitting and the residual effects of the Archaeology VC by causing damage to site EbPw-21 or to unknown archaeological sites.
Human habitation	The J2 Ranch is situated on the south side of the Kootenay River and is located 6 km southwest of the proposed Project. The Village of Canal Flats occurs 12 km to the southwest of the proposed Project.	Unlikely	The J2 ranch involves agricultural and ranching activities. The Village of Canal Flats involves residential and commercial development as well as a network of infrastructure and roadways.

Project/Activity	Description	Potential interaction with the Archaeology VC residual effects?	Rationale
			These human habitations do not occur near site EbPw-21 nor do are they expected to create vibrations that may impact this site. The J2 Ranch has been operating for at least 60 years and Canal Flats has been occupied for thousands of years by First Nations people and then established by European settlers in the 1880's. It is anticipated that the establishment of these areas likely caused impact to unknown archaeological sites, however, the extent of this remains unknown. Because of these reasons, it is unlikely to anticipate interactions between human habitations and the residual effects of the Archaeology VC by causing damage to site EbPw-21 or to unknown archaeological sites.
Residential development	Painted Ridge is a residential development located within Canal Flats on the southeastern shore of Columbia Lake. The infrastructure of this development is complete, however, no houses have been constructed. There is no anticipated date for when future development will occur.	Unlikely	The Painted Ridge residential development included land clearing and the construction of infrastructure. Due to its distance from the proposed Project (approximately 12 km straight line distance west) and the intervening terrain (mountainous), it is not anticipated that Painted Ridge will interact with the residual effects of the Archaeology VC by causing damage to site EbPw-21. A project-specific archaeological assessment was completed at Painted Ridge and no impacts to sites outside of the development footprint will occur.

Project/Activity	Description	Potential interaction with the Archaeology VC residual effects?	Rationale
			Because of these reasons, it is unlikely to anticipate interactions between this residential development and the residual effects of the Archaeology VC by causing damage to site EbPw-21 or to unknown archaeological sites
Elkhorn Gypsum Mine	The Proponent's existing gypsum mine site is located approximately 13 km east of Invermere, BC. This operation will phase out of gypsum production as the proposed Project is developed.	Unlikely	The Elkhorn Gypsum Mine is a part of a 60-year old gypsum mining operation in the Windermere Creek drainage that involves drilling/blasting, crushing and hauling activities. Due to its distance from the proposed Project (approximately 30 km straight line distance north) and the intervening terrain (mountainous), it is not anticipated that Elkhorn will interact with the residual effects of the Archaeology VC by causing damage to site EbPw-21. The original creation of Elkhorn is unlikely to have caused damage to site EbPw-21 through physical disturbance or vibrations due to its proximity. It is unknown if Elkhorn caused damage to unknown archaeological sites through the disturbance of ground. Although this is unknown, it is unlikely to anticipate an interaction between Elkhorn and the residual effects of the Archaeology VC by causing damage to unknown archaeological sites.

Project/Activity	Description	Potential interaction with the Archaeology VC residual effects?	Rationale
Baymag Mine	Baymag is a crystalline magnesite mining operation that began in 1982. It operates year round and is located at the 80 km marker of the Kootenay Forest Service Road.	Unlikely	Baymag as an industrial **mining** operation that involves open pit mining and hauling of ore to processing facilities in Alberta. Due to its distance from the proposed Project (approximately 30 km straight line distance northeast) and the intervening terrain (mountainous), it is not anticipated that Baymag will interact with the residual effects of the Archaeology VC by causing damage to site EbPw-21. The original creation of Baymag is unlikely to have caused damage to site EbPw-21 through physical disturbance or vibrations due to its proximity. It is unknown if Baymag caused damage to unknown archaeological sites through the disturbance of ground. Mines follow a strict regulatory process and it is assumed that Baymag would have had to complete archaeological assessments as a part of this permitting process. Although this is unknown, an interaction between Baymag and the residual effects of the Archaeology VC by causing damage to unknown archaeological sites is not anticipated.

7.1.10.1.3 Is a Detailed Cumulative Effects Assessment Required?

No interactions between the residual effects of the proposed Project on the Archaeology VC and past, present, or reasonably foreseeable projects and activities were identified. As such, a detailed cumulative effects assessment is not warranted for the Archaeology VC, and therefore it is not carried forward in this process.

7.1.11 Follow-up Strategy

In areas of archaeological potential, monitoring by an archaeologist may be required during some or all phases of the proposed Project. Activities will be undertaken in accordance with the Archaeology Management Plan, which includes a 'Chance Find Procedure'. The Archaeology Management Plan was developed in consultation with professional archaeologists. If cultural remains are uncovered all work must stop and the Chance Find Procedure initiated without delay.

7.1.12 Conclusion

Archaeological site EbPw-21 has been appropriately considered in this assessment. The Proponent has committed to avoiding EbPw-21, altering the blasting design, and monitoring vibration activity when mining near the pictograph. In the event of a chance find, further investigation (i.e. monitoring or testing under a Site Alteration Permit [SAP]) will be conducted at the discretion of the BC Archaeology Branch.

Although AIAs are inherently rigorous and target areas with moderate to high archaeological potential, there is still the potential for unknown archaeological resources to be discovered on-site during construction, operation, closure and post-closure phases of the proposed Project. Due to this potential, a residual effect of damage or destruction to unknown archaeological sites was identified for the proposed Project. The residual effect is predicted not to be significant because the likelihood of further archaeological finds is expected to be low. The confidence in this prediction is high.