

8.14 HERITAGE RESOURCES

Heritage Resources are those resources, both human and natural, created by activities from the past that remain to inform present and future societies of that past. Heritage Resources are relatively permanent, although highly tenuous, features of the environment; if they are present, their integrity is highly susceptible to construction and ground-disturbing activities. Heritage Resources has been selected as a valued environmental component (VEC) in recognition of the interest of provincial and federal regulatory agencies who are responsible for the effective management of these resources, the general public as a whole, and First Nations that have an interest in the preservation and management of Heritage Resources related to their history and culture. For this VEC, Heritage Resources include consideration of historical, archaeological, architectural (built heritage), and palaeontological resources. Heritage Resources will focus on archaeological, architectural (built heritage), and palaeontological resources, as all resources that would be understood to be “historical” are captured under one of the other heritage resource types. Further definition of archaeological, architectural, and palaeontological resources as components of Heritage Resources is provided in Section 8.14.1.

Potential interactions between the Project and Heritage Resources that may cause environmental effects are described in this VEC. Any Project activity that includes surface or sub-surface ground disturbance has the potential for interaction with Heritage Resources where they are present. Accordingly, Construction represents the Project phase with the greatest potential for interaction with Heritage Resources, as it is during this phase that the majority of the ground breaking and earth moving activities of surface soils will take place to construct Project components.

From documentary research and field investigations carried out in support of the Project, there were no known Heritage Resources in the Project Development Area (PDA, Figure 1.2.1) prior to the initiation of the shovel testing recommended within the PDA. Although New Brunswick in general, and many areas within and in the vicinity of the PDA, have a rich history of human activities such as forestry and mining, the PDA itself has not experienced any known settlement during the Historic Period. Based on information gathered by local First Nations, Aboriginal persons have used areas of central New Brunswick, including those near the Project, in carrying out their traditional activities. The discovery of archaeological resources in the PDA during shovel testing carried out in 2013 and 2014 provides further evidence that there has been Aboriginal use of this area in the distant past. The archaeological resources discovered within the PDA appear to date from between 6,500 and 7,500 years before present, based on the shape of the projectile points that have been recovered. During the Historic Period, there has been little settlement within and near the PDA prior to the construction of a sawmill near Juniper on the South Branch Southwest Miramichi River in 1914 (Stone 1953). Similarly, there are no known architectural or palaeontological resources in or near the PDA.

During the field survey conducted in 2011 a number of areas with elevated potential to contain archaeological resources were identified, in particular along the shorelines of watercourses that have been identified by the Provincial archaeological potential map received from the provincial regulator (Archaeological Services of the New Brunswick Department of Tourism, Heritage and Culture). Sub-surface shovel testing carried out in 2013 and 2014 has identified several hundred artifacts and recorded a number of archaeological sites, most of which are in the area of the Open Pit. Additionally, two artifacts were recovered from the area of the tailings storage facility (TSF). Shovel testing will be

continued to delineate the extent of these resources within the PDA. As agreed with NBDELG and as described in SML's ESMS (Appendix D), SML intends to complete the archaeological test pitting in the Tailings Storage Facility (TSF) and Open Pit areas prior to commencement of construction. The rest of the test pitting, and any consequent archaeological site mitigation, will be completed according to a schedule to be agreed with Archaeological Services and NBDELG.

As a result of discovering archaeological resources in the PDA, a Heritage Mitigation Plan was developed (Stantec 2014b) to ensure that all work is conducted in accordance with the provincial *Guidelines for Conducting Archaeological Assessments in New Brunswick* (Archaeological Services 2012), and the New Brunswick *Heritage Conservation Act*. Given that all archaeological mitigation will be completed in accordance with the Heritage Mitigation Plan and applicable legislation and Guidelines, and that these activities will be conducted in consultation with Archaeological Services, there will be no unauthorized disturbance to heritage resources that are not mitigated and therefore the Project will not have a significant adverse environmental effect on Heritage Resources. Similarly, the Project will not, in combination with other past, present, or reasonably foreseeable future projects or activities, result in significant cumulative environmental effects.

8.14.1 Scope of Assessment

This section defines the scope of the environmental impact assessment (EIA) of Heritage Resources in consideration of the regulatory setting, the issues identified during public and First Nations engagement activities, potential Project-VEC interactions, and the existing knowledge of the PDA.

8.14.1.1 Rationale for Selection of Valued Environmental Component, Regulatory Context, and Issues Raised During Engagement

Heritage Resources has been selected as a VEC in recognition of the interest of provincial and federal regulatory agencies who are responsible for the effective management of these resources, the general public as a whole, and potentially affected First Nations that have an interest in the preservation and management of Heritage Resources related to their history and culture.

For this VEC, Heritage Resources will focus on structures, sites or things that are of historical, archaeological, architectural, and palaeontological significance.

Archaeological and historical resources are defined as any physical remnants on or below the ground surface which show evidence of manufacture, alteration, or use by humans from the past. If present, these resources provide information on past human use of, and interaction with, the physical environment in the area. They can include both Pre-Contact (*i.e.*, up to the settlement of the area by Europeans) resources and Historic Period (*i.e.*, from European settlement to the mid-20th Century) resources. These resources may be from the earliest times of human occupation to the more recent past (*e.g.*, 100 years before present).

Architectural resources (also known as "built heritage") are defined as any human-made standing structure that provides information on a person, place or event from the past or may have intrinsic value due to some element of its design or construction. In addition to being susceptible to the activities of Project development, these resources are also considered susceptible to changes in their setting, such as the addition of new structures in the immediate area of such resources.

Palaeontological resources (fossils) are works of nature consisting of or containing any remains, trace or imprint of a multi-cellular plant or animal or bacteria preserved in the Earth's crust and date to geological times. These resources are contained in bedrock and may be near the surface or relatively deep.

As required by the Final Guidelines (NBENV 2009), the assessment of Heritage Resources will consider resources of historical, archaeological, architectural, and palaeontological importance. Federally, the assessment of Heritage Resources is required based on its inclusion in the definition of environmental effect within the *Canadian Environmental Assessment Act (CEAA)*. The approach to the EIA of the Project on Heritage Resources to meet the requirements of the Final Guidelines and CEAA was defined in Section 4.13 of the Terms of Reference (Stantec 2012a).

There were no specific issues or concerns raised by the general public or stakeholders in relation to Heritage Resources during engagement activities conducted as part of the Project. However, considerable interest and concern regarding archaeological resources was expressed by First Nations representatives as part of ongoing Aboriginal engagement activities, particularly with respect to the potential for the PDA to harbour archaeological resources of potential significance to First Nations. Specifically, First Nations expressed the opinion that any archaeological artifacts that might be present in the PDA (should any be discovered) would be of considerable importance to their identity, history, heritage and culture, provide evidence of their occupation and traditional use rights, and contribute to traditional ecological knowledge. To address these concerns, Aboriginal persons were invited to participate in archaeological field programs; discussions with First Nations knowledge holders were held to confirm findings and the extent and content of field programs; field visits to observe archaeological field work were offered; Aboriginal consultation was conducted in the issuance of Archaeological Field Research Permits; First Nations monitors and a First Nations archaeologist were retained to oversee the shovel testing work; and considerable discussion with First Nations representatives and regulatory agencies was carried out to define and respond to these issues and concerns as part of the EIA and Project design. In addition, a comprehensive Heritage Mitigation Plan was developed and approved by the Province in July 2014, following First Nations consultation, to guide all future archaeological work on the Project site. During the course of those discussions, First Nations requested that all shovel testing be completed before the Project receives EIA approval, contrary to the requirements of the Final EIA Terms of Reference. Further discussion with the provincial government has led to an agreement that completion of the shovel testing program and any consequent mitigation will not be required before EIA approval.

During the background research for Heritage Resources, various local individuals, regional experts and regulatory agencies were contacted in order to gather information on potential Heritage Resources within the PDA. The nature of these discussions and the relevant findings are described in the Baseline Heritage Resources Technical Report for the Project (Stantec 2012j).

Archaeological Services requested that, in addition to all areas identified by the archaeological potential map as having elevated archaeological potential, the archaeological assessment consider if any areas within the PDA had previously contained large water bodies or lakes (e.g., post-glacial lakes) since the shorelines of such water bodies appear to be a selection criterion for Palaeo-Indian habitation sites.

To support the archaeological survey, a meeting was held with two Aboriginal knowledge holders identified by the Woodstock First Nation in order to obtain information that could be used to further augment the Baseline Heritage Resources Technical Report (Stantec 2012j) and associated archaeological programs for the Project. The results of the archaeological survey were presented to the knowledge holders who were asked if they had any information that could assist the archaeological assessment of the PDA. The knowledge holders provided information on relatively recent activity within the PDA (e.g., hunting and trapping); however, they indicated they were not aware of any information regarding the potential existence of burials, settlements or archaeological resources within the PDA.

No other issues were raised by individuals or groups who were contacted regarding the assessment of Heritage Resources for the Project.

8.14.1.2 Selection of Environmental Effect and Measurable Parameter

The environmental assessment of Heritage Resources focuses on the following environmental effect:

- Change in Heritage Resources.

The environmental effect has been selected in recognition of the requirements of the Final Guidelines (NBENV 2009) and the Terms of Reference (Stantec 2012a) with respect to the need to assess environmental effects of the Project on Heritage Resources, and in recognition of the interest of regulatory agencies, the general public as a whole, and potentially affected First Nations that have an interest in the preservation and management of Heritage Resources related to their history and culture. This environmental effect reflects the definition of “environmental effect” in CEAA.

The measurable parameter used for the assessment of the environmental effect presented above and the rationale for its selection is provided in Table 8.14.1.

Table 8.14.1 Measurable Parameter for Heritage Resources

Environmental Effect	Measurable Parameter	Rationale for Selection of the Measurable Parameter
Change in Heritage Resources	Presence/absence of a heritage resource.	<ul style="list-style-type: none"> • The Final Guidelines (NBENV 2009) and Terms of Reference (Stantec 2012a) state that the effect of the Project on physical and cultural heritage, and any structure, site or thing that is of historical, archaeological, palaeontological or architectural significance must be included in the assessment. • The <i>Heritage Conservation Act</i> outlines the legislative protection of archaeological sites, built heritage sites, palaeontological sites, and burial grounds by the Province of New Brunswick. To comply with the Act, an assessment of heritage resources is required.

8.14.1.3 Temporal Boundaries

The temporal boundaries for the assessment of the potential environmental effects of the Project on Heritage Resources include the three phases of Construction, Operation, and Decommissioning, Reclamation, and Closure of the Project as defined in the Project Description (Chapter 3). Particular emphasis is placed on Construction as that is the phase where most ground disturbing activities of surface soils associated with the Project are conducted, although ground disturbance will continue during Operation in the areas of the open pit and tailings storage facility (TSF).

The temporal boundaries for the characterization of existing conditions include the background research and archaeological assessment conducted in 2011, as well as the shovel testing conducted in 2012, 2013, and 2014 to document the archaeological resources in the PDA and describe the mitigation completed to date. Shovel testing and associated mitigation of discovered archaeological resources is expected to continue in 2015.

8.14.1.4 Spatial Boundaries

The spatial boundaries for the environmental effects assessment of Heritage Resources are defined below.

Project Development Area (PDA): The PDA (Figure 8.14.1) is the most basic and immediate area of the Project, and consists of the area of physical disturbance associated with the Construction and Operation of the Project. Specifically, the PDA consists of an area of approximately 1,253 hectares that includes: the open pit; ore processing plant; storage areas; TSF; quarry; the relocated Fire Road and new Project site access road; and new and relocated power transmission lines. The PDA is the area represented by the physical Project footprint as detailed in Chapter 3.

Local Assessment Area (LAA): The LAA (Figure 8.14.1) is the maximum area within which Project-related environmental effects can be predicted or measured with a reasonable degree of accuracy and confidence. Since the potential environmental effects on Heritage Resources are limited to the footprint of physical disturbance associated with the Project, the LAA for Heritage Resources is limited to the PDA.

Regional Assessment Area (RAA): The RAA (Figure 8.14.2) is the area within which the Project's environmental effects may overlap or accumulate with the environmental effects of other projects or activities that have been or will be carried out. The extent to which cumulative environmental effects for Heritage Resources may occur depend on physical and biological conditions and the type and location of other past, present, or reasonably foreseeable future projects or activities that have been or will be carried out, as defined within the RAA. For Heritage Resources, the RAA is defined as an area within the Nashwaak River Watershed between the Southwest Miramichi Upper Watershed and the Central Saint John Keswick Watershed. The RAA straddles a topographical divide that separates the headwaters of McBean Brook and Napadogan Brook watersheds. The RAA is located in the southern portion of the Madawaska Uplands of the Central Uplands Ecoregion which is characterized by broad valleys, rolling hills, and many lakes. In addition, the new 138 kV transmission line extends into the Valley Lowlands Ecoregion.

8.14.1.5 Administrative and Technical Boundaries

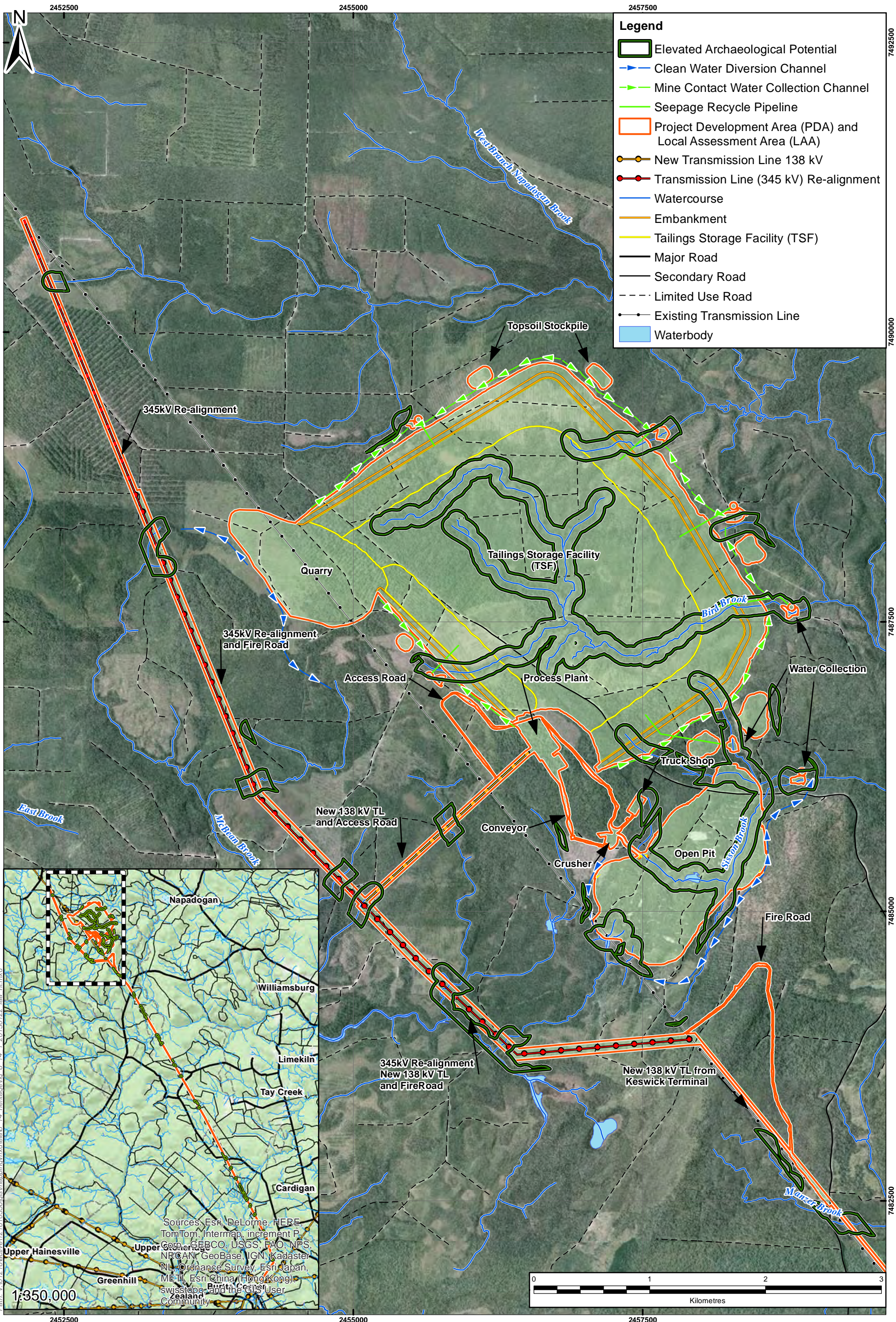
The following section describes the Administrative and Technical Boundaries that were considered in assessing the potential environmental effects of the Project on Heritage Resources. The regulatory context for the assessment of Heritage Resources is summarized in Section 8.14.1.1 above, in terms of the legislative, regulatory and policy instruments at the provincial and federal levels.

Except on federal land, the protection of heritage resources in New Brunswick is a provincial responsibility. Nevertheless, heritage resources, as described within the definition of an “environmental effect” under the federal *CEAA*, are consistent with the definition provided under the Final Guidelines for this Project (NBENV 2009).

Heritage Resources in New Brunswick are regulated under the New Brunswick *Heritage Conservation Act*. The Act defines multiple requirements relating to heritage in the province, the legislative protection for these resources, permitting requirements for those doing research on and/or encountering these resources, and penalties for those who violate the requirements of the Act. The regulatory management of Heritage Resources falls under the New Brunswick Department of Tourism, Heritage and Culture, and is administered by its Heritage Branch.

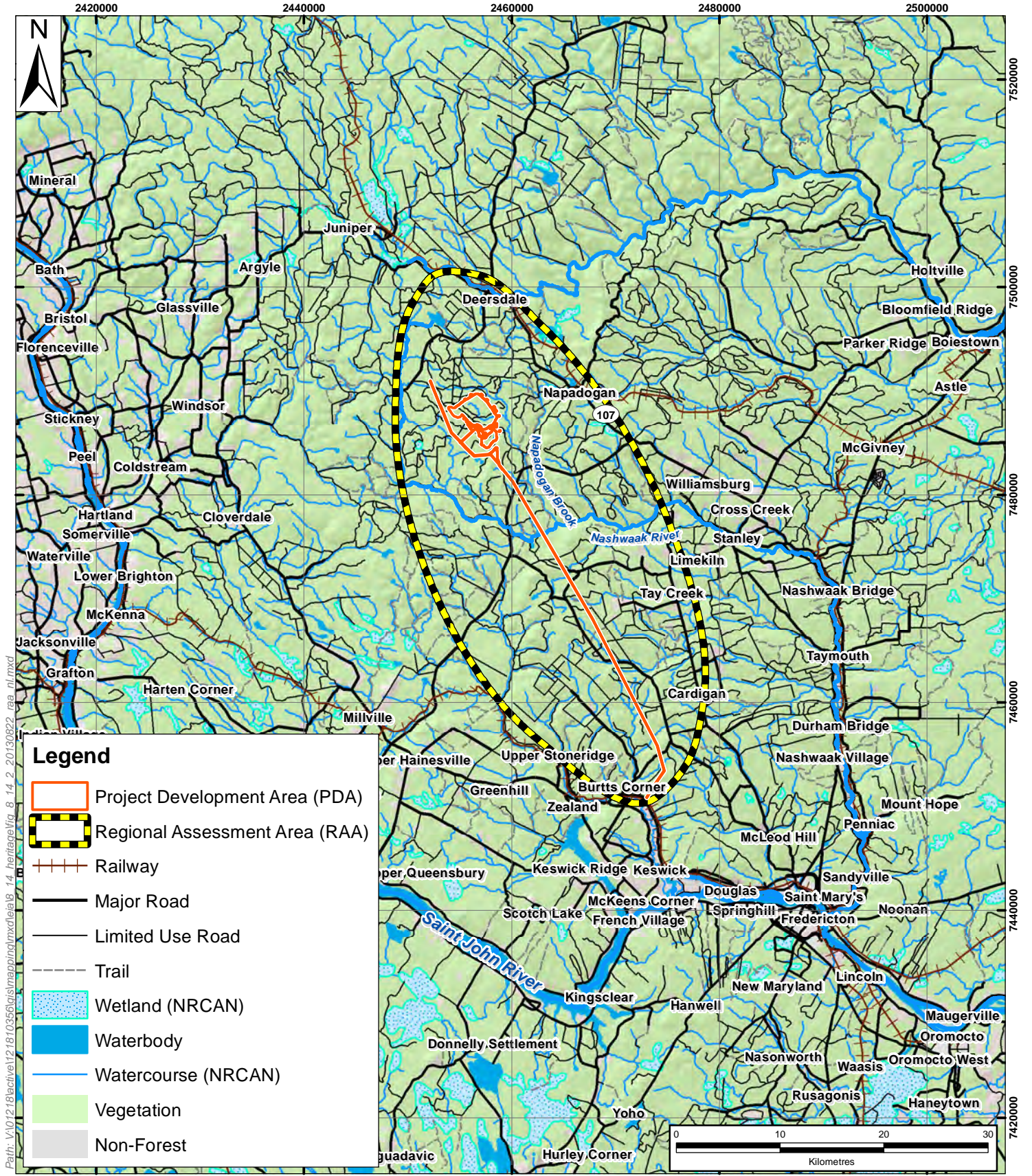
The mandate of the Heritage Branch is to coordinate and support those activities in the Province designed to promote heritage awareness and to protect and preserve heritage resources as well as to develop provincial policy and a legislative framework for the protection and preservation of heritage assets, including archaeological resources. The Heritage Branch also manages and maintains provincial heritage databases, and coordinates the administration of provincial legislation including archaeological permitting, and participates in environmental assessment reviews and land use policy and planning. Within the Heritage Branch are the offices of Archaeological Services; Historic Places; and the New Brunswick Museum (NBM); the mandates of which are defined briefly below.

- Archaeological Services is responsible for the management of the Province's archaeological heritage. This responsibility includes protecting, preserving, and interpreting New Brunswick's non-renewable archaeological resources, maintaining the archaeological sites database, collections management, archaeological resource impact assessment, salvage, and liaison with First Nations on archaeological issues. In addition, it is responsible for issuing field research permits to archaeological researchers. Any field work for the purpose of investigating a location for potential archaeological resources requires a permit to be issued to a qualified archaeological professional.
- Historic Places promotes increased awareness and stewardship of New Brunswick's built heritage resources (architectural resources). Built heritage resources include buildings, other structures, landscapes and districts. Historic Places also administers provincial involvement in the recognition, commemoration and designation of historic places in New Brunswick (New Brunswick Department of Tourism, Heritage and Culture n.d.).
- The New Brunswick Museum serves both as the provincial museum and as the administrator of all activities related to palaeontology in New Brunswick. Its Board of Directors reports to the Minister of Tourism, Heritage and Culture. In addition to maintaining fossil collections and extensive palaeontological databases, it issues permits for palaeontological field research to qualified professionals as well as interested amateurs (New Brunswick Department of Tourism, Heritage and Culture n.d.).



NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

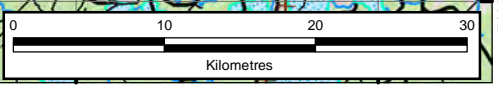
Project Development Area (PDA), and Local Assessment Area (LAA) for Heritage Resources Sisson Project: Environmental Impact Assessment (EIA) Report, Napadogan, N.B.		Scale:	Project No.:	Data Sources:	Fig. No.:	
		1:30,000	121810356	NBDNR	8.14.1	
Client:	Sisson Mines Ltd.	Date: (dd/mm/yyyy)	Dwn. By:	Appd. By:		
		23/11/2014	JAB	DLM		



Path: V:\012\18\active\12_18\10356\gis\mapp\raa\raa_n1.mxd

Legend

- Project Development Area (PDA)
- Regional Assessment Area (RAA)
- Railway
- Major Road
- Limited Use Road
- Trail
- Wetland (NRCAN)
- Waterbody
- Watercourse (NRCAN)
- Vegetation
- Non-Forest



NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

<h2 style="margin: 0;">Regional Assessment Area (RAA) for Heritage Resources</h2> <p style="margin: 0;">Sisson Project: Environmental Impact Assessment (EIA) Report, Napadogan, N.B.</p>		Scale: 1:500,000	Project No.: 121810356	Data Sources: SNB NRCAN, ESRI	Fig. No.: 8.14.2
		Date: (dd/mm/yyyy) 23/11/2014	Dwn. By: JAB	Appd. By: DLM	
Client: Sisson Mines Ltd.					

The assessment for Heritage Resources is undertaken through the completion of historical, archaeological, architectural, or palaeontological research in New Brunswick and is referred to as a Heritage Assessment. The conduct of a Heritage Assessment is governed by provincial regulations and guidelines, such as the *Guidelines and Procedures for Conducting Professional Archaeological Assessments in New Brunswick* (“the Archaeological Guidelines”, Archaeological Services 2012) issued under the *Heritage Conservation Act* that defines and protects heritage resources in New Brunswick. The Archaeological Guidelines describe the minimum requirements and procedures for the assessment of archaeological resources.

Under the Archaeological Guidelines, background research must be undertaken to ascertain the presence of any known archaeological resources, and then an archaeological survey is carried out in areas of elevated archaeological potential to determine the potential for any as-yet undiscovered archaeological resources to exist within the PDA. The potential presence of undiscovered heritage resources is determined by a sub-surface examination (*i.e.*, shovel testing) of these areas of elevated archaeological potential, based on recommendations made during the archaeological survey. Based on the requirements set out in the Archaeological Guidelines and archaeological potential modelling by Archaeological Services, the shoreline areas of all watercourses within the PDA were identified as having elevated potential (and hence may warrant shovel testing) (Figure 8.14.1). Specifically, areas 0-50 m from a watercourse bank or 100 m from the confluence of any two watercourses were identified as high archaeological potential, and areas 50-80 m from a watercourse bank were identified as medium archaeological potential. These areas were the focus of the archaeological survey completed for the Project.

The assessment of Heritage Resources has technical limitations of the methods used to gather information or predict and determine the presence of potential heritage resources. These pertain to the limitations relating to: the availability of information on known heritage resources; the ability to predict the presence or confirm the absence of heritage resources within a given location; and the methods used for conducting the archaeological survey for such resources. Further, some data sources are more complete and/or accurate than others. For example, a database listing known archaeological sites are limited by whether or not an archaeological survey (both professional and non-professional surveys) has been completed at a given location or if the discovery of any artifacts has been reported by members of the public. In locations where no such reports have been submitted and no professional archaeological survey has been completed (such as with the PDA for the Sisson Project), there will be no known archaeological resources in provincial databases.

8.14.1.6 Residual Environmental Effects Significance Criteria

A significant adverse residual environmental effect on Heritage Resources is one that results in a permanent Project-related disturbance to, or destruction of, all or part of a heritage resource (*i.e.*, archaeological, architectural or palaeontological resource) considered by the provincial heritage regulators to be of major importance due to factors such as rarity, undisturbed condition, spiritual importance, or research importance, and that cannot be mitigated or compensated.

The implementation of mitigation is a key element of this significance criterion. Any archaeological excavation would be implemented only under permit issued by the Province of New Brunswick and in consultation with the appropriate regulatory agencies. It is anticipated that the Province and the Proponent would engage First Nations as appropriate and that the active participation of the First Nations would be sought in the case of a Pre-contact or First Nation historic period archaeological site. Given that undertaking archaeological mitigation or excavation activities under appropriate regulatory authorization is an occurrence contemplated in the *Heritage Conservation Act* and the *Archaeological Guidelines* (2012), it is anticipated that the implementation of such an activity under these auspices, if required, could not be considered a significant adverse residual environmental effect.

8.14.2 Existing Conditions

Existing conditions within the LAA were determined using the following methods.

- Background research was conducted to gain an understanding of the general and specific history of the LAA, to determine the location of any known heritage resources within it, and to identify locations with elevated potential to contain previously undiscovered heritage resources. A wide variety of information sources were consulted to determine existing knowledge for archaeological resources in the PDA, and to gather information that would assist in the determination of any areas of the PDA that may potentially hold previously undiscovered heritage resources. In addition, various regional and technical experts were contacted regarding information with respect to the PDA. Information sources included provincial databases, provincial archives, provincial and local museum records, local historical societies, Aboriginal knowledge holders, and heritage regulators.
- An archaeological survey of the PDA was conducted to assess the potential for archaeological resources to be present within the PDA through a surface examination of all watercourse banks and their associated archaeological potential zones. The archaeological survey consists of a field investigation of the PDA based on predictive models (the archaeological potential map) and information gathered from background research to conduct a physical assessment to identify any surface heritage resources and to develop a methodology to investigate the potential presence of sub-surface heritage resources.
- The implementation of shovel testing in the PDA, as mitigation for environmental effects on Heritage Resources (discussed later). This includes the shovel testing completed in 2012, 2013, and 2014 (as of September 19, 2014, when shovel testing was suspended). Shovel testing and associated mitigation of discovered archaeological resources is expected to continue in 2015.

8.14.2.1 Background Research

Archaeological resources (Pre-Contact Period and Historic Period), existing built environment, and palaeontological resources were considered as existing conditions as part of this VEC.

As part of the background research, a search of the provincial archaeological site database was conducted at Archaeological Services in June 2011 for the archaeological survey of the mine site conducted during the summer of 2011, and in June 2012 for the archaeological survey of the transmission line corridor conducted during the fall of 2012. This research provides information on the documented history of the PDA to assist in planning the archaeological survey. An archaeological site search consists of a review of:

- archaeological potential maps of areas determined by Archaeological Services to hold elevated potential for Pre-Contact Period (*i.e.*, up to the settlement of the area by Europeans) archaeological sites (Archaeological Potential Map, Stantec 2012k) based on anthropological, geographic, and geological data; and
- the provincial archaeological sites database for any known archaeological sites within or near the PDA.

The archaeological potential map of areas determined by Archaeological Services to hold elevated archaeological potential within the PDA was obtained (Stantec 2012k). The term “elevated archaeological potential” is used to denote areas determined by Archaeological Services to have high or medium archaeological potential, where high archaeological potential is defined as being from 0-50 m from a watercourse, and medium archaeological potential is defined as 50-80 m from the watercourse. A review of the archaeological potential map did not identify the presence of any cemeteries, plane crash sites, Historic Period sites, Pre-Contact Period sites, or Proto-Historic Period sites within the PDA. The archaeological potential map obtained in 2011 was suitable for the Project site as well as for the relocation of the existing 345 kV transmission line and Fire Road (Suttie, B. Personal communication, July 23, 2012), whereas a new archaeological potential map was obtained prior to the field assessment of the new 138 kV electrical transmission line.

A review of the provincial archaeological sites database was conducted to identify known archaeological sites within the PDA, and to determine the potential for any previously undiscovered archaeological resources to be present. A review of the archaeological potential map and databases confirmed that there are no known archaeological sites within the PDA. The archaeological potential map indicated several areas that may have elevated potential for Pre-Contact Period archaeological sites based on anthropological, geographic, and geological data; specifically those areas in proximity to watercourses.

Figure 8.14.3 presents the methodology followed by the Study Team in accordance with the Archaeological Guidelines (Archaeological Services 2012) for evaluating the archaeological potential of the PDA. Additional details for the archaeological impact assessment are presented in the text following Figure 8.14.3.

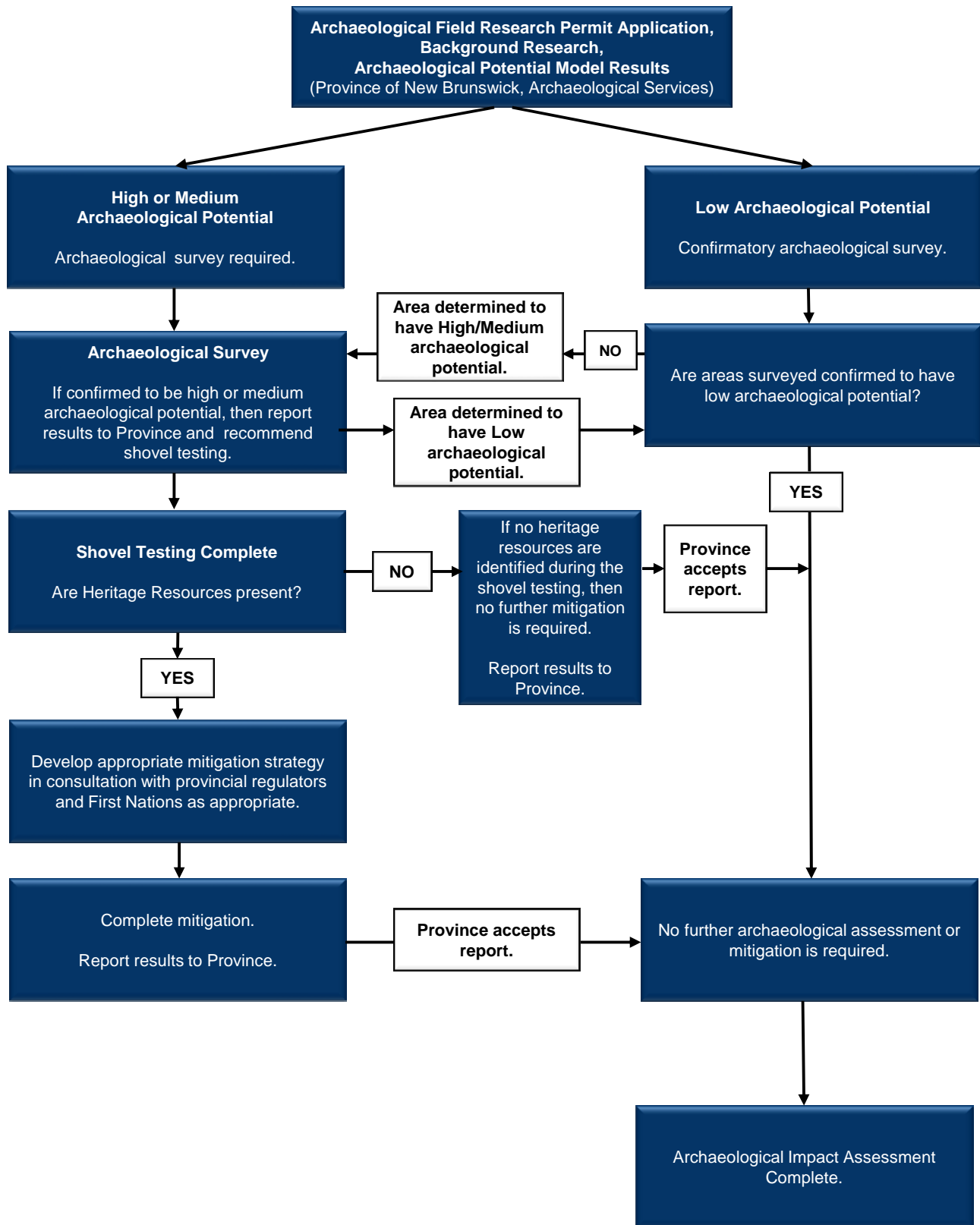


Figure 8.14.3 Steps for the Evaluation of High, Medium and Low Archaeological Potential Areas

According to the Archaeological Guidelines (2012), the provincial archaeological potential model states that shoreline areas within 80 m of the banks of most watercourses (and 100 m at river confluences) within the PDA are considered to have elevated (*i.e.*, high or medium) potential to contain archaeological resources. The Province has made this determination based on an analysis of the locations of known archaeological sites throughout New Brunswick in combination with various topographical data (*e.g.*, slope, wetlands). During the archaeological survey conducted for the Project, the Study Team tested the results of the potential model by assessing the ground conditions within the areas modeled as having elevated archaeological potential. In areas of, for example, steep slope, year-round saturated ground conditions, and extensive surface rock, it is determined generally that these locations are not suitable for habitation by Pre-Contact people, and the results of the model are recommended to be adjusted from “elevated” archaeological potential to “low” archaeological potential, and shovel testing in these areas is not warranted. In areas that are confirmed during the archaeological survey to be suitable for human settlement, hence confirming the model result of “elevated” archaeological potential, shovel testing is required prior to ground breaking construction activities associated with the Project that might disturb these areas.

Equally as important was the review of areas determined by the Province’s archaeological potential model to have low potential for archaeological resources. These areas were also examined by the permitted archaeologist, and if there was elevated archaeological potential at specific locations within these low potential areas, they were recommended for shovel testing.

If no archaeological resources are identified as a result of shovel testing, the Province considers the model “tested” at these locations and that it is very unlikely that any archaeological resources are present. Thus, no further mitigation is required and Project activities are allowed to proceed. If any archaeological resources are identified during the shovel testing, then further mitigation (*e.g.*, further shovel testing, archaeological excavation) is required in consultation with Archaeological Services, as well as First Nations in the context of Pre-Contact or Historic Period First Nation archaeological resources, before they are disturbed by construction activities.

Based on the requirements of the Archaeological Guidelines, areas indicated on the archaeological potential map as having elevated archaeological potential require an archaeological assessment to determine the level of shovel testing required within 80 m of lands bordering watercourses and 100 m at watercourse confluences within the PDA. An archaeological survey of low potential areas is also required by the Archaeological Guidelines (Archaeological Services 2012). The background research did not identify any areas in particular that were considered to have elevated potential for archaeological resources beyond the 80 m of land bordering watercourses (100 m at watercourse confluences).

Several regional experts were contacted regarding additional historical information near the PDA, and the potential historical presence of large water bodies or lakes (*e.g.*, post-glacial lakes) within the PDA, as these water bodies appear to be a selection criterion for Palaeo-Indian habitation sites. As part of the ongoing research on the surficial geology of New Brunswick, an examination of the PDA by staff from NBDNR has not located any lacustrine sediment within the PDA (Seaman, A. and Broster, B. Personal communications, November 24, 2011). Thus, it is very unlikely that post-glacial lakes formed in the PDA during the melting of the Younger Dryas glaciers (Seaman, A. and Broster, B. Personal communications, November 24, 2011).

Further research has demonstrated that the area specifically within the Open Pit area is characterized by complex surficial geology relating to both Illinoian and Wisconsinan glaciation, initial Wisconsinan deglaciation during the Allerød warm period, and the Younger Dryas ice re-advance, followed by deglaciation that may not have terminated until the early Holocene. During the Allerød (Seaman 2006), this inundation would be a series of short-lived (10-100 years, possibly shorter), small, and likely biologically dead (e.g., sediments from Glacial Lake Acadia in the Saint John River drainage basin were devoid of diatoms and forams (Seaman 1982)), kettle lakes in glaciofluvial outwash deposits, the latter deposits formed by meltwater released by “dead ice” melting *in situ* as a result of down-wasting of the Appalachian Glacier Complex, resulting in the latest ice to melt occupying topographically low areas (Seaman *et al.* 1993; NBDNRE Open File OF 93-1). Organics, particularly spruce, were present in this area during the Allerød, as indicated by the needles dated from a test trench excavated within the Open Pit area (Seaman and McCoy 2008). These kettled outwashes would not be visible now due to the reworking of their sediments into the Younger Dryas till, obscured again by subsequent ablation melt-out. Shorelines relating to these features would be highly ephemeral due to their small size and short-lived nature (Seaman, A. Personal communication, September 25, 2014). In addition, hummocky terrain visible on LiDAR maps is related to hummocky ablation moraines deposited during the melting of the Younger Dryas glacier, superimposed on sub-glacial Caledonia Phase Rogen moraines, which resulted in ponding events post-Younger Dryas, not during the Allerød (Seaman, A. Personal communication, September 25, 2014). In summary, although it may be presumably correct to assume that the Open Pit area might have been inundated some time during the past, it could also presumably be correct that any low-lying area in the province could have been inundated post-glaciation—this suggests that low-lying topography (like that within the Open Pit area) is not necessarily a good indication of the formation of a substantial post-glacial lake.

Based on these interpretations, it is unlikely that substantial post-glacial lakes attracting human habitation, particularly during the Palaeo-Indian Period, would have existed in the past within the Open Pit area. In contrast, although they are located southwest of and outside of the PDA, Trouser Lake and Christmas Lake likely are post-glacial lake features (Seaman, A. Personal communication, September 25, 2014); in these areas there is the potential that shorelines conducive to human habitation in the past (e.g., the Palaeo-Indian Period) may exist, but they will not be affected by the Project.

Communication with staff from Archaeological Services who have examined the results of the Palaeo-Indian shoreline predictive model for the PDA also found there are no currently identified palaeo-shorelines in the PDA and hence, currently no high potential areas for Palaeo-Indian archaeological sites have been predicted in the PDA (Suttie, B. Personal communication, February 14, 2012).

Given the challenges to access and the relatively small size of the watercourses within the PDA, it is unlikely to have been an area sought for fishing. It is reported that the general Project area was used as an overland travel route between the St. John and Miramichi rivers (NBDNR 2007). Historic records indicate the presence of a First Nation portage route that passes near the Project site (Ganong 1899), specifically between the Napadogan and Miramichi Lakes, which connects the Nashwaak River system to the Miramichi River from the East Branch Napadogan Brook and Napadogan Lake. According to an Indigenous Knowledge Study conducted for the Sisson Project (Moccasin Flower Consulting 2013), the name “Nashwaak” appears to originate from the Maliseet word *Nahwijwauk* possibly meaning “slow current”, “winds among hills”, or “interlaces with others”. It may also apply a different meaning to two

watercourses in the transmission line corridor: Grand John Brook, named after a Maliseet hunter, and the Keswick River, from the Maliseet word *Nookamkeechwak* meaning “gravelly river” (Rayburn 1975). “Nashwaak” may also derive from the Maliseet word *newicewakk* meaning “strong undercurrent” (Moccasin Flower Consulting 2013). Amateur archaeologist and historical author George Frederick Clarke also made reference to the proximity of the Miramichi and Napadogan lakes in his writings (1963). This route would have been located over 3 km from the PDA. Additional research could not identify any evidence of a portage route within the PDA. A review of the watercourses located within the PDA could not identify any logical or more accessible route than the one described by Ganong (1899) as a means to access the Miramichi River system. Thus, it was determined that the portage route is not likely located within the PDA.

There are several small communities located in the region around the Project. These include but are not limited to Napadogan, Juniper, Maple Grove Station, Williamsburg, Currieburg, Boyds Corner, Stanley, Cross Creek, Deersdale, and Half Moon. These communities are located either along the Canadian National Railway line or along the Royal Road (Route 107) (NBDNR 2007). Stanley, Maple Creek, Cross Creek and Williamsburg were villages established by the New Brunswick & Nova Scotia Land Company (CRM 2008), a company chartered in 1831 to purchase large tracks of land with the promise of infrastructure development including: roads, mills, and towns to derive profit for prominent English shareholders by reselling purchased land to settlers (Elliott 2005). Stanley was named after the president of the New Brunswick & Nova Scotia Land Company who was responsible for settlement in the area *circa* 1833 (Hamilton 1996). Napadogan, the community located nearest to the Project, was named after Napadogan Brook, and was reportedly originally spelled Napudogan. W.F. Ganong attributes the word to the Maliseet *Napudaagun*, [possibly] meaning “brook to be followed”, in travelling to nearby Miramichi Lake (as cited by Hamilton 1996; Rayburn 1975). An Indigenous Knowledge Study conducted for the Project indicated that “Napadogan” may also relate to the Maliseet word for “to kill something”, or, *nkedon’kewagen* meaning “my hunting ground” (Speck and Hadlock 1946:362).

The majority of surrounding communities located along or close to the new 138 kV electrical transmission line corridor are small farming communities settled in association with the construction of the Canadian National and Canadian Pacific Railway lines (NBDNR 2007, NBPA 2012; Rayburn 1975) or the construction of the Royal Road (constructed during the 1930s) (NBDNR 2007; NBPA 2012). A search of the register of Canada’s Historic Places indicates there are no registered built heritage places in or around the PDA (CRHP 2012). The closest registered Historic place is a Welsh Chapel (*ca.* 1856) between the communities of Tay Mills and Hamtown Corner along Route 610, approximately 8 km east of the 138 kV electrical transmission line. In 1989, the Canadian Inventory of Historic Buildings identified two structures in the community of Napadogan, including the old railway office (constructed in 1908) and the “old round house” (*ca.* 1908), both of which are located outside of the PDA. At that time, both structures were standing and the old round house was being used for wood-mill purposes, although the current state of both buildings is unknown (CIHB 2011; Finley, S. Personal communication, June 14, 2012).

To the north of the PDA, along Route 107 is Juniper, a community built on the “backbone of the forestry industry” (Falls Brook Centre n.d.). The community of Juniper was established in August 1914 after two lumbermen (George Gilmore and George Foster) built a sawmill on the north bank of the South Branch Southwest Miramichi River for softwood lumber (Hamilton 1996; Stone 1953). Prior to the construction

of this sawmill, there is little evidence of important forestry activities in the area and there were few inhabitants in the community (Stone 1953). Just after the sawmill was established, George Gilmore and Guy Welch brought the first horse drawn road grader into Juniper with two teams of horses (Stone 1953). In 1915, James Kidd (J.K.) Flemming and his partner Charles Rogers purchased the business from Gilmore and Foster. The company began to flourish and people working in the mill began to build homes in Juniper.

Juniper's post office was constructed in 1918, after Juniper was established as a lumbering centre by James Flemming and Alexander Gibson (Rayburn 1975). Before Juniper was settled, there were no documented inhabitants in the area; however Stone (1953) noted that when building of the Intercolonial Railroad started in 1905, "*the first inhabitants lived at a place called Sparkle [Juniper?] and [residents] Mr. and Mrs. Sweet cooked for a gang of men employed on the railroad while Mr. Sweet ran lines.*" A review of an historic atlas map from 1878 confirms the lack of settlement in the area at that time. There are no communities indicated on the map, no rail lines, and what roads are indicated that come from communities along the St. John River to the west, end before they reach the area of the Project (Dawson 2005).

The use of the PDA during the Historic Period appears to be limited to forest resource extraction, recreational hunting and fishing facilitated by forest resource road access, and some mineral exploration. The history of modern mineral exploration of the Sisson ore body itself spans the time period from the mid-1950s through to the present. A review of recent and historical (ca. 1945) aerial photographs indicates little more than mineral exploration and forestry for the last 50 to 60 years within the Juniper area and the surrounding communities. There is no evidence of logging camps or forestry mills in or near the PDA prior to that time, and the aerial photographs taken in 1945 do not show any remnants of old structures within the PDA. All evidence identified during the background research and the archaeological survey indicates that most of these activities have taken place within the last 100 years. These areas were identified by the presence of various garbage dumping areas consisting of piles of discarded tin cans; however, all appear to be food waste (likely from logging operations from the 1950s and 1960s). Due to their relatively recent date, these locations do not meet the definition of a heritage resource (Archaeological Services 2012).

There are several privately-owned, active recreational campsite leases north of Grand John Brook, mid-way between the southern end of the new 138 kV electrical transmission line corridor and the open pit location (*i.e.*, approximately 15 km southeast of the open pit). The majority of the transmission line corridor is within provincial Crown land and used for forestry purposes. As the 138 kV electrical transmission line crosses Little Forks stream south through the community of Birdton and continuing to the NB Power Keswick terminal, land is almost exclusively privately-owned. This land, particularly land adjacent to the Keswick River (outside of the PDA), is used for residential and agricultural purposes (NBDNR 2007).

Although New Brunswick in general and many areas in the vicinity of the PDA have a rich history in agriculture, forestry and mining, the PDA itself has not experienced settlement and associated subsistence during the Historic Period. The timber industry was well established in communities southeast of the PDA such as Stanley, but historic records and atlases do not indicate much development north of Stanley prior to the 20th Century.

The remains of an old dam at Otter Brook Canyon in the Deersdale District, documented as part of the J.D. Irving Unique Areas Program (J.D. Irving, Limited n.d.) are located near a canyon that was created by water erosion from Otter Brook. The dam may have been created as part of a series of small dams used to facilitate log drives during the peak of the timber industry. This dam is located approximately 10 km away from the PDA, and due to the isolated nature of the dam and small watercourse, it is not anticipated that a sawmill would be associated with this feature.

In summary, in concert with various experts consulted as part of the background research, no records of built heritage resources or any buildings of architectural or historical importance were found within, or immediately near, the PDA.

Background research on palaeontological resources included a review of existing maps produced by NBDNR (2008) in consultation with the Natural Science Section of the NBM. The sedimentary rock units within the PDA are from the Cambrian to Early Ordovician Periods. The Early Ordovician Meductic Group in the PDA is comprised of igneous formations within the Meductic Group which do not contain fossils, and the Porten Road Formation which is primarily a porphyritic rhyolitic flow and breccia, which do not contain fossils (Miller, R. Personal communication, December 14, 2011). The Belle Lake Formation of the Meductic Group is fossil-bearing and known to contain graptolite fossils (Fyffe *et al.*, 1983); however, it is located outside of the PDA. The Cambrian-Early Ordovician Woodstock Group in the PDA includes the Baskahegan Lake Formation, a grey to green turbiditic sandstone and shale with minor red sandstone and shale. The Woodstock Group resembles the Grand Pitch Formation of central Maine, which contains the Cambrian trace fossil *Oldhamia* (Neuman 1984). The proposed 138 kV transmission line crosses eight mapped geologic units including the Shin Formation (Lower Carboniferous); Minto Formation (Upper Carboniferous); Burtts Corner Formation (Silurian); Hawkshaw Granite (Devonian); Belle Lake Formation (Ordovician); Porten Road Formation (Ordovician); Baskahegan Lake Formation (Cambrian-Ordovician); and Howard Peak Granodiorite (Devonian).

According to the most recent Department of Natural Resources published geology map, Plate 2006-7, no fossil localities are indicated in the PDA (Miller, R. Personal communication, December 14, 2011). There are no fossil reports in records in the immediate vicinity of the Project including along the 138 kV transmission line.

Dr. Randall Miller, Curator, Natural Science Section of the NBM was contacted to obtain general information on palaeontological resources within the PDA, to confirm if any fossil localities have been identified, or are likely to be present within the PDA. Dr. Miller confirmed that the trace fossils such as *Oldhamia* are known to exist within the Woodstock Group bedrock formation, but it is unknown if they exist within the Sisson ore body. Macrofossils such as graptolite fossils in Ordovician and Silurian rocks would generally occur in thin shale beds and are potentially sparsely distributed in the bedrock units encountered along the transmission line, but are often very difficult to recognize in the field. The most probable fossil occurrences, if they occur, would be in the Minto Formation where plant fossils can be locally abundant. While Upper Carboniferous plant fossils can be common in the Province, associated invertebrate and vertebrate fossils are always considered rare and would require further investigation if encountered (Miller 2013).

The bedrock geology of the PDA is characterized by Cambrian aged schist and gneiss as well as narrow bands of Ordovician meta-sedimentary rock strata. Toward the south, the bedrock transitions through Early-Late Carboniferous sedimentary rocks, predominantly sandstone and conglomerate, siltstone and shale (Miller 2011; NBDNR 2007). During the 2011 archaeological survey of the PDA, it was observed that small quantities of quartzite in the form of individual cobbles or small veins in bedrock were located throughout the area of the Sisson Project (Stantec 2012k). Consultation with regional experts suggested that quartzite and potentially rhyolites (both materials used for stone tool making) are present geologically in the PDA. These materials would be found predominantly as cobbles or glacial erratics, and it is unlikely that a lot of bedrock outcrops exist in the PDA (Stantec 2012j).

8.14.2.2 Archaeological Survey

The archaeological survey (walkover) of the mine site portion of the PDA (including the areas encompassed by the Open Pit, ore processing plant, and TSF) was conducted in 2011 under Archaeological Field Research Permit #2011NB54 (Stantec 2012k).

The archaeological survey was conducted to assess the potential for archaeological resources to be present within the PDA. The goals of the archaeological survey were to:

- based on the findings of the background research, identify and record any heritage resources encountered while completing the archaeological survey;
- make recommendations on the need for mitigation, specifically the number and placement of shovel test pits relative to the areas previously identified as having elevated archaeological potential; and
- confirm the determination of low archaeological potential for all other areas.

The archaeological survey consisted of a surface examination of all watercourse banks and their associated archaeological potential zones (as determined by the archaeological potential map, Stantec 2012k), and additional areas considered to potentially have elevated archaeological potential as determined by the permitted archaeologist. In addition, several areas that were considered to have low archaeological potential were assessed within the PDA (in consultation with Archaeological Services) such as existing woods roads and wooded areas adjacent to the roads, topographically prominent areas (*i.e.*, vantage points), bedrock outcrops, and areas subjected to previous ground disturbance (*e.g.*, geotechnical testing areas with exposed sub-surface conditions). Various other locations were examined in addition to the watercourses and associated archaeological potential zones.

The archaeological survey of the areas identified as having elevated archaeological potential within the areas to be covered by the Project's open pit and TSF involved traversing the entire length of both sides of all watercourse shorelines within the 80 m elevated archaeological potential zone (and 100 m at confluences) to determine if shovel testing in these areas was warranted and/or practical. In addition, an archaeological survey of all low archaeological potential areas was conducted following pre-defined transects.

The archaeological survey (walkover) of the portion of the PDA to be occupied by the new 138 kV electrical transmission line corridor and the corridors for the relocated 345 kV transmission line and Fire Road and ancillary linear facilities was conducted in 2012 under Archaeological Field Research Permits #2012NB36 and 2012NB38 (Stantec 2013a). This archaeological survey required an assessment of the entire length of linear corridor (25 m wide in the area of the 138 kV electrical transmission line, 200 m wide for the 345 kV transmission line and Fire Road re-alignment, and 100 m in all remaining linear facilities) at pre-defined transects.

In addition to the areas defined as having elevated archaeological potential on the archaeological potential maps, recommendations for shovel testing also considered the following:

- the physical condition of the ground, such as saturation level, slope, depth to surface rock and surface conditions (e.g., ground conditions that are considered too wet and not suitable for shovel testing are often characterized by low lying areas with standing pools of water or forested wetland with a thin veneer of mossy, forest floor with virtually no soil development);
- vegetation density and the practicality of being able to implement the shovel testing recommendations; and
- judgment of the Study Team.

Detailed definitions of these criteria are included in the Heritage Assessment Report for the Sisson Project (Stantec 2012k).

The archaeological survey of the open pit and TSF areas confirmed that even in most of those areas previously identified as having elevated archaeological potential, the ground conditions are generally poor as a result of the presence of surface water, saturated ground (e.g., wetland), steep slopes, surface glacial till, and/or surface rock—making these areas unlikely to contain heritage resources (Photos 8.14.1, 8.14.2, and 8.14.3).



Photo 8.14.1 Large wetland showing saturated ground conditions within the TSF area.



Photo 8.14.2 Example of steep slope along Sisson Brook within the Open Pit area.



Photo 8.14.3 Example of rocky surface and sub-surface conditions along Sisson Brook within the Open Pit area.

Most of the watercourses within the PDA are small, very rocky with numerous small waterfalls (Photo 8.14.4), and would likely not be navigable by any kind of watercraft—though navigability is not a determining factor in assessing archaeological potential. No archaeological resources or other surface heritage resources were identified during the archaeological walkover survey (including Pre-Contact and Historic Period resources).



Photo 8.14.4 Series of cascading waterfalls on Bird Brook within the TSF area.

The archaeological survey of the 138 kV electrical transmission line corridor and the corridors for the relocated 345 kV transmission line and Fire Road and remaining ancillary linear facilities determined that ground conditions varied substantially depending on the area assessed within areas of elevated archaeological potential presented on the archaeological potential map. Eight named or main branch watercourses (three of which would be navigable for most of the year) were assessed within the linear facilities of the PDA, as well as 36 unnamed or tributary watercourses. A further 15 wetland complexes were also assessed. Ground conditions immediately adjacent to many of the smaller tributary watercourses and surrounding wetland complexes were generally poor with surface water and broken terrain, steep slopes, and abundant large glacial boulder erratics within the PDA. Shovel testing in many of these areas is limited to small areas of dry or elevated terrain and/or terrain features such as high ridges, benches or terraces. Ground conditions within the elevated potential zone for named or main branch watercourses were generally favourable, many exhibiting elevated, dry, and flat banks or terraces extending the full width of the corridor. Furthermore, there are five areas within the linear facilities corridors that have a terrain feature with a vantage point that would have been desirable to early people as they began inhabiting this part of New Brunswick, and/or adjacent to a former watercourse channel that would be considered to have elevated archaeological potential, even though they are not listed on the archaeological potential map.

No archaeological resources or other surface heritage resources were identified during the archaeological survey of the transmission line corridors.

8.14.2.3 Shovel Testing Results To Date

Even though the Terms of Reference for the EIA of the Project had identified that shovel testing would be carried out after the EIA had been approved, but before construction disturbance, shovel testing was initiated in 2012 by Northcliff as an accommodation to First Nations who had requested that such work be initiated as early as possible. Shovel testing was conducted as mitigation for environmental effects of the Project in 2012, 2013 and again in 2014. The following provides a high-level summary of the results of shovel testing activities carried out to date in support of the Project. For further detail, the reader is referred to the Archaeological Field Research Permit Reports for each year the testing was carried out, which are on file with Archaeological Services.

2012

Shovel testing in the areas identified as having elevated archaeological potential was started in 2012 within the Open Pit area. This location was selected to start the shovel testing as this is the location of the ore body, which is fixed and cannot be moved (thereby limiting any potential for avoidance of the area if that were desired). A total of 869 test pits were completed in 2012 before the work was stopped due to onset of winter. No artifacts were identified during the 2012 shovel testing program.

For additional information on the results of the 2013 field work, the reader is directed to the Archaeological Field Research Permit Report (Permit # 2012NB40) (Stantec 2013h).

2013

The shovel testing program resumed in 2013, with work continuing in the area of the Open Pit. Of the 26 areas shovel tested:

- shovel testing in 16 locations was completed and no artifacts were identified, and thus the locations require no further work;
- shovel testing in 3 locations was not finished due to the onset of winter and was required to be completed in 2014; and
- shovel testing in 7 locations identified some shovel test pits that contained archaeological resources (*i.e.*, artifacts), located on an elevated terrace near Sisson Brook, and thus these locations require additional mitigation.

Following the identification of the archaeological resources the work was temporarily suspended at those locations, pending notification of First Nations.

A total of 667 shovel test pits were completed in the Open Pit area in 2013. The ground conditions throughout much of the Open Pit area were characterized by undulating post-glacial topography, with glacial boulder fields noted within the testing locations. In some areas, glacial till was noted directly below the forest litter mat, with very little soil development. Riparian areas along the margins of the watercourse are present throughout most of the shovel testing, as are delineated wetlands. In some areas, steep slopes exceeding 25 degrees are present along the watercourse margins.

Archaeological resources such as stone tools and stone debitage (30 artifacts in total) were recovered in 14 of the 667 test pits that were excavated during the 2013 field program. Another 15 artifacts were recovered during a controlled surface collection in the area following a major rain event. The location of these positive test pits and surface finds has been labelled the “Site Area”. One of the more noteworthy finds within the Site Area was a contracting-stemmed projectile point composed of fine-grained volcanic material. Projectile points of similar morphology, or typology, to this have been recovered from archaeological sites throughout northeastern North America (the Northeast) and are associated with Middle Archaic occupations (ca. 8,000-6,000 years BP) (Dincauze 1976; Murphy 1998; Robinson *et al.* 1992; Tuck 1991). In particular, the contracting-stemmed projectile point found in the Site Area appears to be “Stark”-like in morphology, and is reliably associated with Middle Archaic components, particularly between 7,500-6,500 BP. Following the recovery of the first artifact, the archaeological site was registered with the Province of New Brunswick, which was assigned the Borden number CcDs-2.

The vast majority of artifacts (36 artifacts, or 80% of the total) recovered from the Site Area in 2013 are composed of quartz. Although lithic material type is seldom used to confirm the age of an archaeological site, it has been demonstrated throughout the Northeast that quartz is a ubiquitous tool-stone material associated with sites dating to the Middle Archaic period (Murphy 1998; Robinson 1992). In addition to the projectile point, among the artifacts discovered in the Site Area were a number of scraping tools as well as flakes and pebbles with evidence of use-wear, that appear to be consistent with Middle Archaic assemblages reported elsewhere (Murphy 1998; Robinson *et al.* 1992; Suttie 2005).

For additional information on the results of the 2013 field work, the reader is directed to the Archaeological Field Research Permit Report (Permit # 2013NB55 and 2013NB57) (Stantec 2014a), on file with Archaeological Services.

2014

Following the discovery of the Pre-Contact archaeological site CcDs-2 in fall of 2013, Stantec prepared the *Heritage Mitigation Plan for the Sisson Project* (Stantec 2014b) as a comprehensive guide for carrying out all archaeological work for the Project going forward. This is a working document that will be updated, as necessary, over the duration of the remaining archaeological field work. The report was reviewed by Archaeological Services as well as designated First Nations representatives prior to being accepted by Archaeological Services in July 2014.

Work completed in 2014 (up to and including September 19, 2014) included:

- a walkover of some Project facilities not previously assessed as part of the PDA in 2011 (as a result of redesigning of some Project facilities including the TSF to avoid areas of elevated archaeological potential);
- shovel testing within the TSF area, specifically along watercourse B1D; and
- surface collection and shovel testing within the Site Area.

The walkovers assessed two areas along the edge of the TSF and two areas of elevated archaeological potential. Recommendations for shovel testing were made as a result of this survey.

During shovel testing within the TSF, two artifacts were recovered from shovel test pits resulting in the registration of a Pre-Contact archaeological site (identified as Borden number CcDs-4). Shovel testing in areas adjacent did not recover any artifacts.

Controlled surface collection within the Site Area took place prior to the start of shovel testing in 2014, and resulted in the discovery of artifacts, as well as the registration of an additional Pre-Contact archaeological site within the Site Area (identified as Borden number CcDs-3). Shovel testing within the Site Area resumed following this surface collection, and continued until the work stoppage on September 19. The intent of this shovel testing was to delineate the archaeological resources in the Site Area. To date, approximately 450 additional shovel test pits have been excavated within the Site Area, and archaeological resources continue to be found. The discovery of artifacts of similar technology to those discovered in 2013 continues to support the notion that the Pre-Contact archaeological sites CcDs-2 and CcDs-3 are associated with the Archaic Period (*ca.* 9,000–3,000 years before present) (Sanger and Renouf 2006), more specifically the Middle Archaic Period (*ca.* 8000–6000 before present) (Deal *et al.* 2006; Dincauze 1976; Murphy 1998; Robinson *et al.* 1992; Sanger 2006; Tuck 1991). In particular, the discovery of another “Stark”-like (Deal *et al.* 2006; Dincauze 1976; Murphy 1998) projectile point and a possible “Neville”-style biface (Dincauze 1976; Sanger 2006) in 2014, along with the recovery of numerous groundstone tools (an almost-exclusively Archaic Period technology) also lend evidence to support this notion.

During the 2014 field season, 442 shovel test pits were excavated within the Site Area and of those, 185 produced Pre-Contact artifacts. The total number of artifacts recovered to date in 2014 (up to and including September 19, 2014) is 541. These artifacts are represented by flaked stone tools, ground stone tools, and lithic debitage from stone tool making. To date, no non-stone artifacts have been found. Clusters of stones indicating the possible presence of cultural features (*e.g.*, a hearth) have been noted in two test pits to date; however, further excavation is required to confirm the archaeological context and whether or not these clusters of stones are indeed cultural features, or a function of the local geology. Confirmation of these artifacts will be sought through consultation with Archaeological Services.

The results of the 2014 field work will be documented in the Archaeological Field Research Permit Report to be issued in the spring of 2015.

8.14.3 Potential Project-VEC Interactions

Table 8.14.2 below lists each Project activity and physical work for the Project, and ranks each interaction as 0, 1, or 2, based on the level of interaction each activity or physical work will have with Heritage Resources.

Table 8.14.2 Potential Project Environmental Effects to Heritage Resources

Project Activities and Physical Works	Potential Environmental Effects Change in Heritage Resources
Construction	
Site Preparation of Open Pit, TSF, and Buildings and Ancillary Facilities	2
Physical Construction and Installation of Project Facilities	2
Physical Construction of Transmission Lines and Associated Infrastructure	1
Physical Construction of Realigned Fire Road, New Site Access Road, and Internal Site Roads	2
Implementation of Fish Habitat Offsetting/Compensation Plan	1
Emissions and Wastes	0
Transportation	0
Employment and Expenditure	0
Operation	
Mining	1
Ore Processing	0
Mine Waste and Water Management	0
Linear Facilities Presence, Operation, and Maintenance	0
Emissions and Wastes	0
Transportation	0
Employment and Expenditure	0
Decommissioning, Reclamation and Closure	
Decommissioning	0
Reclamation	0
Closure	0
Post-Closure	0
Emissions and Wastes	0
Transportation	0
Employment and Expenditure	0
<p>Project-Related Environmental Effects</p> <p>Notes:</p> <p>Project-Related Environmental Effects were ranked as follows:</p> <p>0 No substantive interaction. The environmental effects are rated not significant and are not considered further in this report.</p> <p>1 Interaction will occur. However, based on past experience and professional judgment, the interaction would not result in a significant environmental effect, even without mitigation, or the interaction would clearly not be significant due to application of codified practices and/or permit conditions. The environmental effects are rated not significant and are not considered further in this report.</p> <p>2 Interaction may, even with codified mitigation and/or permit conditions, result in a potentially significant environmental effect and/or is important to regulatory and/or public interest. Potential environmental effects are considered further and in more detail in the EIA.</p>	

The Project will not result in the disturbance to or loss of any buildings of architectural significance. A review of the numerous documents, knowledge of the general history of the area as well as a review of past and recent aerial photographs indicated that buildings or structures of architectural significance, or any structure that would be associated with a significant historical event for local, New Brunswick or Canadian history, are unlikely to be found within the PDA. In concert with various experts consulted as part of the background research, no records of built heritage resources or any buildings of architectural or historical significance within, or immediately near, the PDA were identified (Stantec 2012k). In addition, no buildings were encountered during any of the archaeological field surveys of the PDA. Therefore, the environmental effects of the Project on built heritage resources as a component of Heritage Resources during all phases of the Project, including cumulative environmental effects, are rated not significant, with a high level of confidence. The built heritage resource component of Heritage Resources is not considered further in this assessment.

8.14.3.1 Construction

Activities ranked as 0 in Table 8.14.2 include Emissions and Wastes, Transportation, and Employment and Expenditure. Emissions and Wastes generated by the Project will not involve ground breaking activities, therefore no interaction with Heritage Resources will occur. Transportation generated by the Project will be via the existing road network and therefore will not result in an interaction with Heritage Resources. Employment and Expenditure are related to the amount of employment generated and positive economic activity as a result of the Project and will not involve ground breaking activities; therefore interaction with Heritage Resources is not anticipated.

Activities ranked as 1 in Table 8.14.2 include the Physical Construction of Transmission Lines and Associated Infrastructure as well as the Implementation of Fish Habitat Offsetting/Compensation Plan. The construction of the new 138 kV electrical transmission line corridor will be adjacent to an existing 345 kV transmission line linking northern New Brunswick to the Keswick Terminal. The Physical Construction of the 138 kV electrical transmission line is ranked as 1 in consideration of the mitigation to be implemented prior to Construction activities and the relatively limited footprint from activities associated with the construction of this transmission line. Areas identified as having elevated archaeological potential, both from the archaeological potential map provided by Archaeological Services and as a result of the archaeological survey, will be provided to the design team during the design and tower placement for the new 138 kV electrical transmission line. Areas of elevated archaeological potential will be avoided to the extent feasible. Where areas of elevated archaeological potential cannot be avoided by tower placement, mitigation in the form of shovel testing to identify any heritage resources in these areas will be implemented in consultation with Archaeological Services.

The Implementation of Fish Habitat Offsetting/Compensation Plan may require assessment for heritage resources. Following the confirmation of the design for the culvert replacement at Nashwaak Lake, the potential interactions with areas of elevated archaeological potential that will be disturbed as a result of construction activities associated with the culvert replacement will be evaluated. The existing culvert itself is not considered a heritage resource as it is less than 100 years old, but the area within 80 m on either side of the watercourse it crosses may be considered to have elevated archaeological potential (subject to confirmation from the archaeological potential model map to be obtained) and thus may require further assessment. Should it be determined that there are areas of elevated potential for heritage resources, shovel testing and any additional mitigation for any discovered archaeological resources will be developed in consultation with Archaeological Services as warranted. Given the relatively small footprint of this planned component of the Project and the already disturbed nature of the location, it is not anticipated that important *in situ* heritage resources are present at this location. Regardless, the area will be evaluated by a permitted archaeologist and any recommended shovel testing will be implemented in consultation with the provincial archaeological regulator. This mitigation will ensure protection and/or documentation of any heritage resources identified at this location.

8.14.3.2 Operation

While there will be physical disturbance to undeveloped portions of the Project site during Operation, the potential interaction between the Project and archaeological and built heritage resources in these undisturbed areas is assessed as if the entire Project footprint will be disturbed during the Construction phase of the Project. Physical disturbance during the Operation phase is anticipated to continue for

approximately 27 years as mining activities are conducted and as the TSF facilities expand. Although the archaeological assessment (including shovel testing) of the open pit and TSF will be completed prior to disturbance, there remains the potential, however unlikely, that ground disturbance at the surface of the open pit could encounter an archaeological resource. Therefore an archaeological response protocol will be in place throughout the life of the Project in the unlikely event of the discovery of any archaeological resources during any ground breaking activities. If such a discovery were to occur, work in the area of the discovery will be halted until the find is investigated by a permitted archaeologist and appropriate mitigation is implemented, if required, in consultation with Archaeological Services and, as applicable, First Nations. Due to the depths at which the open pit excavation will occur, a potential interaction between archaeological resources and the Project during mining activities is not likely as archaeological resources are most susceptible during ground breaking activities associated with Construction (*i.e.*, the removal of surface soils); however, there could be an interaction between the Operation phase of the mine and palaeontological resources, albeit unlikely and of limited concern.

Mining during Operation is ranked as 1 in Table 8.14.2 due to the planned bedrock blasting and rock removal activities in support of mining. While there are no fossil reports on record for the vicinity of the Project (NBDNR published geology map, Plate 2006-7) and no known fossil localities within the PDA (Miller, R. Personal communication, December 14, 2011), it is possible that some of the geological formations within the PDA, such as the Woodstock Group located within the open pit area, and the Minto, Burtts Corner, and Belle Lake Formations along the 138 kV transmission line corridor may contain trace fossils such as *Oldhamia*, graptolites, plants, and potentially associated invertebrate and vertebrate fossils (Miller, R. Personal communication, December 14, 2011; Miller 2013). If present, mining activities or the construction of the transmission line could encounter these fossils. In accordance with the *Heritage Conservation Act*, any fossils discovered must be reported and may not be destroyed, or removed from where they are found, without a permit. The *Heritage Conservation Act* requires the proponent to contact the NBM if fossils are identified by those undertaking construction activities within the PDA to allow representatives from the NBM the opportunity to collect these resources. Such opportunity would be afforded within reasonable limitations so as not to unnecessarily affect the progress of mining. SML will work with the NBM and Archaeological Services to develop a response protocol.

All other Project-related activities during the Operation phase have been ranked as 0 in Table 8.14.2 including Ore Processing; Mine Waste and Water Management; Linear Facilities Presence, Operation, and Maintenance; Emissions and Wastes; Transportation; and Employment and Expenditure. None of these activities will involve ground breaking activities that are likely to interact with Heritage Resources due to prior testing and/or low potential. Any ground disturbing activities involving the 138 kV transmission line are anticipated to occur during Construction (*i.e.*, grubbing of the locations for the transmission line towers). Therefore, these activities will not interact with Heritage Resources.

As shown in Table 8.14.2, there are no Project interactions ranked as 2 for Heritage Resources during Operation. It is anticipated that any maintenance activities conducted during the Operation Phase (*e.g.*, vegetation removal) will be conducted in such a way as there is no ground disturbance (*e.g.*, vegetation removal during winter). Based on the background research and archaeological survey conducted, and in consideration of the potential environmental effects of the activities required for Construction of the Project, the proposed mitigation, and the residual environmental effects significance

rating criteria, the environmental effects of Operation on Heritage Resources including cumulative environmental effects are not discussed further.

8.14.3.3 Decommissioning, Reclamation and Closure

All activities in the Decommissioning, Reclamation and Closure phase of the Project (including Decommissioning, Reclamation, Closure, Post-Closure, Emissions and Wastes, Transportation, and Employment and Expenditure) have been ranked as 0 in Table 8.14.2 since these activities will not result in ground breaking activities outside areas already disturbed by the Project and thus, not interact with Heritage Resources. Since no disturbance of new ground beyond that already affected during the Construction or Operation phases is planned during the Decommissioning, Reclamation and Closure phase, there will not be any environmental effects to Heritage Resources.

8.14.3.4 Summary

Overall, for all Project activities for which interactions with Heritage Resources were ranked as 0 or 1 in Table 8.14.2, the environmental effects of the Project on Heritage Resources (including cumulative environmental effects) for all phases of the Project are rated not significant, with a high level of confidence. The environmental effects of these Project activities are not considered further in this report.

8.14.4 Assessment of Project-Related Environmental Effects

A summary of the environmental effects assessment and prediction of residual environmental effects resulting from interactions ranked as 2 in Table 8.14.2 is provided in Table 8.14.3.

Table 8.14.3 Summary of Residual Project-Related Environmental Effects on Heritage Resources

Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Mitigation / Compensation Measures	Residual Environmental Effects Characteristics										Recommended Follow-up or Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/ Socioeconomic Context	Significance	Prediction Confidence	Likelihood	Cumulative Environmental Effects?	
Change in Heritage Resources	Construction: <ul style="list-style-type: none"> • Site Preparation of Open Pit, TSF, and Buildings and Ancillary Facilities. • Physical Construction and Installation of Project Facilities. • Physical Construction Transmission Lines and Associated Infrastructure. • Physical Construction of Realigned Fire Road, New Site Access Road, and Internal Site Roads. 	<ul style="list-style-type: none"> • During the course of the archaeological survey conducted in 2011, several areas of elevated archaeological potential were identified that are recommended for shovel testing within the Project site (Stantec 2012j). It was noted that a redesign of the TSF would avoid two watercourses, and thus, greatly reduce the number of shovel test pits required for the TSF areas. The footprint of the TSF was modified, thus eliminating some of the elevated archaeological potential areas to be affected by Project activities, and reducing the number of required shovel test pits within the TSF. As the location of the open pit is fixed by the location of the ore body, it is not possible to make similar adjustments to the open pit. • As mitigation for the Project, a systematic sub-surface test ("shovel testing") program has been developed and submitted to Archaeological Services for review and approval. This shovel testing was undertaken in 2012, 2013 and 2014 by a permitted archaeologist. The shovel testing is following the provincial Guidelines (Archaeological Services 2012) and accepted professional standards and practices. As agreed with NBDELG and as described in SML's ESMS (Appendix D), SML intends to complete the archaeological test pitting in the Tailings Storage Facility (TSF) and Open Pit areas prior to commencement of construction. 	A	H	S	P/O	I	U/D	N	H	--	Y	Monitoring of preliminary ground breaking construction activities in proximity to locations where archaeological resources were discovered..

Table 8.14.3 Summary of Residual Project-Related Environmental Effects on Heritage Resources

Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Mitigation / Compensation Measures	Residual Environmental Effects Characteristics								Recommended Follow-up or Monitoring	
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/ Socioeconomic Context	Significance	Prediction Confidence		Likelihood
		<ul style="list-style-type: none"> • Further to this, a Heritage Mitigation Plan has been developed (Stantec 2014b) to guide any and all archaeological investigation and excavation within the PDA. This Plan was reviewed by Archaeological Services and their comments implemented prior to finalizing the Plan. The Plan was also provided to First Nations for review and comment and those comments were also implemented prior to finalizing it. • The archaeological resources discovered during the shovel testing will be mitigated in accordance with the Guidelines and the <i>Heritage Conservation Act</i> and in consultation with Archaeological Services and First Nations, as applicable, according to a schedule to be agreed with Archaeological Services and NBDELG. • The archaeological survey of the 138 kV electrical transmission line will assist in the planning and placement of transmission line towers to avoid elevated areas of archaeological potential areas where possible. Due to the relatively small area of the transmission line towers and base, and the average 160 to 200 m span limit between transmission line towers, NB Power Transmission will attempt to move the location of these towers outside of any areas identified as having elevated potential for archaeological resources. Following the completion of the design of the new transmission line, any areas where towers 										

Table 8.14.3 Summary of Residual Project-Related Environmental Effects on Heritage Resources

Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Mitigation / Compensation Measures	Residual Environmental Effects Characteristics								Recommended Follow-up or Monitoring	
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/ Socioeconomic Context	Significance	Prediction Confidence		Likelihood
		<p>cannot avoid areas of elevated archaeological potential will be subject to an archaeological survey that will determine detailed shovel testing recommendations that will be provided to Archaeological Services for approval prior to implementation.</p> <ul style="list-style-type: none"> Any small areas of the PDA that may not have been previously assessed due to minor adjustments in the Project footprint will be assessed prior to initiating Construction, and any recommended mitigation (e.g., shovel testing) will be implemented. These areas likely have low archaeological potential as no additional watercourses or areas considered to hold elevated archaeological potential were identified on the archaeological potential map (Stantec 2012k). The specific recommendations of the number of shovel test pits are documented in the Archaeological Assessment Reports (Stantec 2012k; Stantec 2013g) and have been provided to Archaeological Services. The archaeological resources that have been identified during the shovel testing will require further mitigation (i.e., archaeological excavation) that will be implemented in consultation with Archaeological Services and in accordance with their most current Guidelines (Archaeological Services 2012). Local First Nations will be engaged as appropriate. The fish habitat offsetting/compensation requirements may result in the need for 										

Table 8.14.3 Summary of Residual Project-Related Environmental Effects on Heritage Resources

Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Mitigation / Compensation Measures	Residual Environmental Effects Characteristics								Recommended Follow-up or Monitoring		
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/ Socioeconomic Context	Significance	Prediction Confidence		Likelihood	Cumulative Environmental Effects?
		<p>ground disturbance associated with the development of the offset measure. Prior to any construction activities, a detailed archaeological survey will be completed in order to determine if a shovel testing strategy as warranted. Any recommendations for shovel testing will be reviewed and approved by Archaeological Services and completed prior to any proposed ground breaking activities associated with fish habitat offsetting/compensation activities.</p> <ul style="list-style-type: none"> A heritage resources response procedure will be in place and will be followed during Project-related construction activities as a part of the overall ESMS. This procedure will document that in the event of the discovery of a potential archaeological or palaeontological site, all work in this area would immediately be temporarily suspended and a sufficient buffer would be established around the find until it can be fully investigated. If it is confirmed to be a heritage resource, appropriate mitigation will be developed and implemented in consultation with Archaeological Services, the NBM, and First Nations, as appropriate. The heritage resources response procedure will include procedures to be followed in the event of the discovery of archaeological resources, palaeontological resources, and unidentified bone material. 											
	Operation												

Table 8.14.3 Summary of Residual Project-Related Environmental Effects on Heritage Resources

Potential Residual Project-Related Environmental Effects	Project Phases, Activities, and Physical Works	Mitigation / Compensation Measures	Residual Environmental Effects Characteristics							Prediction Confidence	Likelihood	Cumulative Environmental Effects?	Recommended Follow-up or Monitoring
			Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Ecological/Socioeconomic Context	Significance				
	Decommissioning, Reclamation and Closure												
	Residual Environmental Effects for all Phases								N	H	--	Y	
KEY Direction P Positive. A Adverse. Magnitude 1 = Low: Minor impairments to heritage resources appreciation or affects to non-significant Historic period heritage feature (e.g., stone fence line, field stone pile; loss of individual artifact). 2 = Medium: Loss of heritage resources not of major importance or pre-disturbed heritage site, artifacts present, however, no or little chance of intact features. 3 = High: A permanent Project-related disturbance to, or destruction of, all or part of a heritage resource (i.e., archaeological, architectural or palaeontological resources) considered by the provincial heritage regulators to be of major importance due to factors such as rarity, undisturbed condition, spiritual importance, or research importance, but that can be mitigated or compensated to the extent that the environmental effects are not significant.		Geographic Extent S Site-specific: Within the PDA. L Local: Within the LAA. R Regional: Within the RAA. Duration ST Short-term: Occurs and lasts for short periods (e.g., days/weeks). MT Medium-term: Occurs and lasts for extended periods of time (e.g., years). LT Long-term: Occurs during Construction and/or Operation and lasts for the life of Project. P Permanent: Occurs during Construction and Operation and beyond. Frequency O Occurs once. S Occurs sporadically at irregular intervals. R Occurs on a regular basis and at regular intervals. C Continuous.	Reversibility R Reversible. I Irreversible. Ecological/Socioeconomic Context U Undisturbed: Area relatively or not adversely affected by human activity. D Developed: Area has been substantially previously disturbed by human development or human development is still present. N/A Not Applicable. Significance S Significant. N Not Significant.	Prediction Confidence Confidence in the significance prediction, based on scientific information and statistical analysis, professional judgment and known effectiveness of mitigation: L Low level of confidence. M Moderate level of confidence. H High level of confidence. Likelihood If a significant environmental effect is predicted, the likelihood of that significant environmental effect occurring is determined, based on professional judgment: L Low probability of occurrence. M Medium probability of occurrence. H High probability of occurrence. Cumulative Environmental Effects? Y Potential for environmental effect to interact with the environmental effects of other past, present or foreseeable future projects or activities in RAA. N Environmental effect will not or is not likely to interact with the environmental effects of other past, present or foreseeable future projects or activities in RAA.									

8.14.4.1 Potential Project Environmental Effects Mechanisms

Archaeological resources, where present, are located in the upper soil layers of the earth and therefore potential interactions between these resources and the Project will most likely take place during the initial ground breaking phases of Construction. Any potentially adverse environmental effects due to Construction activities on Heritage Resources will be permanent, as no archaeological site can be returned to the ground in its original state and no built heritage resource that is removed can be replaced.

While the two main Project features, the open pit and the TSF, will be expanding throughout the operational life of the Project, most of the potential interactions with Heritage Resources will take place during Construction. All ground preparation activities within the open pit are assessed as a Construction activity, even though these activities may take place while the mine is operating.

Surficial soils in the open pit will be removed during Construction, and this represents the period during which the highest potential for encountering undiscovered heritage resources exists. Construction of the TSF will involve the construction of TSF embankments at specific locations, and then flooding of most low lying areas will take place during Construction. It is within the low lying areas that the majority of the elevated archaeological potential areas are located.

While most locations within the PDA have a low potential to contain important archaeological resources, two locations containing Pre-contact archaeological resources have been identified. One location is within the TSF area, at watercourse B1D (a tributary to Bird Brook) adjacent to Fire Road. The other location is a relatively large archaeological site (or series of archaeological sites) in the Open Pit area. Additional mitigation is required at each of these locations to complete the delineation of these heritage resources (and other possible such resources that may be uncovered in the future), in order to facilitate the design and implementation of an archaeological excavation program.

8.14.4.2 Mitigation of Project Environmental Effects

The following mitigation measures, through careful design and planning, will be employed to avoid or reduce the environmental effects potentially resulting from the environmental effects mechanisms described above.

During the course of the archaeological survey conducted in 2011, several areas of elevated archaeological potential were identified that are recommended for shovel testing within the Project site (Stantec 2012j). It was noted that a redesign of the TSF would avoid two watercourses, and thus, greatly reduce the number of shovel test pits required for the TSF area. The footprint of the TSF was modified, thus eliminating some of the elevated archaeological potential areas to be affected by Project activities, and reducing the number of required shovel test pits within the TSF. As the location of the open pit is fixed by the location of the ore body, it is not possible to make similar adjustments to the open pit.

In order to confirm the absence or determine the presence of any archaeological resources within the PDA, a systematic sub-surface test (“shovel testing”) program was developed and submitted to Archaeological Services for review and approval. This shovel testing was initiated in 2012 and has continued through 2013 and 2014. This work was undertaken by a permitted archaeologist. The

shovel testing is following the provincial Guidelines (Archaeological Services 2012) and accepted professional standards and practices. The proposed shovel testing strategy is described in the Heritage Mitigation Plan (Stantec 2014b) and the ESMS. As agreed with NBDELG and as described in SML's ESMS (Appendix D), SML intends to complete the archaeological test pitting in the Tailings Storage Facility (TSF) and Open Pit areas prior to commencement of construction.

Shovel testing was initiated in 2012 as mitigation for environmental effects of the Project on Heritage Resources, and continued in 2013 and 2014. The discovery of a Pre-Contact archaeological site through shovel testing yielded a number of artifacts that appear to date between 6,500 and 7,500 years before present (a period known as the Middle Archaic Period). As a result of this discovery, a Heritage Mitigation Plan was developed for the PDA to outline the manner and method for the implementation of the remainder of the shovel testing as well as the archaeological excavation that will follow. The Plan was submitted to the provincial archaeological regulator for review and comment and also provided to the First Nations archaeologist for review and comment. Following these reviews, the document was finalized and has been the guiding document for the work during the 2014 field season. Additional shovel testing will be completed within the Open Pit area to delineate the extent of the archaeological site(s) discovered within the PDA.

Following the delineation of the known archaeological resources within PDA, a professional archaeological excavation will be implemented for the authorized and permitted recovery and excavation of the archaeological site(s) that have been identified to date as well as any additional archaeological resources that may be discovered as shovel testing continues. All archaeological excavation will be implemented under permits and approval issued by the Province for such an activity, and in consultation with the provincial archaeological regulator and interested First Nations, as applicable, according to a schedule to be agreed.

Following the excavation, the artifacts will be catalogued and a preliminary analysis will be completed. The result of this analysis will be presented in the Permit report that will also provide a detailed description of all work completed under the permit. The report along with all photographs, maps, field notes, and all artifacts, which are held in trust by the Province for the First Nations, will be submitted to the Province once the report is completed.

Depending on the results of the archaeological excavation, monitoring may be recommended during ground breaking construction activities in areas where archaeological resources have been discovered. The scope of this monitoring will be determined in consultation with the provincial archaeological regulator.

The specific recommendations of the number of shovel test pits are documented in the Archaeological Assessment Reports (Stantec 2012k; Stantec 2013g) and have been provided to Archaeological Services. If any additional archaeological resources are identified during the shovel testing, further mitigation (*i.e.*, archaeological excavation) will be implemented in consultation with Archaeological Services and in accordance with their most current Guidelines (Archaeological Services 2012) and the Heritage Mitigation Plan. Local First Nations will be engaged as appropriate.

The archaeological survey of the 138 kV electrical transmission line will assist in the planning and placement of transmission line towers to avoid elevated areas of archaeological potential areas where possible. Due to the relatively small area of the transmission line towers and base, and the average

160 to 200 m span limit between transmission line towers, NB Power Transmission will attempt to locate these towers outside of any areas identified as having elevated potential for archaeological resources. Following the completion of the design of the new transmission line, any areas where towers cannot avoid areas of elevated archaeological potential will be subject to an archaeological survey that will determine detailed shovel testing recommendations that will be provided to Archaeological Services for approval prior to implementation.

Any small areas of the PDA that may not have been previously assessed due to minor adjustments in the Project footprint will be assessed prior to initiating Construction, and any recommended, shovel testing will be implemented.

Regarding the fish habitat offsetting/compensation requirements to be implemented for the Project, a detailed archaeological survey will be completed at the Nashwaak Lake culvert replacement location in order to determine if any shovel testing is warranted. Any recommendations for shovel testing will be reviewed and approved by Archaeological Services and completed prior to any proposed ground breaking activities associated with fish habitat compensation activities.

A heritage resources response procedure will be in place and will be followed should any heritage resource be discovered during Project-related construction activities as a part of the overall ESMS. In the event of the discovery of a potential archaeological or palaeontological site, all work in this area would immediately be temporarily suspended and a sufficient buffer would be established around the find until it can be fully investigated. If it is confirmed to be a heritage resource, appropriate mitigation will be developed and implemented in consultation with Archaeological Services, the NBM, and First Nations, as appropriate. The heritage resources response procedure will include procedures to be followed in the event of the discovery of archaeological resources, palaeontological resources, and unidentified bone material.

8.14.4.3 Characterization of Residual Project Environmental Effects

The background research (including documentary research and contacting knowledgeable individuals) and the archaeological field survey in 2011 did not identify any known archaeological resources, nor were any discovered during the shovel testing complete in the Open Pit area in 2012. However, during the completion of the 2013 and 2014 field seasons, a number of archaeological resources have been discovered and several Pre-Contact archaeological sites have been registered with the Province of New Brunswick. These resources are located in areas where adjustments to the Project footprint cannot be made, and therefore additional mitigation in the form of salvaging these resources through a controlled, permitted, professional archaeological excavation will be required. As a result of the implementation of the excavation mitigation as outlined in the Heritage Mitigation Plan, the important information about the people who used this area in the distant past as represented by the artifacts and any features (e.g., fire pits) that might be present will be retained. There are very few examples of archaeological sites from this time period within New Brunswick and to date none have been professionally excavated. The excavation of this site(s) will present a unique opportunity to shed a light on this culture and time period in order that we may understand how people were living during this era and what they were doing at this location. In addition to providing very important information about a relatively poorly known time period, this excavation could also help us predict where similar

archaeological sites from this time period may be located, which could help for planning and archaeological potential modeling for other locations within New Brunswick.

It is possible that an archaeological resource (e.g., artifact) or palaeontological resource (e.g., fossil) could be encountered during Construction activities, even in areas where shovel testing activities do not identify any archaeological sites. This contingency will be planned for and a heritage resources response procedure as outlined in the ESMS will be invoked and all work in the affected area will cease until the find can be assessed by a professional archaeologist or the NBM, as applicable.

As a result of the presence of the important archaeological sites that have been identified within the PDA, without mitigation the potential adverse environmental effects to Heritage Resources are anticipated to be high in magnitude as the Project will require the professional archaeological excavation and removal of these resources in order to proceed. Potential adverse environmental effects to palaeontological resources (e.g., fossils) are anticipated to be low, given the low likelihood of discovering scientifically important fossils in the course of mining.

The geographic extent of the environmental effect is limited to the specific area within the PDA where the archaeological resources are located and thus the implementation of mitigation is achievable. The duration of this environmental effect will be permanent and irreversible as no archaeological site can be “reconstituted” after disturbance. The environmental effect on Heritage Resources is of low frequency as these archaeological resources can only be adversely affected once. The ecological context of the Project is that it is in an area that has been subject to forestry activities and mineral exploration in the relatively recent past.

Provincial heritage assessment guidelines and procedures will be followed and all mitigation will be implemented in consultation with, and under the approval of, Archaeological Services and in accordance with the Heritage Mitigation Plan. This includes shovel testing of areas identified as possessing elevated archaeological potential within the PDA, in accordance with the Archaeological Guidelines and the Plan. As agreed with NBDELG and as described in SML’s ESMS (Appendix D), SML intends to complete the archaeological test pitting in the Tailings Storage Facility (TSF) and Open Pit areas prior to commencement of construction. The discovery of the archaeological site(s) within the PDA will not result in a significant adverse environmental effect as the site(s) will be mitigated through the professional, permitted excavation and recovery of the artifacts and any other archaeological information (e.g., features), in accordance with all applicable laws and regulations and in consultation with the Provincial archaeological regulator and First Nations, as applicable.

Whether an archaeological resource is determined to be significant or important (as determined by provincial regulators) is not to be confused with a significant adverse environmental effect as defined under the *Canadian Environmental Assessment Act* or the provincial *Environmental Impact Assessment Regulation*. Provincial laws and regulations including the *Heritage Conservation Act* contemplate the excavation and salvage of archaeological resources, and when done under a permit issued by the Province, archaeological excavation is a legal, sanctioned activity in the eyes of the Province. Given that such an excavation will be implemented under the strict guidance of a professional archaeologist, and permitted by the Province, the mitigation will be a legal and authorized activity that is not considered a significant environmental effect according to the defined threshold of significance as provided in Section 8.14.1.6.

Therefore, based on the significance criteria presented in Section 8.14.1.6, the mitigation that has been implemented to date, and the mitigation that will be implemented as the Project moves forward, both under provincial regulation and authorization, the environmental effects of the Project on Heritage Resources for all phases of the Project are rated not significant.

A few areas of the PDA were determined through the archaeological survey to potentially be unsuitable for shovel testing due to vegetation conditions (e.g., extremely dense or felled vegetation) but still may have an elevated potential to contain archaeological resources. The vegetation in these areas may be removed by hand to facilitate shovel testing, or the Proponent may engage the provincial archaeological regulator as to whether or not these few locations would be candidates for archaeological monitoring by a professional archaeologist during the initial ground breaking phases of Construction at these locations.

8.14.5 Assessment of Cumulative Environmental Effects

In addition to the Project environmental effects discussed above, an assessment of the potential cumulative environmental effects was conducted for other projects or activities that have potential to cause overlapping environmental effects to Heritage Resources with those of the Project. Table 8.14.4 below presents the potential cumulative environmental effects to Heritage Resources, and ranks each interaction of the Project with other projects or activities on Heritage Resources as 0, 1, or 2.

Table 8.14.4 Potential Cumulative Environmental Effects to Heritage Resources

Other Projects or Activities With Potential for Cumulative Environmental Effects	Potential Cumulative Environmental Effects Change in Heritage Resources
Past or Present Projects or Activities That Have Been Carried Out	
Industrial Land Use (Past or Present)	1
Forestry and Agricultural Land Use (Past or Present)	1
Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons (Past or Present)	0
Recreational Land Use (Past or Present)	0
Residential Land Use (Past or Present)	1
Potential Future Projects or Activities That Will Be Carried Out	
Industrial Land Use (Future)	0
Forestry and Agricultural Land Use (Future)	1
Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons (Future)	0
Recreational Land Use (Future)	0
Planned Residential Development (Future)	0
<p>Cumulative Environmental Effects</p> <p>Notes:</p> <p>Cumulative environmental effects were ranked as follows:</p> <ul style="list-style-type: none"> 0 Project environmental effects do not act cumulatively with those of other projects or activities that have been or will be carried out. 1 Project environmental effects act cumulatively with those of other projects or activities that have been or will be carried out, but are unlikely to result in significant cumulative environmental effects; or Project environmental effects act cumulatively with existing significant levels of cumulative environmental effects but will not measurably change the state of the VEC. 2 Project environmental effects act cumulatively with those of other projects or activities that have been or will be carried out, and may result in significant cumulative environmental effects; or Project environmental effects act cumulatively with existing significant levels of cumulative environmental effects and may measurably change the state of the VEC. 	

8.14.5.1 Past or Present Projects or Activities That Have Been Carried Out

The interaction between the environmental effects of the Project and those of Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons and Recreational Land Use on Heritage Resources from past or present projects or activities that have been carried out have been ranked as 0 in Table 8.14.4 because those activities typically do not involve substantive ground disturbance. Adverse environmental effects to Heritage Resources require some relatively substantive ground disturbance in a manner that such activities result in the discovery of heritage resources. Traditional Aboriginal land use and activities generally refer to hunting, fishing, and gathering as well as ceremonial activities that, by their nature, have a relatively low environmental effect and are unlikely to encounter heritage resources. Presumably, Aboriginal land and resource use of the RAA has occurred for centuries and these activities have the potential to result in the generation of archaeological resources, as demonstrated by the discovery of several archaeological sites within the PDA. However, it does not appear that those activities have had overlapping environmental effects on Heritage Resources with those of the Project. Similarly, a wide variety of recreational activities may have been carried out by the public (e.g., hunting, fishing, snowmobiling/ATV'ing, etc.), but these activities also have a relatively low environmental effect in terms of their potential to disturb sub-surface cultural/natural ground features (e.g., archaeological sites, palaeontological sites). These activities are also unlikely to affect surface-based heritage resources, such as built heritage. Therefore, there is no overlapping environmental effect of the Project with these projects or activities on Heritage Resources.

Past or present Industrial Land Use, Forestry and Agricultural Land Use, and Residential Land Use typically involve some form of ground disturbance. While most of these activities, in particular as they were carried out in the past, typically do not result in a great deal of ground disturbance, they are not anticipated to result on significant overlapping cumulative environmental effects with those of the Project. However, it appears to be the case that some disturbance, either as a result of past road-building activities within the PDA or heavy rain/erosion events, resulted in the disturbance of archaeological resources as evidenced by the recovery of surface artifacts during the 2013 and 2014 field seasons. Based on this finding, the interaction between the Project and these potential past or present projects or activities on Heritage Resources has been ranked as 1 in Table 8.14.4 in recognition of the fact that some overlapping environmental effects have occurred between the Project and these other past or present activities. Based on the recovery of those artifacts during the field survey as well as the continued shovel testing and proposed excavation in the Site Area, as well as the limited special extent of the past disturbance, the magnitude of the cumulative environmental effect is considered low. The limited number of resources that appear to have been disturbed by past activities is relatively small, and at least a portion of them have been recovered for analysis and will be included in the inventory with the other artifacts from the Site Area. While out of context, some information can still be gleaned from them. These artifacts will be catalogued and submitted to Archaeological Services and held in trust for the First Nations.

Given that there are no significant residual environmental effects to Heritage Resources as a result of the Project it is concluded that the cumulative environmental effects of the Project in combination with other past or present projects or activities are not significant. This conclusion is based on the limited knowledge of the environmental effects of other past or present projects or activities and the implementation of the mitigation in compliance with applicable regulatory procedures and good practice as outlined in this EIA to reduce adverse environmental effects such that they are not significant.

8.14.5.2 Future Projects or Activities That Will Be Carried Out

As was the case for past or present projects or activities that have been carried out, the interaction between the environmental effects of the Project and those of Future Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons and Future Recreational Land Use on Heritage Resources has been ranked as 0 in Table 8.14.4. Those activities will not involve substantive ground disturbance, and since some relatively substantive ground disturbance is required to adversely affect a heritage resource, there are no substantive overlapping environmental effects on Heritage Resources from such activities that might be carried out in addition to those of the Project. Future Industrial Land Use and Residential Land Use activities could result in environmental effects on Heritage Resources that could overlap with those of the Project, and thus such interactions have been ranked as 1 in Table 8.14.4. Though no such substantive activities are planned to Stantec's knowledge, if they were to occur, these activities would likely require an environmental review and permitting that would evaluate their environmental effects on Heritage Resources, alone and in combination with the Project. Such an assessment would include consideration of potential adverse environmental effects to Heritage Resources and implementation of mitigation to address these effects. With that assessment and compliance with the Archaeological Guidelines and the provisions of the *Heritage Conservation Act* including an archaeological survey and shovel testing to confirm the presence or absence of heritage resources as part of any such development, the potential for significant adverse cumulative environmental effects on Heritage Resources from those other projects or activities in combination with those of the Project is low, as appropriate steps to substantially reduce or eliminate the overlapping environmental effects on Heritage Resources within their respective development areas would presumably be taken in the course of the EIA, permitting, or archaeological assessment of those projects or activities.

Future Forestry and Agricultural Land Use may adversely interact with Heritage Resource as these activities can result in relatively substantive ground disturbance, and thus such interactions have been ranked as 1 in Table 8.14.4. In contrast to other possible future projects or activities (such as Industrial Land Use), Forestry and Agricultural Land Use activities are not subject to an EIA review process and therefore no archaeological assessment is typically undertaken for these activities. However, an extensive archaeological assessment and mitigation process for Heritage Resources has been developed for the Project that meets the *Heritage Conservation Act* and the Archaeological Guidelines, including an archaeological survey of the entire PDA, including all areas that will be subject to ground disturbance and/or flooding. The archaeological survey resulted in the identification of several areas within the PDA that are recommended for archaeological shovel testing and the identification of several archaeological sites. As agreed with NBDELG and as described in SML's ESMS (Appendix D), SML intends to complete the archaeological test pitting in the Tailings Storage Facility (TSF) and Open Pit areas prior to commencement of construction. Any archaeological resources that have been identified, as well as any resources that may be identified as the shovel testing continues, will be mitigated in consultation with Archaeological Services and First Nations (as appropriate), prior to the implementation of any Project-related activities. In so doing, there are no significant residual Project-related environmental effects and it thus follows that there cannot be any significant overlapping cumulative environmental effects with those of other future Forestry and Agricultural Land Use activities.

8.14.6 Determination of Significance

8.14.6.1 Residual Project Environmental Effects

Construction activities as identified in Table 8.14.2 are the only Project activities with potential to result in residual environmental effects of the Project on Heritage Resources. With the implementation of the proposed mitigation, the Project will not result in the unauthorized permanent disturbance to or destruction of a heritage resource considered by the provincial heritage regulators to be of major importance that is not mitigated. All archaeological shovel testing and excavation is being, and will be, carried out under provincial legislation and authorization and with full knowledge of First Nations. Therefore, the residual environmental effects of the Project on Heritage Resources during all Project phases are rated not significant. This conclusion has been determined with a high level of confidence due to the comprehensiveness of the background research, completeness of the archaeological survey, the conservative application of shovel testing recommendations, and the professional, regulated, systematic implementation of the mitigation for the professional recovery and archaeological resources that are identified within the PDA.

Background research for the presence of Heritage Resources within the PDA, the archaeological survey, shovel testing, and the implementation of archaeological excavation and any additional mitigation that may be required based on the results of the shovel testing will reduce the potential for significant adverse residual environmental effects to Heritage Resources. All mitigation will be conducted by a permitted archaeologist following consultation with and approval by Archaeological Services.

8.14.6.2 Residual Cumulative Environmental Effects

The characterization of the potential cumulative environmental effects, combined with the proposed mitigation measures proposed in Section 8.14.4.2, demonstrate that the Project in combination with the environmental effects of other projects or activities that have been or will be carried out will not result in a permanent disturbance to or destruction of a heritage resource considered by the provincial heritage regulators to be a major importance that is not mitigated. Therefore, the residual cumulative environmental effects of the Project in combination with those of other projects or activities that have been or will be carried out on Heritage Resources are rated not significant. This determination has been made with a high level of confidence because of the planned mitigation to identify heritage resources prior to the development of these areas, the commitment to implement mitigation in consultation with heritage regulators and First Nations, as appropriate, the anticipated environmental assessment and mitigation requirements for other projects that may be developed, and thus the relatively low potential for significant overlapping environmental effects on Heritage Resources from such projects or activities in combination with those of the Project.

8.14.7 Follow-up or Monitoring

Subject to the results of shovel testing of areas of elevated archaeological potential in the PDA and the completion of the excavation of the archaeological resources identified in the PDA, and any that may be identified during continued shovel testing, follow-up archaeological monitoring may be required during ground breaking construction activities in proximity to locations where archaeological resources were discovered. All monitoring will be done by an archaeologist permitted by the Province and the results reported to the Province and First Nations as applicable. In the event that the archaeological monitoring identifies any additional archaeological resources, the heritage response protocol that will be developed for the Project will be implemented. The protocol will include provisions to halt the work in the areas of the discovery and implement mitigation in consultation with the Province and in accordance with provincial heritage legislation.

