23. Assessment of Potential Navigation Effects

23.1 INTRODUCTION

This chapter considers the potential effects on navigation by the Brucejack Gold Mine Project (the Project). Navigation is identified as a Valued Component (VC) in the federal EIS (Environmental Impact Statement) Guidelines (CEA Agency 2013).

The regulatory framework, regional navigation setting, and baseline studies conducted for the navigation effects assessment are described. The physical characteristics, context, legal criteria (including information from stakeholders) are used to determine whether waterbodies on which work and activities are planned are technically navigable. A scoping exercise is then undertaken to identify two environmental effects associated with navigation: safety (i.e., an indirect effect on safe navigation), and access (i.e., an indirect effect on the ability of Aboriginal and other user groups to access navigable waters for traditional [e.g., fishing, hunting, and trapping], commercial, and/or recreational [e.g., river rafting] purposes). Finally, mitigation to reduce the potential effects on navigation is discussed.

Appendices associated with this chapter include:

- Appendix 23-A, Screening of Stream Crossings against the MWWO; and
- Appendix 23-B, Transport Canada Permits and Responses to Applications for the Existing Exploration Road.

23.2 REGULATORY AND POLICY FRAMEWORK

In Canada there is a public right to navigation that exists under common law. This right can only be restricted by an Act of Parliament, such as the *Navigation Protection Act* (NPA; 1985), which requires approval for any "works" that may affect navigation on listed "navigable waters." The NPA, formerly the *Navigable Waters Protection Act* (NWPA; 1985), was subject to amendments in the *Jobs and Growth Act* (2012b) that received Royal Assent on December 14, 2012. These amendments came into effect on April 1, 2014. The amendments included (Transport Canada 2012a):

- a change of the name of the law from the *Navigable Waters Protection Act* to the *Navigation Protection Act*;
- inclusion of a schedule that clearly lists the major waterways for which regulatory approval is required prior to the placement or construction of a work;
- the opportunity for proponents of works in non-scheduled waters to opt-in and seek approval of a proposed work to provide additional legal certainty; and
- an expanded list of low risk works (i.e., minor bridge repairs) that can be pre-approved because they pose very little impact on safe navigation.

This assessment of potential effects of the Project on navigation was initially prepared for the NWPA before the amendments were brought into effect and has been modified to reflect current legislation.

Under the NPA, a work is defined as any of the following: "any man-made structure, device or thing" (e.g., bridges, dams, or docks), any "dumping of fill," or any "excavation of materials from the bed of any navigable water" (1985). The NPA and other applicable legislation, policy, standards, and guidelines to navigable waters in Canada are presented in Table 23.2-1.

Table 23.2-1. Navigable Waters Legislation, Policy, Standards, and Guidelines

Name	Year	Type	Level of Government	Description
Canadian Environmental Assessment Act, 2012	2012	Act	National	Section 5 of the Act requires that various environmental effects be taken into account in relation to a project. Navigation is not specifically listed but could fall under the subcategories related to aboriginal peoples, health and socio-economic conditions, or physical and cultural heritage. The decision of inclusion or exclusion of a valued component is left to the federal regulating body.
NPA	1985	Act	National	Section 4 of the Act states that "An owner of a work that is constructed or placed, or proposed to be constructed or placed, in, on, over, under, through or across any navigable water, other than any navigable water that is listed in the schedule, may request that this Act be made applicable to the work as if it were a work that is constructed or placed, or proposed to be constructed or placed, in, on, over, under, through or across any navigable water that is listed in the schedule."
NPA	1985	Act	National	Section 22 of the Act states that: "No person shall throw or deposit or cause, suffer or permit to be thrown or deposited any stone, gravel, earth, cinders, ashes or other material or rubbish that is liable to sink to the bottom in any water, any part of which is navigable or flows into any navigable water, where there is not a minimum depth of 36 metres of water at all times, but nothing in this section shall be construed so as to permit the throwing or depositing of any substance in any part of a navigable water if it is prohibited by or under any other federal Act."
Navigation Protection Program		Program	National	Department of Transport Canada which reviews and approves all works which interact with navigable waters. Ensures that works are performed in accordance with the legislation.
CAN/CSA-C22.3 No. 1-10 Overhead Systems	2010	Standard/ Code	National	This Standard applies to electric supply and communication lines and equipment located entirely outside buildings and fenced supply areas. It provides requirements for the construction of overhead systems.

23.2.1 Definition of Navigable Waters

The NPA only states that "navigable water" includes "a canal and any other body of water created or altered as a result of the construction of any work" (1985), as the definition of a navigable water has largely been developed by jurisprudence through case law precedent. For the purposes of this navigation effects assessment, the common law interpretation of navigability outlined in Section 23.3.5 will be used to make a proponent determination of navigability for waters affected by the Project, and deem the nature and extent of the potential effects to navigation on waterways affected by Project components.

23.2.2 Applicable Sections of *Navigation Protection Act* (1985)

For the list of scheduled waters, section 3 of the NPA (1985) states that:

> *It is prohibited to construct, place, alter, repair, rebuild, remove or decommission a work in, on, over, under, through or across any navigable water that is listed in the schedule except in accordance with this Act or any other federal Act.*

No effects to scheduled waters are expected due to Project activities, and there are no scheduled waters in the Project area. The omission of a waterbody from the schedule does not indicate that it is not navigable as common law applies to any navigable water regardless of scheduled status. The NPA puts the onus on the proponent for assessing potential navigability for waters that are not on the list of scheduled waters and for which navigation has not already been, in fact, demonstrated—including the liability of being potentially charged in court by parties claiming impacts on their right to navigate by a proposed work. To provide an extra "shield" to this legal risk, under section 4 of the NPA, a project proponent can elect to "opt in" for a given waterway to be treated as though it was on the list of scheduled waters. Section 4 states:

> *An owner of a work that is constructed or placed, or proposed to be constructed or placed, in, on, over, under, through or across any navigable water, other than any navigable water that is listed in the schedule, may request that this Act be made applicable to the work as if it were a work that is constructed or placed, or proposed to be constructed or placed, in, on, over, under, through or across any navigable water that is listed in the schedule.*

Pretivm has not elected to opt in for any of the waters affected by the Project at this time, and as a result, Section 4 will not be applicable to this assessment.

Section 22 of the NPA is considered in this assessment of Project works, including for waste rock deposition in and near Brucejack Lake and tailings deposition at depth in Brucejack Lake.

Section 22 of the NPA (1985) states:

> *No person shall throw or deposit or cause, suffer or permit to be thrown or deposited any stone, gravel, earth, cinders, ashes or other material or rubbish that is liable to sink to the bottom in any water, any part of which is navigable or flows into any navigable water, where there is not a minimum depth of 36 metres of water at all times, but nothing in this section shall be construed so as to permit the throwing or depositing of any substance in any part of a navigable water if it is prohibited by or under any other federal Act.*

Transport Canada could determine that Section 22 applies to Brucejack Lake, and Brucejack Creek—which is downstream of Brucejack Lake—dependent on their navigability and the navigability of Sulphurets Lake, downstream of Brucejack Creek. The NPA only applies to navigable waters, and so navigability criteria established through case law have been applied to conduct a proponent evaluation of the navigability of the waters affected by the Project, including Brucejack Lake, Brucejack Creek, and Sulphurets Lake (Section 23.3.5). While a proponent can put forward and assess evidence on the navigability of a waterway, if contested, determination of navigability and the related applicability of section 22 of the NPA to a waterway ultimately rests with the courts.

Depending on Transport Canada guidance, Pretivm has the option to "opt-in and seek approval of their proposed work to provide additional legal certainty" (Transport Canada 2013) for Project works in non-scheduled waters.

23.2.3 Land Use Planning Objectives

Land use planning in the vicinity of the Project is dictated mainly by two regional scale land and resource management plans: the Cassiar-Iskut Stikine Land and Resource Management Plan (CIS LRMP; BC ILMB 2000) and the Nass South Sustainable Resource Management Plan (SRMP; BC MRLNRO 2012).

The CIS LRMP, developed with the support of the Tahltan joint councils, encompasses an area of 5.2 million hectares in northwestern BC and overlaps the western portion of the Project region, including the Brucejack Mine Site. The Nass South SRMP was developed in partnership with Nisga'a Nation, the Gitanyow First Nation, local stakeholders, and government agencies (BC MFLNRO 2012). The Nass South SRMP overlaps with the eastern and southern portions of the Project region, including the potential transmission line route and access road.

Both plans are broadly concerned with defining and providing a framework for implementing regional land and resource management objectives that balance environmental, economic, social, and cultural concerns. The plans deal with multiple, potential uses that range from the protection of biodiversity and various ecosystem functions to traditional cultural activities and contemporary recreational uses, to timber supply management and mineral development.

For navigable waters, the focus of the CIS LRMP is the management of visual quality of the land (i.e., viewscapes) from the vantage point of navigable sections of the Unuk River, rather than on navigation itself (BC ILMB 2000; Chapter 24, Assessment of Potential Commercial and Non-commercial Land Use Effects). The Nass South SRMP makes no mention of "navigation" or "navigable waters" in the June 2012 version of the Plan (BC MFLNRO 2012).

23.3 BASELINE CHARACTERIZATION

23.3.1 Regional Overview

23.3.1.1 Physical Navigation Setting

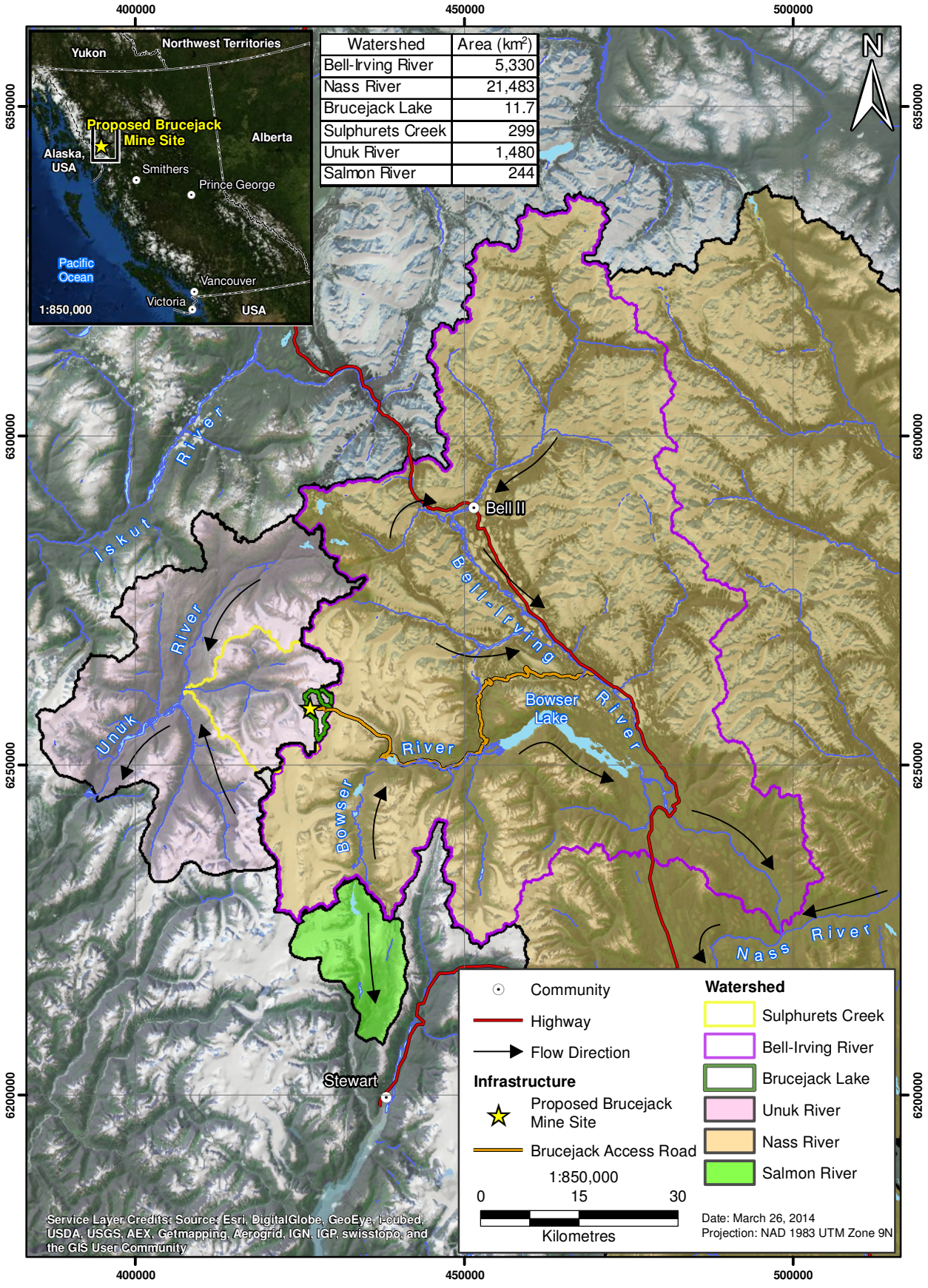
The Project is located within the Boundary Ranges of Coast Mountains physiographic region in northwestern British Columbia (BC; Holland 1976). The Boundary Ranges are comprised of dominantly granitic mountains along the Alaska-BC border, extending northwest from the Nass River. The proposed Brucejack Mine Site is situated within the Brucejack Lake watershed (Figure 23.3-1), a small headwater sub-basin within the Sulphurets Creek watershed. Brucejack Lake has one outlet, Brucejack Creek, which flows west from the lake and into Sulphurets Lake downstream. The outlet of Sulphurets Lake, Sulphurets Creek, is a tributary of the Unuk River that flows southwest, eventually discharging in to the Pacific Ocean northeast of Ketchikan, Alaska (drainage area 2,577 square kilometres [km^2] at mouth).

The Brucejack Access Road and majority of the transmission line route are located in the Bowser River watershed. Bowser Lake and the Bowser River are part of the Bell-Irving watershed. From its origins northeast of the Project, the Bell-Irving River flows southwest within the Klappan Range of the Skeena Mountains. The Bell-Irving itself flows within the Nass Basin physiographic region and continues until its confluence with the Nass River. The Nass River flows 380 km from the Coast Mountains southwest to Nass Bay, an inlet of the Pacific Ocean. The Nass watershed (21,483 km^2) encompasses the Bell-Irving watershed (5,330 km^2), which in turn contains the watersheds of Wildfire Creek (67 km^2), Scott Creek (75 km^2), and Todedada Creek (61 km^2).

A portion of the proposed transmission line will pass through the Salmon River watershed. The Salmon River headwater is fed by the Salmon Glacier, and flows 23 km south to tidewater at the head of Portland Canal, Alaska (Mathews and Clague 1993). Drainage area of the watershed is 244 km^2, 35% of which is covered with glaciers. The watershed has a mean elevation of 1,170 m above sea level, and the estimated mean annual precipitation is 2,790 millimetres (mm; Wiley and Curran 2003).

Further detail, including maps, of the waterways in and around the Project footprint, is provided in Chapter 13, Assessment of Potential Surface Water Quality Effects.

Figure 23.3-1
Brucejack Project Regional Hydrological Setting



Larger river systems in the region include the Stikine River and its tributary, the Iskut River to the north, the Nass River to the east and south, and the Skeena River further east and south. All of these systems are located more than 50 km from Project components. Use of streams and rivers within these regional watersheds for navigation purposes (i.e., traditional, commercial, and/or recreational) has historically been, and still is, limited because of the remoteness and ruggedness of the terrain as well as due to glaciation. Glacial barriers to aqueous travel were significantly greater in historic times, as glaciers in Western Canada have been retreating from past extents since the nineteenth century (Moore et al. 2009).

The historical use of waterways within the Project footprint and the surrounding region provides a means of demonstrating whether waterways have public utility for navigational purposes under common law (Section 23.3.5). Towards this end, a review of navigational use in the greater Project region has been conducted and is outlined below.

23.3.1.2 Commercial/Recreational Navigation Setting

Regarding the use of waterways in northern BC for transport, MacDonald and Cove (1987) have reported:

> *Of all the northern coast rivers from Telegraph Creek in the north to Kemano in the south, only a handful, such as the Nass and the Skeena are navigable for even a part of their length, because of the steep gradient of their channels. The Skeena and the Nass have problems of spring flooding, other seasonal flash flooding and winter freeze up that put limits on their usefulness as well as for canoe travel. Overland trails and trails along the riverbanks, provided a much more reliable system for the transport of trade items.*

The difficulty of transportation in the Project region has long been thought to be an impediment to the establishment of large-scale mining operations. Historical accounts of early commercial (mining and exploration) activity in the region of the Project indicate prospectors used the downstream portions of the Unuk River for travel. Prospectors staging from Alaska used flat-bottomed river boats to travel up the navigable portion of the lower Unuk River. Beyond that point, a series of overland trails and cable crossings were used to access the claims further up the Unuk River (Barbeau and Benyon 1950), but there are no records of navigation along Unuk River in the immediate Project footprint. Mineral claims along the north side of Treaty Creek, to the northeast of the Brucejack Mine Site, had to be accessed via overland trails from Meziadin Lake and the Nass Valley.

There is currently one commercial operator within the regional area that provides seasonal guided river rafting opportunities and operates along the Unuk River. Additionally, Boundary Lodge, an outpost camp of Spey Lodge, is located on the Bell-Irving River (located approximately 30 km north of the intersection of the Project access road and Highway 37) and operates as a seasonal fishing camp. There are two boat launches associated with Boundary Lodge at Bell I and Bell II (W. Faetz, pers. comm.).

23.3.1.3 Aboriginal Navigation Setting

Traditional knowledge and use of river networks as transportation corridors and for subsistence activities is documented in northwest BC by Aboriginal groups such as Nisga'a Nation, Tahltan, and Skii km Lax Ha, as described below. Major rivers and tributary systems were mostly used, in addition to numerous overland trails, for travel and transport. Winter travel via snowshoe was also common.

Skii km Lax Ha

The Skii km Lax Ha claim to be descended from the eastern branch of the Tsetsaut ethnolinguistic group. Little has been written regarding the Tsetsaut as they had been generally absorbed into other groups (particularly Nisga'a, Gitxsan, and Tahltan) by the early twentieth century. Some information on Tsetsaut navigation and travel is obtained from Boas (1895) who mentioned how the Tsetsaut descended the Unuk River in the summer to Portland Inlet to harvest salmon, drying their excess catch for winter use. He also mentions, in a legend, how the Tsetsaut went up Portland Inlet to catch oolichan in the spring (Boas 1895). Other sources indicate that the Tsetsaut caught spring and sockeye salmon at Meziadin Lake and "used hooks to spear the salmon" (Barbeau and Beynon 1950). Fishing also occurred throughout the lake using drift nets or gaff hooks from a canoe (D. Simpson, pers. comm. 2013).

According to Skii km Lax Ha knowledge holders, overland trails ran throughout their territory and were used either to travel long distances, or to access resource harvesting areas. On the western side of the territory, starting from Stewart, there were four separate trails: the first, along Bear River, descended down onto Strohn River to Meziadin Lake (the current location of Highway 37A); the second went up the Salmon River, along Silver Creek and Summit Lake, up and over the Salmon Glacier to Bowser Lake; the third went along Bear River and then cut down American Creek to Bowser River; and the fourth, from Strohn River, descended Surprise Creek to reach Surveyor's Creek, which led down to the Bell-Irving River at the location of a cabin. While these trails followed the course of the river systems, there is no information that these trails incorporated water-borne travel.

Descendants of the Tsetsaut also described a travel route to Stewart from Hanna Ridge, which passed along Hanna Ridge, up to the top of Meziadin Lake along a glacier bed and then travelled about 14 miles (22 km) toward Stewart, as far as the road ran from Stewart in the winter months (Delgamuukw v. The Queen 1988). Information from the Skii km Lax Ha indicates that trips to and from Stewart may have required passage over small waterways such as Brucejack Creek and Brucejack Lake, among others (D. Simpson, pers. comm. 2014); however, this was most likely done on foot over the ice. This travel route also appears to have been documented by William Beynon in 1953, who says "[t]he trappers who trap Meziadin Lake, even those from Kitwancool, travel by water to the head of Observatory Arm and then go up over the glacier. It is only a few days travel; the other way around is much longer" (Barbeau 1910-1969). This information was confirmed by Beynon and Barbeau during their interviews with Aboriginal elders throughout the region (Barbeau and Beynon 1950).

In a 1980 interview, Jessie (Lumm) Sterritt, an elder of the Skii km Lax Ha, describes travel from Prince Rupert to Stewart by boat, and then hiking to Bowser and Awiijii, which took a total of two weeks. Travel was expedited in the winter with snowshoes. Travel from Bowser Lake to Stewart was by foot over the glacier, which was fraught with danger, and Jessie describes several near misses with family members almost falling into crevasses or off cliffs (Rescan 2009).

On the north side of Bowser Lake, an overland foot trail proceeded up along the back side of Mount Anderson to Hidden Lake (on Wildfire Ridge), then down following Scott Creek and along the shores of Todedada Lake and into the North Treaty Creek valley, then down following Treaty Creek to the Bell-Irving River. The river at this point, just north of Awiijii, is very shallow, and the Skii km Lax Ha used rafts made of cottonwood to cross the river to get to Awiijii. A branch of this trail went over the Treaty Creek headwaters to Teigen Lake, then down Teigen Creek to the Bell-Irving River and Ningunsaw Pass.

Travel corridors, such as those along the Bear or Salmon rivers, or the Skeena River into the Klappan headwaters, are considered important to the Skii km Lax Ha and are still used during hunting or trapping activities.

In the recent past, the Skii km Lax Ha would occasionally use canoes (and later different types of boats) in the summer along lakes and larger rivers (particularly Bowser Lake, Bowser River, and the lower portion of Bell-Irving River near its confluence with the Nass River) to hunt bear and moose that foraged near the banks. The use of boats would occur mainly in the spring when water levels were high from the freshet. At all other times of the year, river travel would have been limited because of the low water levels. Other creeks in the Skii km Lax Ha's asserted territory were too small to navigate. The upper Bell-Irving River could not be navigated because it was too braided and marshy. Rather, the Skii km Lax Ha would use rafts to cross the upper Bell-Irving River where it was shallow, particularly when crossing over from the mouth of Treaty Creek to Oweegee Creek, or vice versa, during resource harvesting excursions. In the winter, when the rivers froze, the Skii km Lax Ha would be able to cross the rivers unimpeded. In recent years, however, the rivers no longer freeze completely in the winter, making travel more difficult (D. Simpson, pers. comm. 2014).

The Skii km Lax Ha are the First Nation group with asserted territory and reported traditional land use that overlaps the most with the area in and around Brucejack Lake. The Skii km Lax Ha have reported some foot travel across Brucejack Lake in the winter time when it was frozen. Otherwise, based on the consultation record, Brucejack Lake has no established navigational use by the Skii km Lax Ha.

Nisga'a Nation

Before 1958 and the establishment of major modern access routes, the most important travel routes for the Nisga'a were along the lower Nass River and along major and minor overland trails that connected major settlements, as well as fishing and hunting camps (Marsden, Seguin Anderson, and Nyce 2002). A major overland trail in Nisga'a territory is the *Genim Sgeenix* (Northward Trail), called the "Grease Trail" by Europeans. This was a major trading route running from Gitlax'aws north to Gitanyow. MacDonald (1989) describes the "Grease Trail" as passing through Aiyansh and heading northeast to the Cranberry Junction, then veering south to Kitwancool Lake and continuing on to the Skeena River. The southern part of the trail at Gitlax'aws is a Nisga'a landmark, which served as a main transportation corridor for Nisga'a Nation to travel north to trade oolichan grease. As well, inland nations such as the Gitxsan would use this trail, particularly on their way to and from the seasonal oolichan fishing sites at the mouth of the Nass River (Sterritt et al. 1998). The Grease Trails were traversed on foot as recently as the late 1800s (People of 'Ksan 1980; Daly 2005). The Kitwancool Grease Trail remains intact in the Cranberry and Kitwanga Valleys (AMEC 2011). There is no information that indicates that water-borne travel was required anywhere along the Grease Trails.

The Kitsumkalum Trail, another overland trail, begins on the Skeena River at Kitsumkalum, below Terrace, passes the old village site of Kitsumkalum (now deserted), and follows the eastern shore of Kitsumkalum Lake to emerge on the Nass River a short distance away from the village of Gitlaxt'aamiks. Highway 113 follows this trail (MacDonald and Cove 1987).

Barbeau and Beynon (1950) made note of a trail that ran from the head of Observatory Inlet, near the current town of Alice Arm, to the grease trail at Gitlaxt'aamiks on the Nass River. MacDonald and Cove (1987) mention this trail as well. There is no information that indicates that water-borne travel was required anywhere along this trail or the Kitsumkalum Trail noted above.

Tahltan Nation

Overland trails that were (or still are) used by the Tahltan are recorded throughout the Stikine watershed, as well as along the Ningunsaw, Snowbank and Teigen drainages (Sterritt et al. 1998; THREAT 2009). Travel through Tahltan territories was typically done on foot, with snowshoes used in winter (Teit 1956; MacLachlan 1981). Tahltan travel along water routes was uncommon except for river crossings, though sturdy dugout canoes were brought up the Stikine River, outside of the Project area,

by Tlingit traders (MacLachlan 1981). Historically, the south bank of the Iskut River was used seasonally as a transportation corridor, providing access to higher-value fishing and hunting habitat further upstream. Historical travel through this area likely tended to occur predominately in late winter or early spring when snow was compact and ease of travel was increased. This transportation route is generally referred to as the Iskut River Trail, and it was traditionally used by the Tahltan to access coastal marine resources at the mouth of the Stikine River, such as oolichan, seaweed, and shellfish (THREAT 2010).

A handful of major trails, including the Telegraph Creek Trail, the Hyland Post Trail and the Glenora to Dease Lake Trail, are interspersed with smaller, seasonal trails (Emmons 1911). In 1928, a major trading and packing trail from Glenora and Telegraph Creek to Dease Lake was converted into a road (now Highway 53), making it possible to bring in and use motorized vehicles.

The Stikine Trail was one of the major overland routes from the Nass River to the Stikine River. From the Nass River at Cranberry Junction, it ran north along the Bell-Irving River and Iskut River, then west through Raspberry Pass to Mess Creek, and then north to the Stikine River (MacDonald and Cove 1987). It is likely that this trail intersected a number of other trails travelling west to the coast and east inland. Portions of Highway 37 and the historic Dominion Yukon Telegraph Line likely followed segments of the Stikine Trail. It appears this was a major trail bringing Russian trade goods into the Upper Skeena and Nass River areas.

The Fort Dionysus Branch Trail was a branch of the Stikine Trail to Fort Dionysus (later named Wrangell) in Alaska. It is described as being the shortest route to Wrangell from the Stikine Trail (MacDonald and Cove 1987). This branch trail diverged from the Stikine Trail at Bowser Lake and then ran along the north side of Bowser Lake to the Lower Iskut River. Its exact route is not described, but this trail may have run north through Scott Pass, along Treaty Creek, and through the Teigen and Unuk lakes area to the Iskut River.

There is no information that indicates that the traditional trails used by Tahltan incorporated water-borne travel.

23.3.1.4 Summary

The above sections—based on relevant desk studies and consultation—establish the past and present use of waterways in the Project region for commercial, recreational, and/or Aboriginal aqueous travel or transport. This research and consultation to date indicates that none of the waters affected by Project works has established use for navigation.

23.3.2 Historical Activities

Several historic and current human activities are within close proximity to the proposed Project. These include mining exploration and production, hydroelectric power generation, forestry, and road construction and use.

The Granduc Mine was a copper mine located approximately 25 km south of the Brucejack Mine Site and west of the transmission line route, which operated from 1970 to 1978 and from 1980 to 1984. The mine included underground workings and a mill site near Summit Lake, connected by an 18.4-km tunnel. In addition, a 35-km all-weather access road was built from the communities of Stewart, BC and Hyder, Alaska to the former mill site near Summit Lake. The area of the former mill site near Summit Lake is currently used as staging for several mineral exploration projects in the region. Its terminus of the Granduc Access Road is 25 km south of the proposed Brucejack Mine Site and is currently used by mineral exploration traffic and tourists accessing the Salmon Glacier viewpoint.

The Sulphurets Project was an advanced underground exploration project of Newhawk Gold Mines Ltd. located at the currently proposed Brucejack Mine Site. Underground workings were excavated between 1986 and 1990 as part of an advanced exploration and bulk sampling program. Brucejack Lake has a historical precedent of use in association with mining. For instance, reclamation efforts following Newhawk Gold Mines Ltd.'s advanced exploration work included deposition of waste rock and ore within Brucejack Lake. An exploration road was also built from Bowser Lake to Brucejack Lake to provide access to the Sulphurets Project. Barges were used on Bowser Lake to shuttle vehicular traffic to the exploration road from forest service roads that connected to Highway 37.

In 2010, construction began on the Long Lake Hydroelectric Project which is located approximately 42 km south of the Project (CEA Agency 2012). It includes redevelopment of a 20-m-high rockfill dam located at the head of Long Lake, and a new 10-km-long 138-kilovolt transmission line. Construction and operation of the Long Lake Hydroelectric Project may have local effects on water navigability.

Historical forestry activities occurred within the general Project area between Highway 37 and Bowser Lake, south of the Wildfire Creek and Bell-Irving River confluence. Similar to the projects indicated above, there are no known forestry-related effects to navigability within the Project area.

The exploration phase of the proposed Brucejack Gold Mine Project commenced in 2011 and has included a drilling program, bulk sample program, construction of an access road from Highway 37 to the west end of Bowser Lake, and rehabilitation of an existing access road from the west end of Bowser Lake to the Brucejack Mine Site. All 23 stream crossings associated with construction of the Brucejack Access Road were assessed in accordance with the NWPA, and the required Transport Canada approvals were obtained for six bridge crossings in late 2012.

Stream crossings and other activities related to the projects described above may have had local effects on navigational access or safety. However, general use of waterways for navigation in the region is minimal. Thus, while there is potential that these projects have impacted navigation local to each project, the actual impact is expected to be negligible.

23.3.3 Baseline Studies

23.3.3.1 Data Sources

Baseline data collected for use in the navigation effects assessment included: (i) information related to waterbody crossing characteristics to determine whether waterbodies were physically navigable as described in the initial screening of the crossings against the NWPA Minor Works and Waters Order (MWWO; 2009) prior to the NPA amendments coming into effect (Appendix 23-A, Screening Level Assessment of Waterways against the MWWO); (ii) hydrological information related to the potential effects of the Project on water levels and flow (Chapter 10, Surface Water Hydrology Predictive Study); and (iii) land use studies, traditional knowledge/traditional use studies, and navigation specific consultation efforts to identify use of waterways in the region. Physical characteristics of streams potentially affected by Project activities were defined using 1:10,000 colour imagery of the Project area from 1997, as well as Google Earth Pro Imagery. Physical characteristics of Brucejack Lake were defined using bathymetry surveys conducted by Frontier Geosciences Inc. (Friesen and Candy 2013).

Project components and physical activities which may affect navigability were identified during a desk-based study utilizing preliminary site plans and Geographic Information Systems (GIS). A transmission line study provided by Valard Construction (2011) and preliminary bridge site plans provided by Cypress Forest Consultants Ltd. (2011) aided in this study. In addition, applications previously submitted to Transport Canada under the NWPA by Pretivm and permits received by Transport Canada during 2012 were reviewed.

Public utilization of waterbodies within the Project area was determined by distributing surveys and conducting phone interviews with several key stakeholders, including Aboriginal groups and recreational business owners (Section 23.4.1.2). In addition, Aboriginal traditional knowledge/traditional use and desk-based research played an important role in determining historical navigational use (Chapter 25, Assessment of Potential Effects to Current Use of Lands and Resources for Traditional Purposes; Appendices 25-A and 25-B; Rescan 2013).

23.3.3.2 Methods

To support an effects assessment on navigability, Transport Canada recommends following a three-point test that answers the following questions: 1) Is there a work that affects a waterway?; 2) Is the waterway navigable?; and 3) Will the work affect navigational access or safety along the waterway? The baseline study area and methods used to address the first two questions are described below, and the third question comprises the main portion of the navigation effects assessment in Section 23.5.

Identifying Works

To identify works, a GIS scoping process was carried out to determine the potential for interactions for all Project components or activities for each phase that had the potential to be in, on, under, through, or across a waterway. The components identified include:

- bridge crossing associated with proposed mine site roads;
- the Brucejack Access Road;
- subaqueous tailings and waste rock deposition areas; and
- transmission lines (aerial cables).

Assessing Navigability of Waters

The baseline study effort assessed 49 stream sites along the proposed transmission line and one stream site at a proposed crossing over Brucejack Creek (Appendix 23-A, Screening Level Assessment of Waterways against the MWWO). The locations of these proposed crossings are shown in Figure 23.3-2.

Applications to Transport Canada under the NWPA were previously submitted by Pretivm for all stream crossings along the Brucejack Access Road. Only the stream crossings deemed by Transport Canada to fall under the NWPA (i.e., non-minor crossings) are carried forward in this assessment, as crossings determined to be minor under the NWPA are assumed to also be physically non-navigable for the purposes of this assessment based on common law criteria. In total, 23 applications were submitted. Transport Canada determined that 17 of those crossings were minor, and approved permits for the remaining six road crossings (Appendix 23-A, Screening Level Assessment of Waterways against the MWWO).

In instances where available data were not conclusive in screening out a waterway as minor, a conservative approach was taken and it was assumed that it is non-minor for the purposes of this assessment (see Appendix 23-A, Screening Level Assessment of Waterways against the MWWO, for further details). It is possible that many of the streams deemed non-minor using this conservative approach are not navigable under the jurisprudence interpretation of navigability (Section 23.2.1), which uses more than physical data. Additional information may be required for confirmation.

Generally, if any type of floating vessel for transportation, recreation, or commerce is able to pass over a body of water, the water could be considered as navigable under the jurisprudence

interpretation (Government of Canada 2009). The legal determination of navigability is further supported by the "Coleman principles," as summarized by the 2011 Ontario Superior Court of Justice citing *Simpson v. Ontario* (2011):

1. A stream, to be navigable in law, must be navigable in fact. That is, it must be capable in its natural state of being traversed by large or small craft of some sort—as large as steam vessels and as small as canoes, skiffs, and rafts drawing less than one foot of water.
2. "Navigable" also means "floatable" in the sense that the river or stream is used or is capable of use to float logs, log-rafts, and booms.
3. A river or stream may be navigable over part of its course and not navigable over other parts.
4. To be navigable in law, a river or stream need not in fact be used for navigation so long as realistically it is capable of being so used.
5. The underlying concept of navigability in law is that the river or stream is a public aqueous highway used or capable of use by the public.
6. Navigation need not be continuous but may fluctuate seasonally.
7. Interruptions to navigation, such as rapids, on an otherwise navigable stream which may, by improvements such as canals, be readily circumvented, do not render the river or stream non-navigable in law at those points.
8. A stream not navigable in its natural state may become so as a result of artificial improvements.

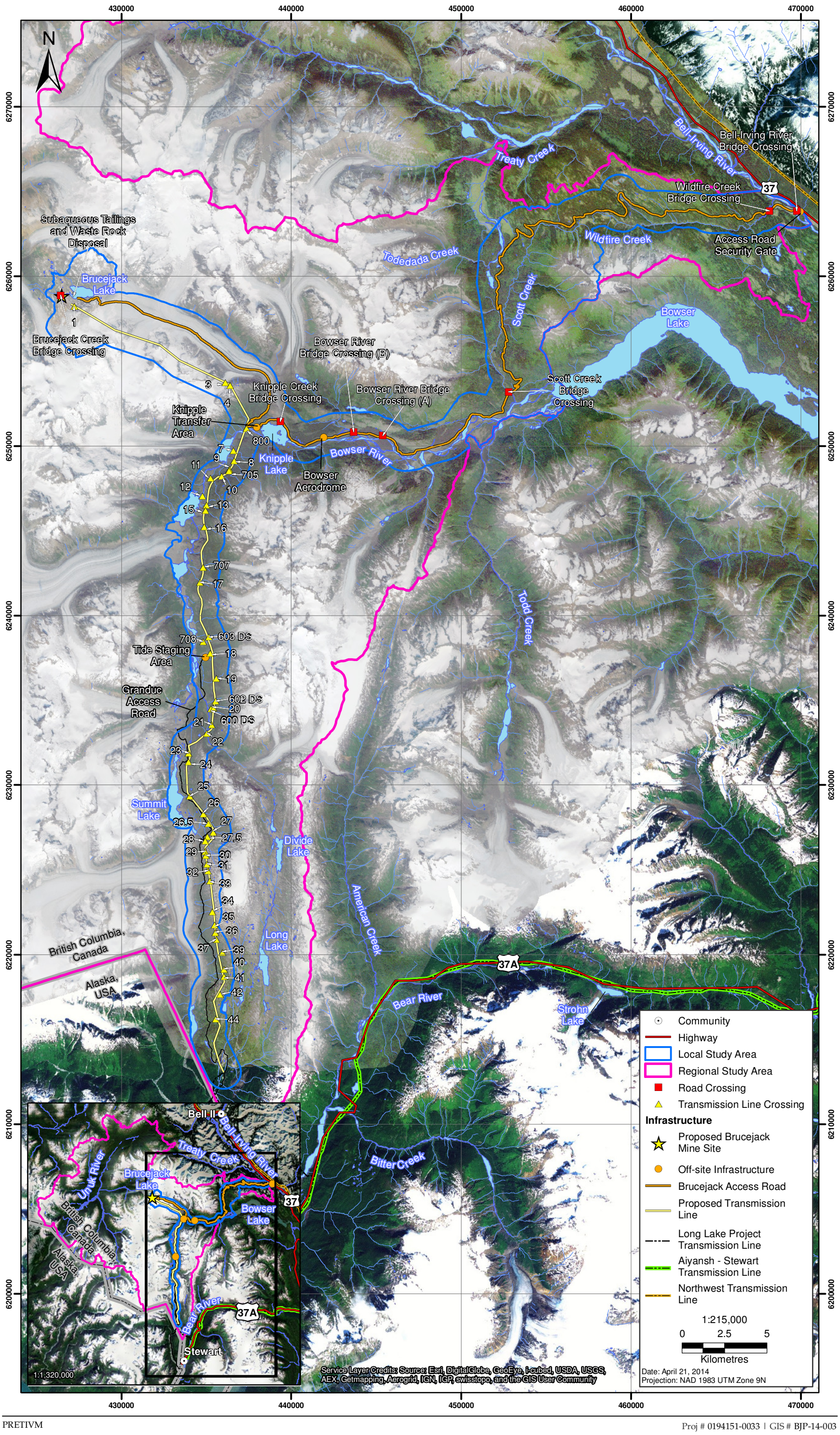
The Coleman principles have been upheld and further defined in other case law, including by Justice Doherty in *Canoe Ontario v. Reed* (1989), who accepted the conclusions reached in the Coleman case and further clarified that:

> *In essence, the test of navigability developed in Canada is one of public utility. If a waterway has* ***real or potential practical value to the public as a means of travel or transport from one point of public access to another point of public access, the waterway is considered navigable****...****navigability should depend on public utility****. If the waterway serves, or is capable of serving, a legitimate public interest in that it is, or can be, regularly and profitably used by the public for some socially beneficial activity, then,* ***assuming the waterway runs from one point of public access to another point of public access, it must be regarded as navigable land as within the public domain*** (*Canoe Ontario v. Reed* 1989, emphasis added).

The following criteria were used, where data were available, to assess the physical navigability of waterbodies:

- average bankfull width of greater than 3 m;
- average bankfull depth of greater than 0.3 m;
- channel slope (gradient) of less than 10%;
- three or fewer natural obstacles counted along a 200 m section, centred around the crossing point;
- substrate type relating to potential effect on navigability (i.e., extensive weeds, boulders, shallow bars, etc.); and
- other impediments to navigation.

Figure 23.3-2
Navigable Waters Study Area



Baseline Study Area

The study area considered for the navigation effects assessment extends to the watershed boundaries for waterways which may be affected by Project works (Figure 23.3-2). Data on potential changes to water levels and flow were conducted in a separate hydrological study (Chapter 10, Surface Water Hydrology Predictive Study).

23.3.4 Characterization of Navigable Waters Baseline Condition

In total, 56 stream crossings were assessed in relation to proposed works (Table 23.3-1).

Table 23.3-1. Waterways Included in Brucejack Gold Mine Project Navigation Assessment

No.	Crossing Site No.	Waterway Type	Type of Work	Easting	Northing
1	1	Stream	Transmission Line Crossing	427215	6258239
2	2	Glacial Meltwater Stream	Transmission Line Crossing	434935	6254758
3	3	Glacial Meltwater Stream	Transmission Line Crossing	436103	6253747
4	4	Glacial Meltwater Stream	Transmission Line Crossing	436382	6253584
5	5	Stream	Transmission Line Crossing	436729	6251944
6	800	Bower River	Transmission Line Crossing	437360	6251037
7	7	Lake Outflow	Transmission Line Crossing	436578	6249719
8	8	Lake Outflow	Transmission Line Crossing	436629	6249119
9	9	Lake Outflow	Transmission Line Crossing	436343	6248620
10	705	Lake Outflow	Transmission Line Crossing	436315	6248517
11	10	Lake Outflow	Transmission Line Crossing	435878	6248215
12	11	Lake Outflow	Transmission Line Crossing	435217	6248122
13	12	Lake Outflow	Transmission Line Crossing	434768	6247057
14	13	Lake Outflow	Transmission Line Crossing	435012	6246498
15	14	Lake Outflow	Transmission Line Crossing	435016	6246500
16	15	Lake Outflow	Transmission Line Crossing	434952	6246205
17	16	Lake Outflow	Transmission Line Crossing	434876	6245230
18	707	Glacial Meltwater Stream	Transmission Line Crossing	434802	6242843
19	17	Glacial Meltwater Stream	Transmission Line Crossing	434623	6241972
20	708	Glacial Meltwater Stream	Transmission Line Crossing	434803	6238469
21	603 DS	Stream	Transmission Line Crossing	435147	6238740
22	18	Stream	Transmission Line Crossing	435596	6237699
23	19	Stream	Transmission Line Crossing	435656	6236326
24	602 DS	Stream	Transmission Line Crossing	435527	6234949
25	600 DS	Stream	Transmission Line Crossing	435259	6234497
26	20	Stream	Transmission Line Crossing	435354	6234632
27	21	Stream	Transmission Line Crossing	435299	6233569
28	22	Stream	Transmission Line Crossing	435031	6233055

(continued)

Table 23.3-1. Waterways Included in Brucejack Gold Mine Project Navigation Assessment (completed)

No.	Crossing Site No.	Waterway Type	Type of Work	Easting	Northing
29	23	Stream	Transmission Line Crossing	433959	6231872
30	24	Stream	Transmission Line Crossing	433916	6231325
31	25	Stream	Transmission Line Crossing	434026	6229356
32	26	Stream	Transmission Line Crossing	434810	6228369
33	27	Stream	Transmission Line Crossing	435395	6227295
34	28	Stream	Transmission Line Crossing	434932	6226706
35	29	Stream	Transmission Line Crossing	434936	6226098
36	30	Stream	Transmission Line Crossing	434969	6225857
37	31	Stream	Transmission Line Crossing	435041	6225349
38	32	Stream	Transmission Line Crossing	435106	6224958
39	33	Stream	Transmission Line Crossing	435217	6224316
40	34	Stream	Transmission Line Crossing	435436	6222608
41	35	Stream	Transmission Line Crossing	435502	6221674
42	36	Stream	Transmission Line Crossing	435525	6221321
43	37	Stream	Transmission Line Crossing	435574	6220908
44	39	Stream	Transmission Line Crossing	435942	6220165
45	40	Stream	Transmission Line Crossing	436025	6219155
46	41	Stream	Transmission Line Crossing	436064	6218619
47	42	Lake Outflow	Transmission Line Crossing	435709	6217901
48	43	Stream	Transmission Line Crossing	435331	6217162
49	44	Stream	Transmission Line Crossing	435527	6216216
50	n/a	Bell-Irving River[a]	Brucejack Access Road crossing	469769	6263854
51	n/a	Bowser River[a]	Brucejack Access Road crossing	445384	6250605
52	n/a	Bowser River[a]	Brucejack Access Road crossing	443630	6250829
53	n/a	Knipple Creek[a]	Brucejack Access Road crossing	439344	6251441
54	n/a	Scott Creek[a]	Brucejack Access Road crossing	452748	6253241
55	n/a	Wildfire Creek	Brucejack Access Road crossing	468167	6263824
56	n/a	Brucejack Lake	Subaqueous tailings deposition	427771	6259055
57	n/a	Brucejack Lake	Waste rock deposition	427332	6258904
58	n/a	Brucejack Creek	Mine site road	426420	6258900

[a] *Crossing previously permitted under the NWPA (1985).*

23.3.5 Proponent's Assessment of Navigability

Assessments of navigability based on common law criteria relied on the physical characteristics of the waterbody, consultation with Aboriginal and other stakeholder groups, as well as on established or reasonable future public utility and accessibility of the waterbodies. This section describes the consultation processes and results and assessment of navigability of waterbodies.

Where the public right of navigation has already been established on a given waterway (through desk- or field-based studies, observation, and/or consultation records), the waterway is typically considered navigable in the courts as it has been demonstrated in fact. Where navigation on a waterway is not already established, there is a lack of certainty as to what actually constitutes a navigable water under case law precedent in Canada (Four Point Learning 2013). As highlighted in the *Simpson v. Ontario* case (2011), "The jurisprudence is mixed and each case seems to lack a consideration that would make it a determinative statement of law." Nevertheless, there are a few general principles on the public right to

navigate that have emerged from case law that could also analogously be applied to waterways affected by Project works. Along with the Coleman principles (Coleman v. Ontario 1983) mentioned in Section 23.3.3.2, there are cases applicable to the interpretation of navigability under the NPA, such as *International Minerals & Chemicals Corp. (Canada) Ltd. v. Canada* (1993), for which the criteria outlined in the following sections are applied to assess the navigability of Brucejack Lake and other waters for the Project.

23.3.5.1 Consultation Feedback on Valued Components

Specific consultations were conducted with various Aboriginal groups and other stakeholders regarding public utility of waterways near the Project for navigation. These included conducting a detailed survey by phone, letter, or e-mail to the following Aboriginal groups: Tahltan Central Council, Nisga'a Lisims Government, and Skii km Lax Ha. The following land use groups were contacted: Bear Enterprises, Trapline TR0621T001 owner, Tenure 601074 owner, Milligan Outfitting Ltd. (Coast Mountain Outfitters), Misty Mountain Outfitters, and Spey Lodge.

The following series of questions were asked in a survey sent by e-mail to the three Aboriginal Groups:

1. Do you currently navigate (i.e., travel by boat, raft, or float plane) in the Project Area? Please specify the waterbodies (i.e., lakes, rivers, streams) you utilize.
2. Do you currently utilize, or in the past have you utilized, Brucejack Lake and its outflow stream Brucejack Creek for navigational purposes? If so, please describe.
3. Do you currently utilize, or in the past have you utilized, the Upper Bowser River above Bowser Lake and its tributaries, and/or the tributaries of the Upper Salmon River for navigational purposes? If so, please describe.
4. If applicable, what type of craft do you use to navigate the waterbodies outlined in Question 1?
5. If applicable, which season/s do you typically navigate within these waterbodies? Please specify for each waterbody.
6. If applicable, how do you typically access waterbodies used for navigation (e.g., by driving, flying)?
7. Do you foresee changes to your navigational use within the Project Area (e.g., do you anticipate utilizing additional waterways or refraining from using others)?

At the time of writing, none of the Aboriginal Groups had indicated in initial or follow-up communication (Table 23.3-2) that they utilize or plan to utilize any of the waterbodies in question.

Table 23.3-2. Navigation Consultation Efforts and Feedback

Stakeholder	Initial Survey Date and Method	Follow-up Date(s) and Method(s)	Stakeholder Feedback
Aboriginal Groups			
Tahltan Heritage Resources Environmental Assessment Team	10/21/2013 by e-mail	N/A	No response.
Nisga'a Lisims Government	10/21/2013 by e-mail	N/A	No response.
Skii km Lax Ha	10/21/2013 by e-mail	11/4/2013 by e-mail 11/22/2013 by e-mail 12/12/2013 by e-mail 03/03/2014 by phone	Identified use of Bowser Lake, the upper Bowser River and tributaries for navigation during hunting trips. Confirmed historic use of area of Brucejack Lake and Brucejack Creek, when frozen as a travel foot route during winter only, and not for navigation.

(continued)

Table 23.3-2. Navigation Consultation Efforts and Feedback (completed)

Stakeholder	Initial Survey Date and Method	Follow-up Date(s) and Method(s)	Stakeholder Feedback
Land Users			
Bear Enterprises	10/24/2013 by phone	N/A	Confirmed no use of waterways near the Project area.
Trapper for TR0621T001/TR621T003	10/21/2013 by e-mail	11/5/2013 by phone	Tenure holder stated they do not travel by water and have not seen anyone else travelling by water in the area.
Guide Outfitter 601074	11/13/2013 by face-to-face interview	N/A	Land user confirmed he does not navigate in the area and does not intend to travel by waterways indicated on the questionnaire.
Spey Lodge	10/21/2013 by e-mail	10/24/2013 by phone	No response.

The following series of questions were asked in a survey conducted by e-mail or phone to the five land use groups:

1. Do you currently navigate (i.e., travel by boat, raft, or float plane) in the Project Area to access your licence/tenure area? Please specify the waterbodies (i.e., lakes, rivers, streams) you utilize.
2. Do you currently utilize, or in the past have you utilized, Brucejack Lake for navigational purposes? If so, please describe.
3. If applicable, what type of craft do you use to navigate the waterbodies outlined in Question 1?
4. If applicable, which season/s do you typically navigate within these waterbodies? Please specify for each waterbody.
5. If applicable, how do you typically access waterbodies used for navigation (e.g., by driving, flying)?
6. Do you foresee changes to your navigational use within your licence/tenure area (e.g., do you anticipate utilizing additional waterways or refraining from using others)?

At the time of writing, responses have been received from three of the potential five land users who confirmed that they do not navigate or plan to navigate on the waterbodies in question (Table 23.3-2). As per previous correspondence, the other land user group (Spey Lodge) does not operate near the specified waterbodies. Spey Lodge operates on the Bell-Irving River (#50, Table 23.3-1), which is therefore deemed navigable based on established use.

23.3.5.2 Navigation Based on Physical Characteristics

The majority of waterbodies potentially affected by proposed works or activities were determined to not be physically navigable. With the exception of the Bowser River, all 49 transmission line crossings were situated on waterbodies where the gradient exceeded 10%, and the majority exceeded 20%.

23.3.5.3 Navigation Based on Public Utility

The navigability of waters is assessed in this report based on the principles and criteria built up through jurisprudence (Section 23.3.3.2), incorporating information gathered from stakeholder consultations for the Project relating to navigational public utility.

The ability of the public to be able to access both ends of a waterway is a precondition to the navigable use of a waterway. As stated by Justice Doherty in *Canoe Ontario v. Reed* (1989):

> *If the waterway serves, or is capable of serving, a legitimate public interest in that it is, or can be, regularly and profitably used by the public for some socially beneficial activity, then, assuming the waterway runs from one point of public access to another point of public access, it must be regarded as navigable and as within the public domain.* (Emphasis added).

In this interpretation, if a physically navigable waterway connects two places that are publically accessible, then it could be considered navigable. The concept of accessibility was expanded upon in *International Minerals & Chemical Corp. (Canada) Ltd. v. Canada* (1993), where Justice Mackay framed access in terms of reasonable public appeal, stating that the concept of an aqueous highway implies "that the waters connect places which in the normal course would facilitate travel, even recreational travel, on a route that would have a likelihood of reasonable appeal to members of the public as a route to be travelled." Note that, as with previous criteria, the court justices utilize the terms "regular," "normal," and "reasonable" to characterize the public use for navigation.

The concepts of access and reasonable public appeal to access a waterway are also linked to that of connectivity of the waterway to a larger network of transport. The concept of navigable waters serving as aqueous highways linking into a larger network, including maritime shipping routes, dates back to the origin of the original NWPA and the public right of navigation in Canada (*International Minerals & Chemical Corp. (Canada) Ltd. v. Canada* [1993]; *Coleman v. Ontario* [1983]). This principle of connectivity to a navigational network is elaborated on in *International Minerals & Chemical Corp. (Canada) Ltd. v. Canada* (1993), which found that "Certain navigable systems form a critical part of the interprovincial transportation networks which are essential for international trade and commercial activity in Canada," and that for this reason, navigable waters are also "more than a small pond or lake isolated from other waters."

From the above cases it is inferred that for the waterways affected by the Project that may be found to be physically navigable, that unless they are also *publicly accessible* and forming part of a *larger system of connectivity* for travel or transport, that the waterway sections are not reasonably navigable waters under the jurisprudence interpretation. Note that a waterway is typically understood to be navigable if it is used for transportation purposes along its channel, but if a water is used for private purposes, or for uses that do not require transport along it (i.e., fishing), then it is not rendered navigable from this usage (*Canoe Ontario v. Reed* [1989] and *Coleman v. Ontario* [1983]).

Under the common law interpretation of navigability, the rugged and remote terrain as well as the absence of any public access route to or from waterways in the Project area negates the potential use of most of the waterways in the Project area as aqueous highways. This is confirmed by the results of baseline studies (including land and resources use) and consultation, which indicates that user groups and Aboriginal groups have not used and do not plan to use waterways in the Project area for navigation (see Sections 23.1 and 23.3.5.1; Chapters 20, 24, and 25).

An exception to this determination is Bowser River (#51 and #52 in Table 23.3-1), which has documented historical navigational use by the Skii km Lax Ha for hunting (Section 23.3.1.3). The Upper Bowser River is physically connected to waterways, such as Bowser Lake and the Bell-Irving River, which have a documented historic precedent of use for navigation (Section 23.3.1.3). During consultations, no other Aboriginal Group or land user groups indicated that they currently use the Bowser River, nor do they plan to use it in the future for navigational purposes.

Pretivm deems that Brucejack Lake (#56 and #57 in Table 23.3-1) is not navigable based on public utility based on a lack of connectivity to upstream or downstream waters The lake is a headwater lake (i.e., no connectivity upstream) and that approximately 1.5 km downstream of the lake its outflow stream, Brucejack Creek, goes over a 200-m elevation drop and flows under the Sulphurets Glacier (i.e., no downstream connectivity). Sulphurets Lake and Sulphurets Creek, downstream of Brucejack Creek, are not considered navigable as there is no public access to either waterbody. Access to the mine site area and Brucejack Lake is possible via the Brucejack Access Road, however this road will be controlled at the junction with Highway 37 and will not be accessible to the public.

In summary, applying the Coleman principles, Project waterways, with the exception of Bowser River, are considered to not reasonably be of public utility for navigation from one point of public access to another.

23.4 ESTABLISHING THE SCOPE OF THE EFFECTS ASSESSMENT FOR NAVIGATION

This section includes a description of the scoping process used to identify potentially affected receptor Valued Components (VCs), select assessment boundaries, and identify the potential effects of the Project that are likely to arise from the Project's interaction with an intermediate component or receptor VC. Scoping is fundamental to focusing the Application for an Environmental Assessment Certificate/Environmental Impact Statement (Application/EIS) on those issues where there is the greatest potential to cause significant adverse effects. The scoping process for the navigation effects assessment consisted of the following four steps:

- Step 1: undertaking an issues scoping process to select components, sub-components, and indicators based on a consideration of the Project's potential to interact with navigation;
- Step 2: consideration of feedback on the results of the scoping process from technical experts and the Environmental Assessment (EA) Working Group;
- Step 3: definition of assessment boundaries for navigation; and
- Step 4: identification of key potential effects on navigation.

These steps are described in detail below.

23.4.1 Selecting Receptor Valued Components

Selecting receptor VCs for assessment is undertaken to focus the Application/EIS on the issues of highest concern. Receptor VCs are specific attributes of the biophysical and socio-economic environments that have environmental, social, economic, heritage, or health significance. Receptor VCs also have the potential to be indirectly affected by changes in the baseline condition of other environmental components thereby acting as receptors of that change. Indirect effects may, in turn, also affect the baseline condition of the receptor VC. To be considered for assessment, a component must be of recognized importance to society, the local community, or the environmental system, and there must be a perceived likelihood that the receptor VC will be affected by the proposed Project. Receptor VCs are scoped during consultation with key stakeholders, including Aboriginal communities and the EA Working Group. Consideration of certain receptor VCs may also be a legislated requirement, or known to be a concern because of previous project experience.

As described in Section 6.4.1.1, a scoping exercise was conducted during the development of the draft Application Information Requirements to explore potential Project interactions with candidate receptor VCs, and to identify the key potential adverse effects associated with that interaction. The results of the scoping exercise were circulated for review and approval by the EA Working Group, and feedback from that process was integrated into the Application/EIS.

23.4.1.1 Potential Interactions between the Project and Navigation

Table 23.4-1 provides an impact scoping matrix of intermediate components and receptor VCs that have a possible or likely interaction with Project components and projects and activities. A full impact scoping matrix for all intermediate and receptor VCs is provided in Table 6.4-1. Interactions between the Project and navigable waters were assigned a colour code as follows:

- not expected (white);
- possible (grey); and
- likely (black).

Table 23.4-1. Interaction of Project Components and Physical Activities with Navigation

Project Components and Physical Activities by Phase	Navigation
Construction Phase	
Activities at existing adit	
Air transport of personnel and goods	
Avalanche control	
Chemical and hazardous material storage, management and handling	
Construction of backup diesel power plant	
Construction of Bowser Aerodrome	
Construction of detonator storage area	
Construction of electrical tie-in to BC Hydro grid	
Construction of electrical substation at mine site	
Construction of equipment laydown areas	
Construction of helicopter pad	
Construction of incinerator	
Construction of Knipple Transfer Area	
Construction of local site roads	
Construction of mill building (electrical induction furnace, backfill paste plant, warehouse, mill/concentrator)	
Construction of mine portal and ventilation shafts	
Construction of Brucejack Operations Camp	
Construction of ore conveyer	
Construction of tailings pipeline	
Construction and decommissioning of Tide Staging Area construction camp	
Construction of truck shop	
Construction and use of sewage treatment plant and discharge	
Construction and use of surface water diversions	
Construction of water treatment plant	
Development of the underground portal and facilities	
Employment and Labour	
Equipment maintenance/machinery and vehicle refueling/fuel storage and handling	
Explosives storage and handling	

(continued)

Table 23.4-1. Interaction of Project Components and Physical Activities with Navigation (continued)

Project Components and Physical Activities by Phase	Navigation
Construction Phase (cont'd)	
Grading of the mine site area	
Helicopter use	
Installation and use of Project lighting	
Installation of surface and underground crushers	
Installation of transmission line and associated towers	
Machinery and vehicle emissions	
Potable water treatment and use	
Pre-production ore stockpile construction	
Procurement of goods and services	
Quarry construction	
Solid waste management	
Transportation of workers and materials	
Underground water management	
Upgrade and use of exploration access road	
Use of Granduc access road	
Operation Phase	
Air transport of personnel and goods and use of aerodrome	
Avalanche control	
Backfill paste plant	
Backup diesel power plant	
Bowser Aerodrome	
Brucejack Access Road use and maintenance	
Brucejack Operations Camp	
Chemical and hazardous material storage, management, and handling	
Concentrate storage and handling	
Contact water management	
Detonator storage	
Discharge from Brucejack Lake	
Electrical induction furnace	
Electrical substation	
Employment and Labour	
Equipment laydown areas	
Equipment maintenance/machine and vehicle refueling/fuel storage and handling	
Explosives storage and handling	
Helicopter pad(s)	
Helicopter use	
Knipple Transfer Area	

(continued)

Table 23.4-1. Interaction of Project Components and Physical Activities with Navigation (continued)

Project Components and Physical Activities by Phase	Navigation
Operation Phase (cont'd)	
Machine and vehicle emissions	
Mill building/concentrators	
Non-contact water management	
Ore conveyer	
Potable water treatment and use	
Pre-production ore storage	
Procurement of goods and services	
Project lighting	
Quarry operation	
Sewage treatment and discharge	
Solid waste management/incinerators	
Subaqueous tailings disposal	
Subaqueous waste rock disposal	
Surface crushers	
Tailings pipeline	
Truck shop	
Transmission line operation and maintenance	
Underground backfill tailing storage	
Underground backfill waste rock storage	
Underground crushers	
Underground: drilling, blasting, excavation	
Underground explosives storage	
Underground mine ventilation	
Underground water management	
Use of mine site haul roads	
Use of portals	
Ventilation shafts	
Warehouse	
Waste rock transfer pad	
Water treatment plant	
Closure Phase	
Air transport of personnel and goods	
Avalanche control	
Chemical and hazardous material storage, management, and handling	
Closure of mine portals	
Closure of quarry	
Closure of subaqueous tailing and waste rock storage (Brucejack Lake)	

(continued)

Table 23.4-1. Interaction of Project Components and Physical Activities with Navigation (completed)

Project Components and Physical Activities by Phase	Navigation
Closure Phase (cont'd)	
Decommissioning of Bowser Aerodrome	
Decommissioning of backup diesel power plant	
Decommissioning of Brucejack Access Road	
Decommissioning of camps	
Decommissioning of diversion channels	
Decommissioning of equipment laydown	
Decommissioning of fuel storage tanks	
Decommissioning of helicopter pad(s)	
Decommissioning of incinerators	
Decommissioning of local site roads	
Decommissioning of Mill Building	
Decommissioning of ore conveyer	
Decommissioning of Project lighting	
Decommissioning of sewage treatment plant and discharge	
Decommissioning of surface crushers	
Decommissioning of surface explosives storage	
Decommissioning of tailings pipeline	
Decommissioning of transmission line and ancillary structures	
Decommissioning of underground crushers	
Decommissioning of waste rock transfer pad	
Decommissioning of water treatment plant	
Employment and Labour	
Helicopter use	
Machine and vehicle emissions	
Procurement of goods and services	
Removal or treatment of contaminated soils	
Solid waste management	
Transportation of workers and materials (mine site and access roads)	
Post-closure Phase	
Discharge from Brucejack Lake	
Employment and Labour	
Environmental monitoring	
Procurement of goods and services	
Subaqueous tailing and waste rock storage	
Underground mine	

Notes:
White = interaction not expected between Project components/physical activities and a receptor VC
Grey = possible interaction between Project components/ physical activities and a receptor VC
Black = likely interaction between Project components/ physical activities and a receptor VC

Interactions coded as not expected (white) are considered to have no potential for adverse effects on a receptor VC, and are not considered further.

23.4.1.2 Summary of Receptor Valued Components Included/Excluded in the Application/EIS

As shown in Table 23.4-2, navigation was selected as a human environment VC for assessment in the Application/EIS.

Table 23.4-2. Navigation Receptor Valued Components Included in the Application/EIS

Valued Component/Indicator	Identified by*				Rationale for Inclusion
	AG	G	P/S	IM	
Navigation		X		X	Navigation was identified as a VC in the federal EIS Guidelines (CEA Agency 2013).

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

Navigation was identified in the EIS guidelines as a federal government requirement to "describe how the Project may impede navigation" (CEA Agency 2013). Navigation was selected as a receptor VC under the topic of Human Environment (Part D). Therefore, Table 23.4-2 lists navigation as a receptor VC identified by a governmental organization (G).

"P/S" is not checked in Table 23.4-2 as there was no public or stakeholder expression of concern regarding Project effects on navigation during the general consultation process. "AG" is not checked in Table 23.4-2 as Nisga'a Nation and First Nations did not express, during general consultations, concern regarding Project effects on navigation of freshwater systems in the area of the Project.

There are no receptor VCs applicable to navigation that have been excluded from this assessment.

23.4.2 Assessment Boundaries for Navigation

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

23.4.2.1 Spatial Boundaries

The Local Study Area (LSA) for the navigation effects assessment, shown in Figure 23.3-2, is based on all Project works which have the potential to interact with navigable waters (Section 23.3.1). The LSA of this assessment includes the Brucejack Mine Site, Brucejack Lake (site of subaqueous tailings and waste rock disposal), all access roads, and the Brucejack Transmission Line (aerial works). All waterways bisected by Project works, including 100 m upstream and 100 m downstream of the works, are contained within the boundaries of the LSA.

The Regional Study Area (RSA) for the navigation effects assessment is the same as the baseline study area shown in Figure 23.3-2. It extends to the watershed boundaries for waterways that would be affected or bisected by Project works.

23.4.2.2 Temporal Boundaries

For the purposes of this assessment, potential effects to navigation will be assessed during all Project phases:

- **Construction:** 2 years;
- **Operation:** 22-year run-of-mine life;
- **Closure:** 2 years (includes Project decommissioning, abandonment, and reclamation activities); and
- **Post-closure:** minimum of 3 years (includes ongoing reclamation activities and post-closure monitoring).

23.4.3 Identifying Potential Effects on Navigation

The Project may affect navigability characteristics of waters within and downstream of Project works and activities. Potential effects on navigation by the Project have been raised during EA Working Group meetings by government. Two potential indirect effects on navigable waterways within the study area from the construction of Project mine infrastructure and related physical activities have been identified: effects on safe navigation and effects on access to navigable waters and related land use.

Regarding potential effects on navigational safety from the Project, pursuant to the *Canadian Environmental Assessment Act, 2012* (2012a), indirect environmental effects of a project on health and socio-economic conditions must be evaluated in the federal EA. In *Bowen v. Canada* (1998), the Federal Court found that "aspects of safety," referring to people's safety while navigating, are to be considered as indirect environmental effects on health and socio-economic conditions. For instance, in-stream Project works that may present additional hazards to boaters in a navigable water must be assessed.

Regarding Project effects on access, as elaborated on by Justice Doherty (Section 23.2.1), the test of navigability is that of public utility to use a waterway for some socially beneficial activity from one point of public access to another point of public access (Canoe Ontario v. Reed 1989), implying access rights. Project works that block or eliminate waterways with real or potential travel or transport value may also affect the ability of the public to access navigable waters for traditional Aboriginal, recreational, or commercial activities, thereby affecting land use. For instance, a project that alters the ability of Aboriginal groups to use navigable waterways may result in effects on their ability to access traditional lands and resources to carry out subsistence activities such as fishing, hunting, and trapping.

For all Project phases, Table 23.4-1 identifies which works may cause a potential safety or access effect on waterways deemed navigable. For instance, impediments on the ability to navigate safely may be caused by Project works for bridge and transmission line crossings, and waste rock or tailings placement. Per the conservative method employed in Section 23.3 to compare affected waterways to the criteria identified above, nine water sites were assessed as potential sites with value for navigation. Indirect effects on navigability (i.e., safety and access) were assessed for one stream crossing along the proposed transmission line, one mine site road stream crossing at Brucejack Creek, six stream crossings along the Brucejack Access Road, and Brucejack Lake in association with subaqueous tailings and waste rock deposition.

23.4.3.1 Construction

Project Construction will involve development activities, including bridge and transmission line construction. As a result, access to navigable watercourses could be restricted during infrastructure installation. Additionally, effects on the ability to safely navigate may occur while physical

construction is taking place and/or once structures are installed due to the presence of in-stream obstacles.

23.4.3.2 Operation

Project Operation may potentially impact safe navigation or access to navigable watercourses due to the presence of in-stream obstacles, overhead power lines, infrastructure maintenance/improvement activities, subaqueous waste rock and tailings storage in Brucejack Lake, and changes in streamflow within the Brucejack Creek and downstream waters.

23.4.3.3 Closure and Reclamation

Project Closure will involve decommissioning of bridges and transmission lines. As a result, access to navigable watercourses during infrastructure removal could be restricted for safety reasons during decommissioning activities. Effects on the ability to safely navigate while decommissioning activities are ongoing may also occur due to the presence of in-stream obstacles. In addition, subaqueous waste rock and tailings deposits will remain in Brucejack Lake and could affect safe navigation due to decreased lake depth or affected shorelines, if the lake is deemed to be navigable. Changes in streamflow within the Brucejack Creek and downstream waters could also affect safe navigation, if these waters are deemed navigable.

23.4.3.4 Post-closure

The continued presence of some Project works during Post-closure, such as subaqueous waste rock and tailings storage in Brucejack Lake, may potentially affect navigational safety or access (if Transport Canada determines Brucejack Lake is navigable) if they accumulate in sufficient quantity to act as an obstruction to navigation.

23.5 EFFECTS ASSESSMENT AND MITIGATION FOR NAVIGATION

23.5.1 Identifying Key Effects

Table 23.5-1 identifies Project works that may potentially cause effects on safety and accessibility relating to navigation. Effects on navigation—whether on safety or access—from Project works manifest as a result of the type of interaction of a particular work within a waterway.

Table 23.5-1. Ranking Potential Effects on Navigation

Project Components/ Physical Activities	Potential Effects on Navigation	
	Safety	Access
Construction		
Construction of local site roads	●	●
Upgrade and use of exploration access road	○	○
Discharge from Brucejack Lake	○	○
Installation of the transmission line and associated towers	●	●
Operation		
Subaqueous tailings disposal	●	○
Subaqueous waste rock disposal	●	○
Brucejack Access Road use and maintenance	●	○
Discharge from Brucejack Lake	○	○
Use of mine site haul roads	●	○

(continued)

Table 23.5-1. Ranking Potential Effects on Navigation (completed)

Project Components/ Physical Activities	Potential Effects on Navigation	
	Safety	Access
Closure		
Decommissioning of Brucejack Access Road	●	●
Decommissioning of local site roads	●	●
Discharge from Brucejack Lake	●	●
Closure of subaqueous tailing and waste rock storage (Brucejack Lake)	●	○
Decommissioning of transmission line and ancillary structures	●	●
Post-closure		
Discharge from Brucejack Lake	○	○
Subaqueous tailing and waste rock storage	●	○

Notes:
○ = *No detectable interaction anticipated*
● = *Negligible to minor adverse effect expected; implementation of best practices, standard mitigation and management measures; no monitoring required, no further consideration warranted.*
● = *Potential moderate adverse effect requiring unique active management/monitoring/mitigation; warrants further consideration.*
● = *Key interaction resulting in potential significant major adverse effect or significant concern; warrants further consideration.*

23.5.1.1 Effects on Ability to Safely Navigate Waters

In general, effects on safe navigation from Project works may occur as a result of:

- linear works (i.e., bridges and overhead power lines) that may pose navigational hazards depending on overhead clearance;
- in-stream works such as bridge or aerial cable supports may pose navigational hazards if they act as partial or complete obstacles (the latter also impeding travel) or reduce waterbody width;
- underwater works (i.e., subaqueous tailings/waste rock) that may pose navigational hazards depending on depth clearance, and may also affect downstream flow volumes;
- changes to downstream flows from Brucejack Lake to Brucejack Creek, Sulphurets Creek, and Unuk River that may cause safety effects during the duration of the Project; and
- clear-span works (i.e., bridges or aerial cables) will not impede safety once built but may cause temporary safety effects during construction and decommissioning activities.

Local Site Roads

The majority of local mine site area roads do not interact with navigable waters and thus will have no effect on navigational safety. There is a proposed clear-span bridge (#58 in Table 23.3-1) located in the mine site area, which crosses Brucejack Creek, just below the outlet of Brucejack Lake (Figure 23.3-2). Although Brucejack Creek is deemed to not be navigable based on the assessment in Section 23.3.5.3, the potential effects on navigation are conservatively discussed as the creek is considered physically navigable. Due to their lack of in-stream works, clear-span bridges are preferred for navigational purposes as they minimize in-stream safety hazards. The cross-sections in the engineering drawings in Appendix A of Appendix 23-A, Screening Level Assessment of Waterways against the MWWO, depict the present water level at the time of measurement for bridge design. While Brucejack Creek is considered physically navigable, since this bridge will be clear-span (Appendix 23-B, Transport Canada Permits and Responses to Applications for the Existing Exploration Road), it is not anticipated to have safety effects except for during its construction and decommissioning, and these will be mitigated per Transport

Canada direction and compliance with the various standards and protocols listed in Section 23.5.2. In addition, based on public utility, Brucejack Creek is not considered navigable (see Section 23.3.5), so no indirect effects of the Project on access to a navigable water, or on safety while navigating, are anticipated as a result of local site road construction, use, or decommissioning. Therefore, this potential effect is not carried forward further in the assessment.

Brucejack Transmission Line

The Brucejack Transmission Line will be designed and constructed in accordance with CSA, Transport Canada, and Fisheries and Oceans Canada standards (Transport Canada 2009a).

The largest stream crossing along the Brucejack Transmission Line is across the Bowser River upstream of Knipple Lake. The Bowser River is a navigable waterbody, and has demonstrated public utility for navigation as per consultations with local Aboriginal and user groups (Sections 23.1 and 23.3.1.3). However, it will have a conductor height of approximately 120 m above the high water level, which will provide ample clearance for any vessel travelling down the river to do so in a safe manner. In addition, the transmission line footings will be positioned approximately 500 m away from each riverbank. Construction of the Brucejack Transmission Line will mainly use helicopter support to reduce on-ground disturbances. Therefore, aside from potential temporary effects during construction, which would be minimal and mitigated per Transport Canada direction (Transport Canada 2009a, 2009b), no effects to safety are anticipated for the Bowser River transmission line crossing.

With the exception of the Bowser River, all other transmission line crossings were over waterbodies where the gradient exceeded the 10% threshold for navigability, and the majority exceeded 20%. These gradients are in excess of the 10% threshold for physical navigability, and in addition are considered to not reasonably be of public utility for navigation from one point of public access to another (Section 23.3.5).

Consequently, they are not considered navigable, so no indirect effects of the Project on access to a navigable water, or on safety while navigating, are anticipated as a result of Brucejack Transmission Line construction, use, or decommissioning (with the exception of the aforementioned Bowser River crossing). Therefore, this effect is not carried further in the assessment.

Subaqueous Tailings Deposition

Since the Project will deposit tailings directly into Brucejack Lake via pipeline at depth, the Proponent investigated the applicability of section 22 of the NPA to this activity (Section 23.2.3). Section 22 is part of Part II of the NPA, which is intended to prevent or prohibit submerged materials (such as stone or tailing) or objects (such as tailings discharge lines) from acting as obstructions or obstacles to vessels in transit. In order to ascertain the applicability of this section, Pretivm investigated:

- the navigability of Brucejack Lake, Brucejack Creek, Sulphurets Lake, and Sulphurets Creek (Section 23.3.5) since NPA provisions are not applicable to non-navigable waters that are not located upstream of navigable waters; and
- whether the activity of placing tailing in Brucejack Lake would meet the 36 m test, should the navigability assessment by TC determine the lake to be navigable.

Brucejack Lake will likely support Project-specific boat traffic during various stages of the Project. All Project personnel operating boats on the lake will be made aware of any hazards, if any, and appropriate signage will be displayed. However, as indicated in Section 23.3.5, public use of the lake, Brucejack Creek, Sulphurets Lake, or Sulphurets Creek is not anticipated. Consequently, the aforementioned waterbodies are not considered navigable for the purposes of the NPA.

Furthermore, the estimated maximum height of tailings in Brucejack Lake is 44 m below the surface (Chapter 5.11.2, Project Description), which is approximately 7 m below the 36 m depth pursuant to section 22 of the NPA.

Although Brucejack Lake is physically capable of supporting floating logs or vessels, it is not expected that Transport Canada will determine it to be navigable for the purpose of the NPA considering common law. Regardless of whether this will be the Transport Canada decision, tailings will be deposited at a depth that would allow for safe navigation of the lake, according to section 22 of NPA and are not expected to migrate out of the lake into downstream waterbodies. Therefore, the effects of the tailings deposition on navigability of Brucejack Lake are considered to be negligible and are not discussed further in this assessment.

Subaqueous Waste Rock Deposition

Waste rock deposition will take place along the west shoreline, progressing from shallower waters to deeper waters (to an approximate maximum depth of 65 m) of Brucejack Lake. At the surface of the lake, PAG waste rock will be capped with NPAG material to provide a laydown area and platform to support the waste rock deposition. The laydown area and platform will extend approximately 150 m from the shore into the lake with the submerged portion of the waste rock extending approximately 400 m from the shore (Chapter 5.11.1, Project Description). If deemed navigable by Transport Canada, waste rock deposition in Brucejack Lake may require a Governor in Council exemption related to Sections 22 and 24 of the NPA.

Although Brucejack Lake is physically capable of supporting floating logs or vessels, it is not expected that Transport Canada will determine it to be navigable for the purpose of the NPA considering common law criteria as evaluated in Section 23.3.5.3, including consultation summarized in Section 23.3.5.1. Regardless of whether Transport Canada will concur with the proponent evaluation for Brucejack Lake, waste rock deposition will not substantially interfere with safety of any potential future public navigation of the lake, and waste rock would not migrate out of the lake into downstream waterbodies. Therefore, the effects of the waste rock deposition on navigability of Brucejack Lake are considered to be negligible, and potential effects to downstream waters are not anticipated, so neither is discussed further in this assessment.

Brucejack Access Road

Transport Canada permitted six bridge crossings in relation to the Brucejack Access Road (existing exploration road) in late 2012 (Appendix 23-B, Transport Canada Permits and Responses to Applications for the Existing Exploration Road). Each of the permits contains various terms and conditions that the Proponent must abide by. The bridges, which are all clear-span with no support structures in the waterway, were built in 2013 in accordance to Transport Canada's terms and conditions (see Sections 23.1 and 23.4.1.2). Because the bridges are already in place and will not further affect navigation during their use or maintenance they are only included in this effects assessment under the decommissioning phase of the Project.

It is possible that there may be temporary safety or access effects in relation to navigation for short durations during the Closure phase. During decommissioning, the Proponent will follow the terms and conditions set forth by Transport Canada and the mitigation measures discussed in Section 23.5.2 to ensure that any effects are minimized. The overall effects of the Brucejack Access Road on navigation are expected to be negligible to minor, temporary, and reversible and fully mitigated by standard mitigation and management measures and therefore not carried forward in this assessment.

Flows from Brucejack Lake

Flows from Brucejack Lake into Brucejack Creek and its tributaries were assessed to determine the effects of water use for mining activities, and deposition of waste rock and tailings into the lake on stream flow in Brucejack Creek, Sulphurets Creek, and the Unuk River. This study is summarized in Chapter 10, Surface Water Hydrology Predictive Study. Table 23.5-2 summarizes the predicted hydrological changes in flow downstream in Brucejack Creek, Sulphurets Creek and in the Unuk River as a result of the Project (Chapter 10, Surface Water Hydrology Predictive Study). As shown in the table, flows to Brucejack Creek would increase through the Construction and Operations phases, decrease marginally during Closure and return to baseline conditions Post-closure. Downstream changes in flow within Sulphurets Creek and the Unuk River are expected to be negligible (>1% expected change) through all phases of the Project. Regardless of the potential navigability of Brucejack Creek or downstream waters, the predicted changes in flow are expected to be negligible with no effect on navigation. As such, changes in flow as a pathway to effect on navigation are not considered further in this assessment.

Table 23.5-2. Changes in Mean Annual Flows Compared to Baseline Conditions (% of Baseline Flows)

Location	Construction	Operations	Closure	Post-closure
Brucejack Creek[1]	6%	6%	-1%	0%
Sulphurets Creek below Sulphurets Lake[2]	0.9%	0.9%	< 0.1%	0%
Sulphurets Creek at the mouth[3]	0.2%	0.2%	< 0.1%	0%
Unuk River at Sulphurets Creek[4]	0.1%	0.1%	< 0.1%	0%

[1] At hydrometric station BJL-H1; [2] At hydrometric station Sl-H1; [3] At hydrometric station SC-H1; [4] At hydrometric station UR-H1

23.5.1.2 Effects on Navigational Access

Indirect effects from Project works leading to potential temporary indirect effects to access along navigable waters may occur as a result of works (i.e., bridge or aerial cable footings) that obstruct passage along a waterway. The only Project works that may affect navigational access will be temporary in length, occurring only during construction and decommissioning activities. There are no Project activities that will permanently affect navigational access, such as dams. Proper mitigation measures, as discussed in Section 23.5.2, will be employed during construction and decommissioning of Project works within waterways to ensure that effects to navigation are minor or negligible. In addition, as discussed in Section 23.3.5, waterways within the Project area are not navigable based on common law, with the exception of the transmission line crossing at Bowser River. For these reasons, potential effects to access along navigable waters are considered minor or negligible and able to be fully mitigated by standard mitigation and management measures and therefore are not further discussed in this assessment.

23.5.2 Mitigation Measures for Navigation

Local Site Roads

The majority of local mine site area road crossings do not interact with navigable waters and thus will have no effect on navigation safety. There is one proposed bridge across Brucejack Creek just below the outlet of Brucejack Lake (Figure 23.3-2). This bridge may be built prior to the Construction phase to support exploration activities north of Brucejack Creek and to allow vehicle access to areas that require reclamation of historical mining materials, and will be deconstructed during the Closure phase, in accordance with any specific guidance provided by Transport Canada.

Because the bridge is a clear-span structure, there will not be any Project works within the waterway during use or maintenance of the structure. At the time of writing, current engineering design drawings indicated that the bridge would have a clearance height of approximately 2 m above the present water

level. Engineering drawings of the bridge crossing are available in Appendix 23-A, Screening Level Assessment of Waterways against the MWWO.

As is the case with bridge construction, any effects of decommissioning will be mitigated per direction from Transport Canada.

Brucejack Transmission Line

The Brucejack Transmission Line will be designed and constructed in accordance with CSA, Transport Canada, and Fisheries and Oceans Canada standards. For example, the transmission line crossing over the navigable Bowser River will follow the CSA C22.3 No. Table 2 (CSA 2010) and TP 14596 Fisheries and Oceans Canada operational statements, as well as Transport Canada AGA – 6.0 Obstruction Marking and Lighting, Clause 6.7 Suspended Cable Span Markings. As shown in the drawing of the proposed transmission line profile along the Bowser River (which has demonstrated public utility for navigation; Appendix A of Appendix 23-A, Screening Level Assessment of Waterways against the MWWO), the height of the conductor above the high water level is about 120 m, which would not interfere with any type of vessel capable of navigating Bowser River. In addition, the transmission line footings will be about 500 m away from each riverbank and construction of the transmission line will mainly use helicopter support so as to reduce on-ground disturbances.

The Project transmission line will follow the criteria outlined in Transport Canada's brochure concerning aerial cables (power and communications) and the NPA (Transport Canada 2009a), which are available in Section 23.2.2.2.

Subaqueous Tailings Disposal

At least 44 m of water will be maintained from the surface of the lake to the top of the tailings deposit at the end of the mine life (Chapter 5.11.2, Project Description). No additional mitigation measures specific to navigation are proposed. Further discussion of section 22 of the NPA is available in Section 23.5.1.1.

Waste Rock Disposal

Waste rock will be deposited on the westerly shores of Brucejack Lake (Chapter 5.11.1, Project Description). As stated in Section 25.3.5, there is no anticipated public usage of Brucejack Lake. Any Project personnel operating boats on the lake will be made aware of any hazards, if any exist, and appropriate signage will be displayed.

Access Road

The exploration access road was constructed in 2013 and, as discussed in Section 23.5.1, the use and maintenance of this existing road is not expected to have an effect on navigation. Therefore, this section focuses solely on the decommissioning of the six bridges permitted by Transport Canada under the NWPA. These bridges will be deconstructed and decommissioned during the Closure phase in accordance to specific guidance provided by Transport Canada within the individual permits which can be found in Appendix 23-B, Transport Canada Permits and Responses to Applications for the existing exploration access road.

23.6 CUMULATIVE EFFECTS

No residual effects on navigation were identified, and no potential cumulative effects to stream flows or water quantity were predicted in any navigable waters (Chapter 10, Surface Water Hydrology). Therefore, a cumulative effects assessment was not undertaken for effects on navigation.

23.7 SUMMARY OF EFFECTS ON NAVIGATION

A total of 49 transmission line crossings (#1 to #49, Table 23.3-1), seven road crossings (#50 to #55 and #58 in Table 23.3-1), and subaqueous tailings and waste rock disposal (#56 and #57 in Table 23.3.-1) were

assessed to determine if they would have an effect on the ability to safely navigate or access navigable waters within the Project region. It was determined that there may be some localized effects of very short duration during construction and decommissioning of the various Project works, but with proper mitigation and management are not expected to result in residual effects for the purposes of this assessment. In addition, navigation by water is uncommon within the Project region as was determined during a desk-based study, which included a review of historical documents and consultations with various stakeholder groups, including recreational business owners and Aboriginal groups. Pretivm determined (Section 23.3.5) that, based on criteria established through case law precedent, the only navigable waterway potentially affected by Project activities is Bowser River (#s 51 and 52 in Table 23.3-1) and none of the other waterways are navigable for the purposes of the Act.

In conclusion, waterways potentially affected by Project works are not expected to be publicly utilized during the duration of the Project. Nevertheless, if waterways are used for public navigation, effects on navigation are expected to be negligible to minor, localized, and temporary in duration, such that with implementation of mitigation and management measures, residual effects on navigation are not anticipated. Because residual effects on the ability to safely navigate as well as the effects on navigational access are not expected, they are not discussed further in this assessment. No cumulative effects are expected. A summary of potential effects, mitigation, and significance on navigable waters is provided in Table 23.6-1.

Table 23.6-1. Summary of Potential Effects, Mitigation, and Significance on Navigation

Effects Considered	Project Phase(s)	Mitigation Measures	Significance
Ability to safely navigate (no residual effect identified) Navigational access (no residual effect identified)	All phases	• Appropriate signage while works are being constructed or removed from waterways, if necessary • Aerial cables and bridge decks will be installed at heights that do not interfere with navigation, where possible • Clear-span bridge designs • Any Project personnel operating boats on Brucejack Lake will be made aware of any hazards, if any exist, and appropriate signage will be displayed	Not significant

REFERENCES

2012a. *Canadian Environmental Assessment Act, 2012*, SC. C. 19, s. 52.

2012b. *Jobs and Growth Act, 2012*, SC. C. 31, s. 318.

1985. *Navigation Protection Act*, RSC. C. N-22.

2009. Minor Works and Waters Order. S.C. 2009, c.2, s.328.

AMEC. 2011. *Avanti Mining Inc. Kitsault Mine Project Archaeological Impact Assessment Final Report*. Permit # 2010-0363. On file, Archaeology Branch, Victoria, BC.

Barbeau, C. M. 1910-1969. *Northwest Coast Files, B-F-1 to B-F-731*. Ottawa: Archival Records Held at the Canadian Museum of Civilization.

Barbeau, C. M. and W. Beynon. 1950. *Raven Clan Outlaws of the North Pacific Coast*. Ottawa, ON: Unpublished Manuscript, Folklore Division, National Museum of Man (Canadian Museum of Civilization).BC. 1936. Annual Report of the Minister of Mines, 1935. On file with the British Columbia Geological Survey, Ministry of Energy, Mines and Natural Gas, Victoria, BC.

BC ILMB. 2000. *Cassiar Iskut-Stikine Land and Resource Management Planning Process Completed*. http://archive.ilmb.gov.bc.ca/slrp/lrmp/smithers/cassiar/news/newsreleases/lrmp_completed.htm (accessed December 2012).

BC MFLNRO. 2012. *Nass South Sustainable Resource Management Plan*. http://www.ilmb.gov.bc.ca/slrp/srmp/south/nass/index.html (accessed November 2012).

Boas, F. 1895. *The Indians of British Columbia: Physical Characteristics of the Tribes of the North Pacific Coast, the Tinneh Tribe of the Nicola Valley, the Ts'ets'a'ut, the Nisk'a, Linguistics of Nisk'a and Ts'ets'a'ut, and Vocabulary of the Tinneh Tribes of Canada*. British Association for the Advancement of Science, Annual Meeting Report 65 523-92.

Bowen v. Canada. 1998. 1997 CanLII 6383 (FC), [1998] 2 FC 395. http://canlii.ca/t/4djq (accessed June 2013).

Canoe Ontario v. Reed. 1989. 69 OR 2d 494. Justice Doherty, cited in Ontario Ministry of Natural Resources. 2007. Ownership Determination – Beds of Navigable Waters. http://www.mnr.gov.on.ca/stdprodconsume/groups/lr/@mnr/@crownland/documents/document/mnr_e000115.pdf (accessed May 2013).

CEA Agency. 2013. *Environmental Impact Statement Guidelines: Brucejack Gold Mine Project*. http://www.ceaa-acee.gc.ca/050/documents/p80034/89566E.pdf (accessed November 2013).

Coleman v. Ontario. 1983 O.J. No 275.

CSA. 2010. *CAN/CSA-C22.3 NO. 1-10. Overhead Systems*. http://shop.csa.ca/en/canada/canadian-electrical-code-part-iii-electricity-distribution-and-transmission/cancsa-c223-no-1-10/invt/27014792010 (accessed November 2013).

Cypress Forest Consultants Ltd. 2011. *Brucejack Exploration Site Access Plan: MX-1-832/ S25343*. Prepared for Pretium Resources Inc. by Cypress Forest Consultants Ltd.: Terrace, BC.

Daly, R. 2005. *Our Box Was Full: An Ethnography for the Delgamuukw Plaintiffs*. Vancouver: University of British Columbia Press.

Delgamuukw v. The Queen. 1988. Cross Examination on Affidavit of Gerry Gunanoot, no. 0843, December 9, 1988.

Emmons, G. T. 1911. *The Tahltan Indians*. University of Pennsylvania Museum, Anthropological Publication, 4 (1): Philadelphia.

Four Point Learning. 2013. *Navigability and Determining Title in Ontario*. The Boundary Point. 1, 9: Four Point Learning.

Friesen, B. and C. Candy. *Pretivm Report on Seismic Refraction, Bathymetric, and Sub-bottom Acoustic Profiling Surveys, Brucejack Lake, Bell II Area, BC*. Frontier Geosciences Inc.: North Vancouver, BC.

Government of Canada. 2009. *Minor Works and Waters (Navigable Waters Protection Act) Order*. Amendment to the *Navigable Waters Protection Act*. Published in the Canada Gazette, Part 1: Vol. 143, No. 19.

Holland, S. 1976. *Landforms of British Columbia – A Physiographic Outline*. Government of British Columbia, Bulletin 48.

International Minerals & Chemicals Corp. (Canada) Ltd. v. Canada. 1993. *1* 1993 F. C. 559

MacDonald, G. F. 1989. *Kitwanga Fort Report*. On file at the Canadian Museum of Civilization: Gatineau, QC.

MacDonald, G. F. and J. Cove, eds. 1987. *Trade and Warfare: Tsimshian Narratives*. Collected by Marius Barbeau and William Beynon. Canadian Museum of Civilization, Mercury Series, Directorate Paper No. 3. Ottawa, ON: Canadian Museum of Civilization.

MacLachlan, B.B. 1981. Tahltan. In *Handbook of North American Indians Vol 6: Subarctic*. Ed. J. Helm. 458-68. Washington D.C.: Smithsonian Institution.

Marsden, S., M. Seguin Anderson, and D. Nyce. 2002. Tsimshian. In *Aboriginal People of Canada: A Short Introduction*. Ed. P. R. Magocsi. Toronto: University of Toronto Press.

Mathews, W.H., and J.J. Clague. 1993. The Record of Jokulhlaups from Summit Lake, Northwestern British Columbia. *Canadian Journal of Earth Science, Volume 30*, 499-508, http://www.nrcresearchpress.com/doi/pdf/10.1139/e93-039 (accessed November 2013).

Moore, R.D., S.W. Fleming, B. Menounos, R. Wheate, A. Fountain, K. Stahl, K. Holm, and M. Jakob. 2009. Glacier change in western North America: implications for hydrology, geomorphic hazards and water quality. *Hydrological Processes, 23*. 42-61.

People of 'Ksan. 1980. *Gathering What the Great Nature Provided: Food Traditions of the Gitksan*. Vancouver, BC: Douglas and McIntyre.

Rescan. 2009. *Northwest Transmission Line Project: Skii km Lax Ha Traditional Use and Knowledge Report*. Prepared for British Columbia Transmission Corporation by Rescan Environmental Services Ltd.: Vancouver, BC.

Rescan. 2013. *Application for an Environmental Assessment Certificate/Environmental Impact Statement for the KSM Project*. Prepared for Seabridge Gold Inc. by Rescan Environmental Services Ltd. Vancouver, BC.

Simpson v. Ontario. 2011. Ontario Superior Court of Justice 2011-02-18 (citing Coleman v Ontario (Attorney General), [1983] O.J. No. 275, at par. 15; accessed June 2013).

Sterritt, N. J., S. Marsden, R. Galois, P. R. Grant, and R. Overstall. 1998. *Tribal Boundaries in the Nass Watershed*. UBC Press: Vancouver, BC.

Teit, J. 1956. Field Notes on the Tahltan and Kaska Indians: 1912-1915. June Helm McNeish, ed. *Anthopologica*, 3: 40-171. Ottawa, ON.

THREAT. 2009. *Tahltan Traditional Use Study – Northwest Transmission Line Project: Interim Report*. Report on file with the BC EAO. Victoria, BC.

THREAT. 2010. *Tahltan Knowledge and Use Study of the Forrest Kerr Hydro Project*. Prepared for Coast Mountain Hydro Corporation: Dease Lake, BC.

Transport Canada. 2009a. *Navigable Waters Protection Act. Aerial Cables (Power and Communication) TP 14596 (12/2009) Brochure*. Minister of Transport. http://www.tc.gc.ca/publications/bil/tp14596/pdf/hr/tp14596b.pdf (accessed June 2013).

Transport Canada. 2009b. *Navigable Waters Protection Act. Temporary Works TP 14893 (12/2009) Brochure*. Minister of Transport. http://www.tc.gc.ca/Publications/bil/TP14893/PDF/HR/TP14893B.pdf (accessed June 2013).

Transport Canada. 2010. *Minor Waters Users Guide – TP 14838 E*. http://www.tc.gc.ca/eng/marinesafety/tp-tp14838-3092.htm (accessed April 2013).

Transport Canada. 2012a. Government of Canada introduces navigation law amend*ments*. *Newswire*. October 18, 2012. http://www.newswire.ca/en/story/1055291/government-of-canada-introduces-navigation-law-amendments

Transport Canada. 2012b. *Proposed List of Scheduled Waters*. https://www.tc.gc.ca/media/documents/mediaroom/proposed_list_of_scheduled_waters.pdf (accessed February 2014).

Transport Canada. 2013. *Navigable Waters Protection Program – Overview*. Government of Canada. http://www.tc.gc.ca/eng/marinesafety/oep-nwpp-menu-1978.htm (accessed January 2014).

Valard Construction. 2011. *Preliminary Transmission Cost Estimate, Brucejack Mine Project, Stewart Area, BC*. Prepared for Pretium Resources Inc. by Valard Construction: Vancouver, BC.

Wiley, J.B., and J.H. Curran, 2003. *Estimating Annual High-flow Statistics and Monthly and Seasonal Low-flow Statistics for Ungaged Sites on Streams in Alaska and Conterminous Basins in Canada*. U.S. Geological Survey Water-Resources Investigations Report 03-4114, 61 p.

Personal Communications

Faetz, W. 2012. Owner, Spey Lodge. Personal Communication: June 22, 2012.

Simpson, D. 2013. Hereditary Chief, wilp Skii km Lax Ha. Information Interview: May 27, 2013, Rescan Office, Vancouver, BC.

Simpson, D. 2014. Hereditary Chief, wilp Skii km Lax Ha. Email communications: February 11, 2014.