6.0 ENVIRONMENTAL SETTING (SUMMARY OF EXISTING CONDITIONS)

This chapter describes the environmental setting of Central New Brunswick generally, and (where information exists) the Project Development Area (PDA) specifically, including general information on the historical, biophysical, and socioeconomic and cultural context of these areas. Together, these descriptions provide a high-level summary of existing conditions in the vicinity of the Project.

6.1 OVERVIEW

The Project is located in a sparsely populated rural setting on provincial Crown land approximately 10 km southwest of the community of Napadogan, New Brunswick, and approximately 60 km directly northwest of the City of Fredericton (Figure 1.1.1). The Project straddles a topographical divide that separates the headwaters of the McBean Brook and Napadogan Brook watersheds. Both brooks drain to the Nashwaak River, which enters the St. John River at Fredericton.

Most of the Project is located near the southwestern border of the Central Uplands Ecoregion within the Beadle Ecodistrict, a lake-filled region of rolling hills separated by broad valleys. This area is typically well-drained, forested upland, separated by rolling valleys. The surface elevation typically ranges from approximately 300 m to 350 m above mean sea level (amsl), with some local peaks rising to over 400 m. Small lakes and wetlands are commonly found in low-lying areas (NBDNR 2007). At Juniper (the Environment Canada weather station that is closest to the Project), precipitation averages 1,190.7 mm annually, of which about 26% falls as snow, and daily average temperatures are 17.7°C in July and -12.4°C in January (Environment Canada 2012a). Like much of Central New Brunswick, the area is sparsely populated, and air quality is good to very good most of the time.

The majority of the Project facilities lie within the small Bird and Sisson brook tributary watersheds to West Branch Napadogan Brook, which drains to the upper Nashwaak River. The southwestern portion of the open pit does, however, partially intersect small unnamed tributaries to McBean Brook, a small tributary watershed to the Nashwaak River itself, as do portions of the relocated 345 kV transmission line and realigned Fire Road. The groundwater table is typically observed as a muted version of surface topography. The Nashwaak River watershed supports several fish species including Atlantic salmon, brook trout and bass. The Nashwaak River and some of its tributaries are salmon-bearing; salmon was found in the West and East Branches of Napadogan Brook and at the mouth of Bird Brook during field surveys conducted for the Project. Surface water and groundwater quality is generally good to very good.

The terrestrial habitat in the vicinity of the Project consists primarily of immature and young forest as a result of several decades of historic forestry activity in the area. Wildlife in the vicinity of the Project is typical for Central New Brunswick, with abundant deer, moose, bear, and a wide variety of small mammals. An abundance of preferred bird nesting and breeding habitat is available.

There is a long history of active commercial logging, and thus many forestry roads, landing areas, and forest blocks in various stages of regrowth and maturity are present in the vicinity of the Project. Recreational activity in the area consists of hunting, fishing, trapping, ATV riding, and snowmobiling.

There are no permanent residences located in the immediate vicinity of the Project. The closest permanent residences to the Project are located in Napadogan, a small community on Highway 107 approximately 10 km to the northeast of the Project site. There are approximately 39 privately-owned, active recreational campsite leases on provincial Crown land to the east and southeast of the Project. The closest of these campsites, some of which contain cabins, is approximately 1.5 km to the east of the open pit location and on the opposite side of a prominent ridge separating the open pit from the location of cabins to its east.

The Project site does not include First Nation reserve land, but is within an area which the Maliseet assert as part of their traditional territory. Natural resources in the vicinity of the Project site have been and continue to be used by Aboriginal people.

Further details on the historical, biophysical, and socioeconomic setting of the Project and the surrounding region of Central New Brunswick are provided in the sections that follow.

6.2 HISTORICAL SETTING

Archaeological records confirm that there were Aboriginal campsites in New Brunswick dating back approximately 11,000 years (Jacques Whitford Stantec 2009). The Wolastoqiyik (Maliseet) and Mi'kmaq peoples currently living in New Brunswick have long occupied parts of New Brunswick as their traditional land for centuries, and continue to use its land and resources to this day. Given its rural and relatively undeveloped nature, Central New Brunswick and the area in the general vicinity of the Project have likely been used by Aboriginal people for at least several centuries, and much of that use of land and resources likely continues today.

Colonization of various areas of New Brunswick including Central New Brunswick occurred following the arrival of the Europeans in the early 17th Century, and various rural communities near the Project were developed in response to the economic drivers that formed the areas of Central New Brunswick and its dependence on its natural resources. Many of those communities remain to this day focused around supplying goods, services, resources, and labour to those resource-based industries, including particularly the forestry sector.

This section provides a brief historical overview of Central New Brunswick, including the Pre-Contact Period (*i.e.*, up to the settlement of the area by Europeans) and the Historic Period (*i.e.,* European settlement to the mid-20th Century).

6.2.1 Pre-Contact Period

While it is likely that the peoples from all Pre-Contact time periods may have been the ancestors of the First Nations peoples currently living in the Province, the archaeological record indicates that the Wolastoqiyik (Maliseet) and Mi'kmaq peoples currently living in New Brunswick are the direct descendants of the Woodland Period (approximately 2500-500 years before present (BP)) peoples (Stantec 2012j).

The Nashwaak River watershed is a sub-watershed of the larger St. John River watershed, which is known to be the traditional territory of the Wolastoqiyik people. Villages and camp sites, as well as other types of sites, were located throughout the St. John River watershed (Wallis and Wallis 1957).

The Wolastoqiyik people lived off the land, gathering resources to feed their families through hunting, fishing, trapping, and gathering. Much of the subsistence efforts of the Wolastoqiyik were focused around major river systems, as these were their primary travel routes. The Wolastoqiyik people used the rivers and streams of New Brunswick, extending up the smallest of watercourses, to access food and other resources. Travelling over landforms from one watershed into another led to the establishment of portage routes. Portage routes, in particular those between major watersheds, were a vital component of trade and communication within and outside of New Brunswick.

Archaeologists know little about settlement patterns during the Late Woodland period; although there is some archaeological evidence that groups may have shifted from a more logistical to residential mobility strategy (Blair 2004; Burke 2000). It is postulated that people moved from one living location to another in seeking resources, rather than gathering resources and bringing them to a central living area.

The late Pre-Contact/early Contact Period (or proto-historic period) in the Maritimes region generally began in the early 17th Century, with the arrival of Samuel de Champlain to the area now known as Saint John in 1604. The extent to which indigenous groups living on the St. John River system had direct contact with Europeans during the 17th Century is not known. However, Bourque (1973) suggested that the presence of Europeans (including those who came seasonally in small numbers) fundamentally altered indigenous settlement and subsistence patterns. European settlement during the 18th and 19th Centuries, and the introduction of wage economy, further contributed to significant changes in settlement and subsistence (Bourque 1973) of the Wolastoqiyik. The shifts in seasonal use of the coast and interior caused many Wolastoqiyik to leave their coastal settlements altogether, and join others at major interior villages such as the Meductic on the St. John River (Burke 2000).

6.2.2 Historic Period

The French (Acadians) were the first Europeans to settle in areas now known as New Brunswick, following Samuel de Champlain's first arrival to the mouth of the St. John River in 1604. They tended to settle mainly along the New Brunswick coast and/or along the shorelines of major rivers leading to or in proximity of the coast, and are not anticipated to have travelled to or settled in any place close to the Project.

By 1600, it is believed that Aboriginal people, including the ancestors of the Mi'kmaq and Wolastoqiyik-Passamaquoddy First Nations people, had inhabited New Brunswick for over 10,000 years. There were an estimated 35,000 Mi'kmaq in the year 1500, but the number of Mi'kmaq people was estimated to decline to 3,500 in as little as 100 years due to the first European contacts and disease (Wynn 1981). The same decline would be expected of the Wolastoqiyik populations. By the 1750s, the First Nations people no longer comprised the majority of the population within the area now known as New Brunswick.

The European-derived population of New Brunswick increased steadily during the early 19th Century. It grew from 25,000 in 1805 to 74,000 in 1824. By 1851, there were almost 200,000 settlers in the province (Wynn 1981).

6.2.2.1 Subsistence

Life in Central New Brunswick in the 18th and 19th Centuries focused heavily on resource-based activities such as small-scale commercial fishing, logging, agriculture, hunting, trapping, and other subsistence-type activities that supported the development of communities and local commerce. The face of the countryside was transformed as villages, dwellings, barns, roads, and bridges were built.

Up until the mid-18th Century, New Brunswick was still almost completely forested. Extensive white pine-hemlock-northern hardwood forest dominated New Brunswick in pre-European times and largely survived until the last decades of the 18th Century (Wynn 1981). Agriculture and the fishery were becoming the main economic drivers in New Brunswick. However, the timber industry emerged as a central economic driver as soon as Napoleon Bonaparte severed Britain's timber source in the Baltic—after which large timber logs began being harvested, squared and shipped from New Brunswick to Britain (Soucoup 2011). The rich forests and resources within New Brunswick offered many opportunities to supply the needs of overseas markets.

The majority of the early 19th Century settlers were farmers (Photos 6.2.1 and 6.2.2), but the lucrative business of shipping sawn timber to Britain saw many shift their activities from agriculture towards a career in the timber industry. Farm clearing in New Brunswick remained an ongoing process though, and by the mid-19th Century, more than 250,000 hectares of land in New Brunswick had been cleared for farming.

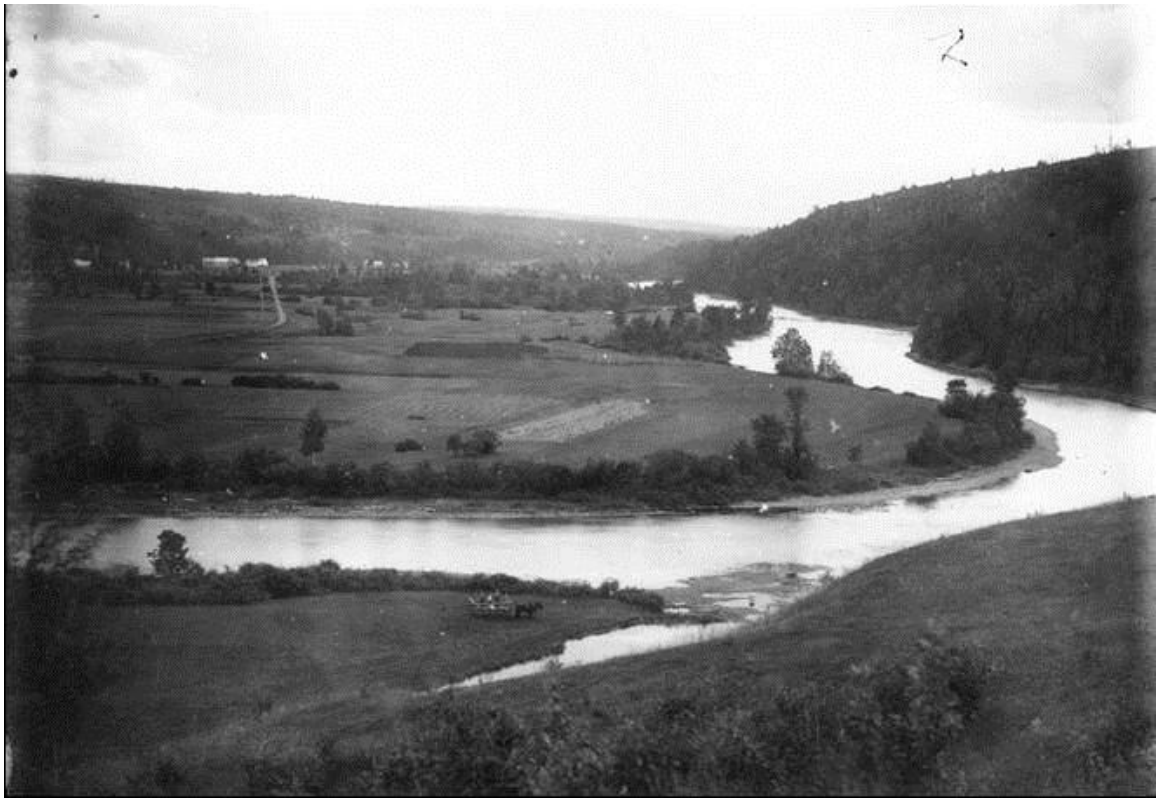


Photo 6.2.1 Nashwaak River Valley, *ca.* 1900. View of farmland with a hay wagon in the foreground and the railway line to the left. P5-483 George Taylor, Provincial Archives of New Brunswick (PANB n.d.).

Photo 6.2.2 Moving barrels of potatoes on a sleigh in the winter, Bristol, New Brunswick, *ca.* 1920. Provincial Archives of New Brunswick (PANB n.d.).

Pine rich forests close to rivers and streams were the immediate targets for wood. Lumbermen favored the watersheds of New Brunswick's largest, least-obstructed rivers and streams for log conveyance from forest to sawmill, and by 1835, most tributaries of the Miramichi and St. John Rivers had been used for timber conveyance (Wynn 1981). By the 1890s, most of New Brunswick's rivers were used extensively for floating logs and lumber to market (Photos 6.2.3 and 6.2.4).

Photo 6.2.3 The drive, *ca.* late 1800s. Photographer, lithographer, and artist unknown. Loggers holding peavies are attempting to roll logs into the water. P4-3-12 New Brunswick Museum photographs collection, Provincial Archives of New Brunswick (PANB n.d.).

Photo 6.2.4 Log Jam on the Nashwaak River, *ca.* 1915. Provincial Archives of New Brunswick (PANB n.d.).

Lumbering offered an opportunity for the common man in New Brunswick to improve his way of life (Photo 6.2.5). Countless New Brunswick farmers contributed to the development of the timber trade by combining the seasonal employment of farming and lumbering (Wynn 1981). Some lumbermen would work year-round, and others were part-time farmers as well. They would plant their gardens in the spring and peel or cut pulp until haying season in mid-summer. Becoming part of the early lumber camps was controversial as the rise of the timber industry was seen as destructive to agriculture and settlement efforts. Although many were critical of the influence of lumbering on the agricultural settler, a visiting agricultural chemist, J.F.W. Johnston, noted that in York County "*almost all the farmers in this neighbourhood were lumberers before they were farmers, and it was lumbering* [that] *they got their farms stocked*" (Wynn 1981).

Photo 6.2.5 Lumbering in New Brunswick: Lumbermen at work in the forest by I. Ortel, *ca.* 1858. Published in Illustrated London News, 28 August 1858. Lithographer unknown. MC2946-MS1C2 David Janigan collection, Provincial Archives of New Brunswick (PANB n.d.).

Lumber mills (Photos 6.2.6 and 6.2.7) were built along waterways emptying into the St. John River, and general stores soon appeared (Ketchum n.d.). Lumber camps were built near the logging sites and some of the larger operations would have multiple buildings which would accommodate cooking, sleeping, dining and have a separate carpentry and blacksmith shop (Photo 6.2.8). Logging camps were often built in proximity to a nearby stream and/or by the cutting grounds. Smaller operations would often have a single structure that would serve multiple functions. Some early lumber camps had built-in stone fireplaces used for cooking while later, stoves were hauled in and facilitated the cooking of the camp food (Soucoup 2010). Prior to World War I, the logging camps were generally operated by the lumber companies and workers received room and board in addition to a small wage. Around 1900, many loggers were cutting railroad ties and being paid by the cord (Soucoup 2010).

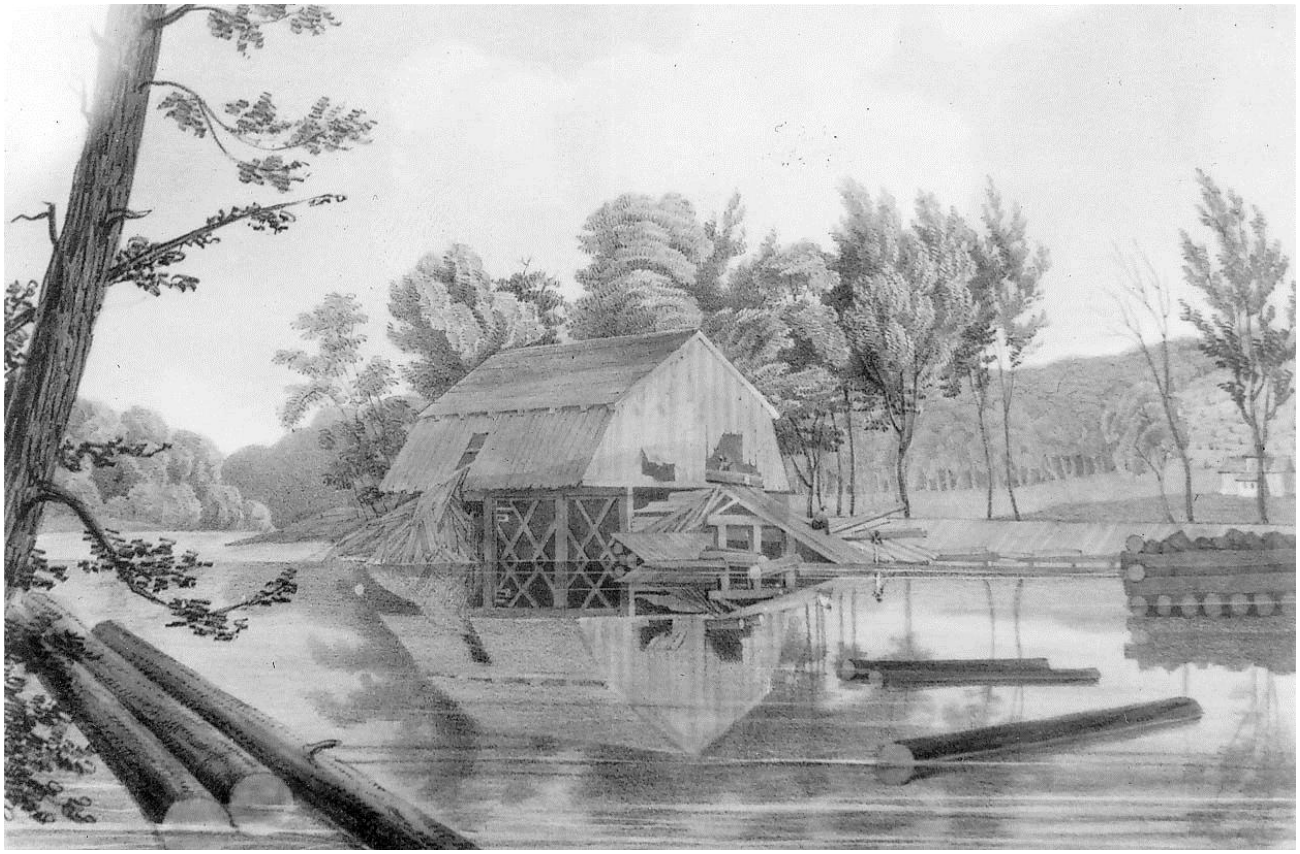


Photo 6.2.6 The mill at Stanley, August 1835. Published by Ackermann & Co. Photograph of a lithograph, from a series entitled "Sketches in New Brunswick". P4-3-19 New Brunswick Museum photographs collection, Provincial Archives of New Brunswick (PANB n.d.).

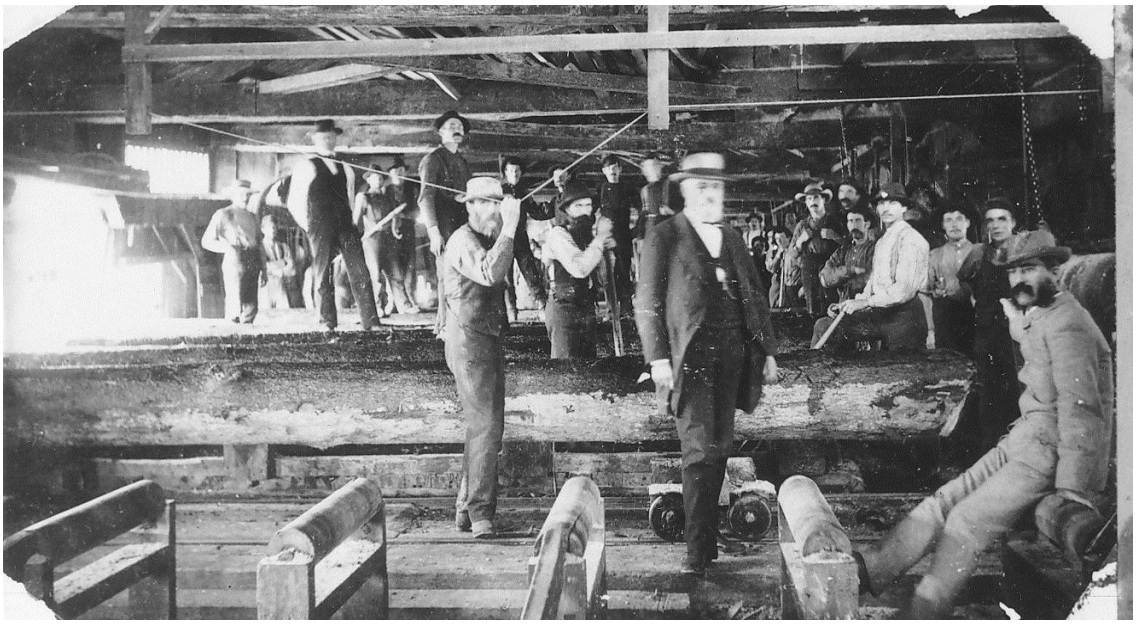


Photo 6.2.7 Alexander (Boss) Gibson in his sawmill, Marysville, NB, *ca.* 1914. Photographer unknown. Boss Gibson purchased his first mill and timber properties on the Nashwaak River in 1862. P4-2-6 York-Sunbury Historical Society photographs, Provincial Archives of New Brunswick (PANB n.d.).

Photo 6.2.8 Men relaxing in lumber camp after a hard day's work, *ca.* late 1800's. Photographer, lithographer, and artist unknown. Scenes such as this one would have been common in the New Brunswick woods during the 19th Century. P4-3-9 New Brunswick Museum photographs collection, Provincial Archives of New Brunswick (PANB n.d.).

In the mid-19th Century, intermittent settlements followed the Nashwaak Valley to the Cardigan and Tay settlements and to the village of Stanley. Beyond these settlements, however, "*there stretched almost unbroken forest*" (Wynn 1981). A survey crew working in Central New Brunswick in the 1860s was lost as the crew members found "*not an eye in the wooded landscape*" to provide orientation and they could "make nothing of the country except for boundless forests" (Wynn 1981).

6.2.2.2 Infrastructure

The Wolastoqiyik and the Mi'kmaq had well-developed transportation routes along New Brunswick's waterways (Leroux 2008) which were also used by the European settlers who started arriving in the 17th Century. The Loyalists settled throughout New Brunswick starting in 1784 and with that, roads started to reach out from one community to the next. These roads were built close to and followed rivers in order to facilitate the logging activities in the surrounding forests as a key area of economic activity. The challenges around building roads (and eventually railroads) in New Brunswick were many due to the hilly topography crisscrossed by lakes, wetlands, and fast-flowing streams and rivers (Frink 1997).

The arrival of the railway opened up the interior of New Brunswick to new settlement and business opportunities. The railway age officially began in the Maritimes in 1876 when the first train ran along the Intercolonial Railway (ICR) from Halifax, Nova Scotia to Rivière-du-Loup, Québec (Soucoup 2010). In 1910, construction of the first railway near the PDA was initiated. The National Transcontinental Railway (NTR) was completed in 1912. The 402 km stretch through New Brunswick ran from Moncton to Chipman, and north to McGivney, Napadogan, Juniper, Plaster Rock, Grand Falls, and Edmundston.

During World War I, the federal government incorporated the NTR into the Intercolonial Railway operation throughout eastern Canada, and in 1918 a new government railway, Canadian National Railway or CNR, was launched. In 1918, CNR became the operator of a vast network of private railways that had been acquired with federal funds by the Canadian Government Railways (Soucoup 2010). In 1919, the Intercolonial Railway was engulfed by the emerging national railway system operated by the CNR (Frink 1997).

Commencing in the early 20th Century, the forest industry transformed to support the development of a pulp and paper industry and a further development of the sawmill industry. Forest harvesting became increasingly industrialized with the advent of motorized vehicles, chain saws, harvesters, and other equipment. More recently, medium-density fibreboard and oriented strand board mills have been opened, and some continue to operate. The pulp and paper industry thrived until the late 20th Century. Several mills have closed in the last two decades and were decommissioned. Two pulp mills, including one in Nackawic approximately 44 km southwest of the Project, were converted in the last decade of the 20th Century and early 21st Century to manufacture dissolving-grade pulp, used in textile manufacture. Generally, global competition due to fast-growing species in warmer climates, labour costs, economies of scale from larger mills in other countries, and a decline in the consumer demand for paper in the computer age have all contributed to the decline.

In parallel to the decline in the pulp and paper sector, the dimension lumber industry has suffered due to a variety of factors including trade policies in the United States, a high Canadian dollar, and more recently the recession and housing industry decline of the past four years. Several sawmills including

those in Juniper (approximately 25 km northwest of the Project) and Deersdale (approximately 12 km north of the Project), were closed in recent years.

In the 20th Century, New Brunswick saw a continued rural to urban migration. Currently, only 49% of the population lives in rural areas (Statistics Canada 2012e). This has reflected the transition from farming and forestry, to urban pursuits including government, post-secondary education, modern services (*e.g.,* engineering, knowledge services), and retail. In the vicinity of the Project, such activities have been centred in Woodstock and in the provincial capital, Fredericton.

6.2.3 Present Day

Today, many of the communities of Central New Brunswick continue to exist in support of the resource-based harvesting of forest and natural resources to supply industries throughout the province as well as to provide products for export. While the forest products industry has declined considerably in recent years due to global competition and economic conditions, forest harvesting activities and the use of the land and resources in Central New Brunswick continue to be the lifeblood of the various communities in the area, including Juniper, Deersdale, Napadogan, Stanley, Millville, and parts in between (Photo 6.2.9). Limited agricultural development is also present in these and surrounding communities.

Photo 6.2.9 Atcon veneer mill, Napadogan, New Brunswick (Janice Cook, July 25, 2006). Located on Route 107 between Williamsburg and Juniper, the mill produced veneers for furniture, flooring, doors, skateboards, and musical instrument cases. P194-598 Miscellaneous photographs collection, Provincial Archives of New Brunswick (PANB n.d.).

The rural nature of these communities and the availability of goods and services and infrastructure to support what was once a thriving economic community consisting largely of important resource-based industries provides an attractive backdrop for the development of suburban communities as well as a refuge for those wishing to escape urban developments in favour of a simpler rural life. Communities like Stanley, for example, have grown into an attractive retirement community for those individuals seeking a simpler, more rural lifestyle. Though many of the mills these communities once supported are now gone or temporarily closed, other communities like Juniper, Deersdale and Millville retain their resource-based character to this day. While the population in these rural communities is generally decreasing and services are declining, they continue to provide goods and services that support the forestry, agricultural, and resource-based industries that remain in the area, and these centres provide important services and infrastructure for those industries and developments to come.

6.3 BIOPHYSICAL SETTING

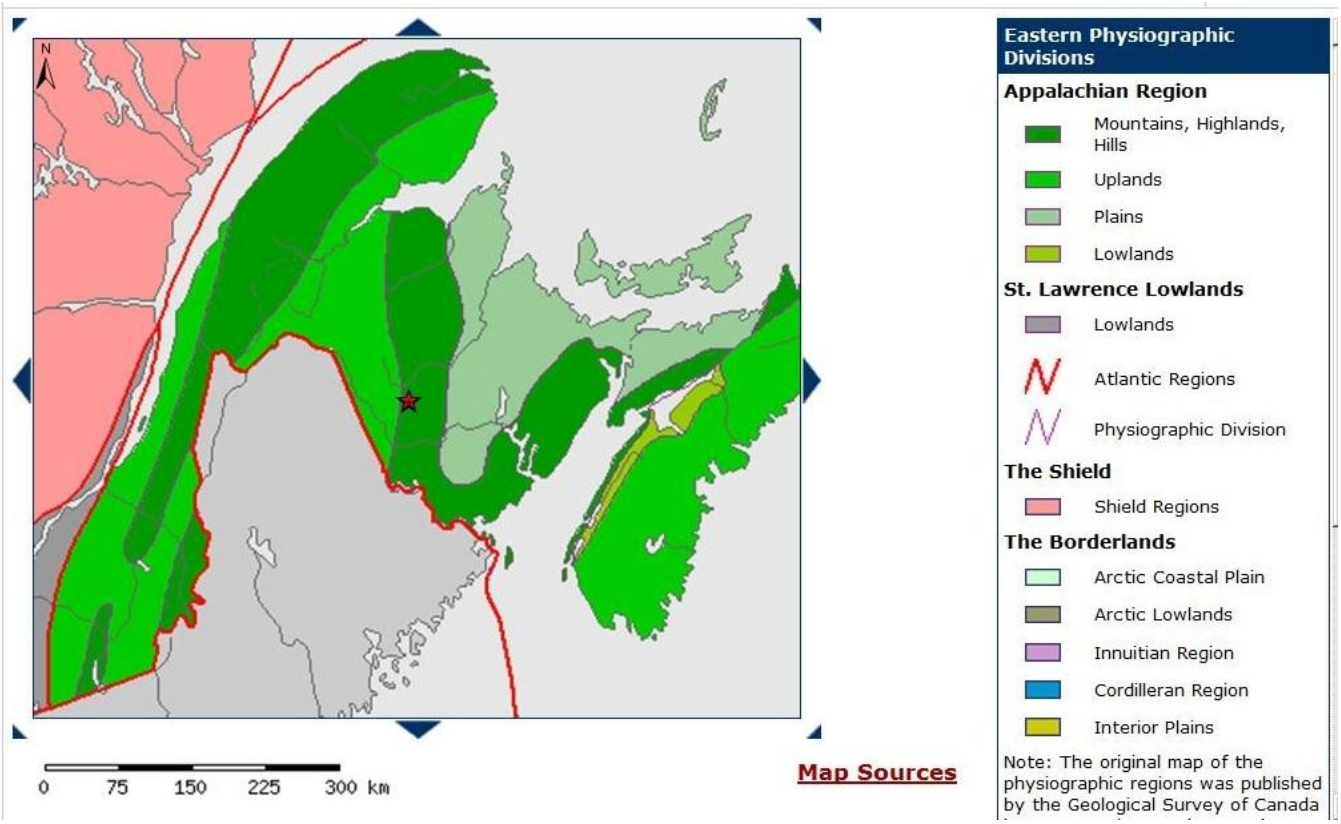
This section provides a brief overview of the biophysical setting of Central New Brunswick.

6.3.1 Physiography and Geology

The Project is located within the Appalachian Region which lies between southern Québec and the Gaspé Peninsula in the north to the Atlantic Continental Shelf in the south. The Appalachian Region spans New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland. The current physiography of New Brunswick reflects mountain building of the Appalachians during tectonic movements between about 480 and 280 million years ago, followed by a long period of relative quiescence and erosion (Bookes 2012).

Within New Brunswick the Appalachian Region is made up of three physiographic units: the New Brunswick Highlands; the Chaleur Uplands; and the Maritime Plain. The Project is located within the New Brunswick Highlands unit, where the regional uplift has maintained smooth-topped uplands and highlands in a Z-shaped belt (Figure 6.3.1), from the Québec border with Vermont and New Hampshire, northeastward to the Gaspé Peninsula, southwestward across New Brunswick, and then continuing northeast north of the Bay of Fundy to Cape Breton Island (NRCan 2012a).

The geology of the Project area comprises Cambrian to Ordovician metavolcanic and metasedimentary rocks which were intruded in the Early to Late Devonian by large granite batholiths and smaller bodies of more mafic composition (NBDNR 2007).



Source: NRCan 2012a.

Figure 6.3.1 Eastern Physiographic Regions

6.3.1.1 Topography and Drainage

Elevations in Central New Brunswick range from over 600 m amsl at Mount Hind and Clark Mountain approximately 80 km north of the Project at Serpentine Lake, to between approximately 400 m and 200 m amsl in the area of the Project (Photo 6.3.1). The Project area elevation typically ranges from 300-350 m amsl, with some local hills rising to over 400 m. The presence of numerous lakes within the region can be attributed to several geological features which can be characterized by undulating hills and wide valleys. Generally poor drainage within the region has resulted in the creation of many lakes, ponds, and wetlands.

The Project is located in the Nashwaak River watershed, which is a tributary to the St. John River. Watercourses north of the Project area generally flow eastward into the Miramichi River; those in the south generally flow southward into the Nashwaak and St. John rivers (NBDNR 2007).

Photo 6.3.1 Aerial view of Project site looking northwest over the Sisson deposit area. Plant site is on the hill in the upper middle of the photo.

6.3.1.2 Surficial Geology and Soils

The ore body for the Project is located in an area mainly overlain by blanket and veneer till consisting of: loamy lodgment till; some lodgment till, sand, gravel; and rubble. The thickness of the till varies between <0.5 (thin veneer) to over 5 m thick (blanket till) with approximately 25% of clasts that are boulder sized (Rampton *et al.* 1984). Based on the soil characteristics of the area, it would appear that soils are primarily coarse-textured (Colpitts *et al.* 1995) and the parent till would appear to be locally-derived from underlying bedrock.

Hilltop soils within the Project area are derived from granitic rock, and include sandy loams, stony tills and generally coarse in texture. More compact soils derived from mafic volcanic or from metasedimentary and igneous rocks are found in the low-lying valleys around the Project. Soil richness varies from moderate to poor, and likewise drainage is moderate to poor as the elevation of the Project area decreases.

There are five different soil units in the vicinity of the Project, as defined by Colpitts *et al.* (1995), as illustrated on Figure 6.3.2 and generally described as follows.

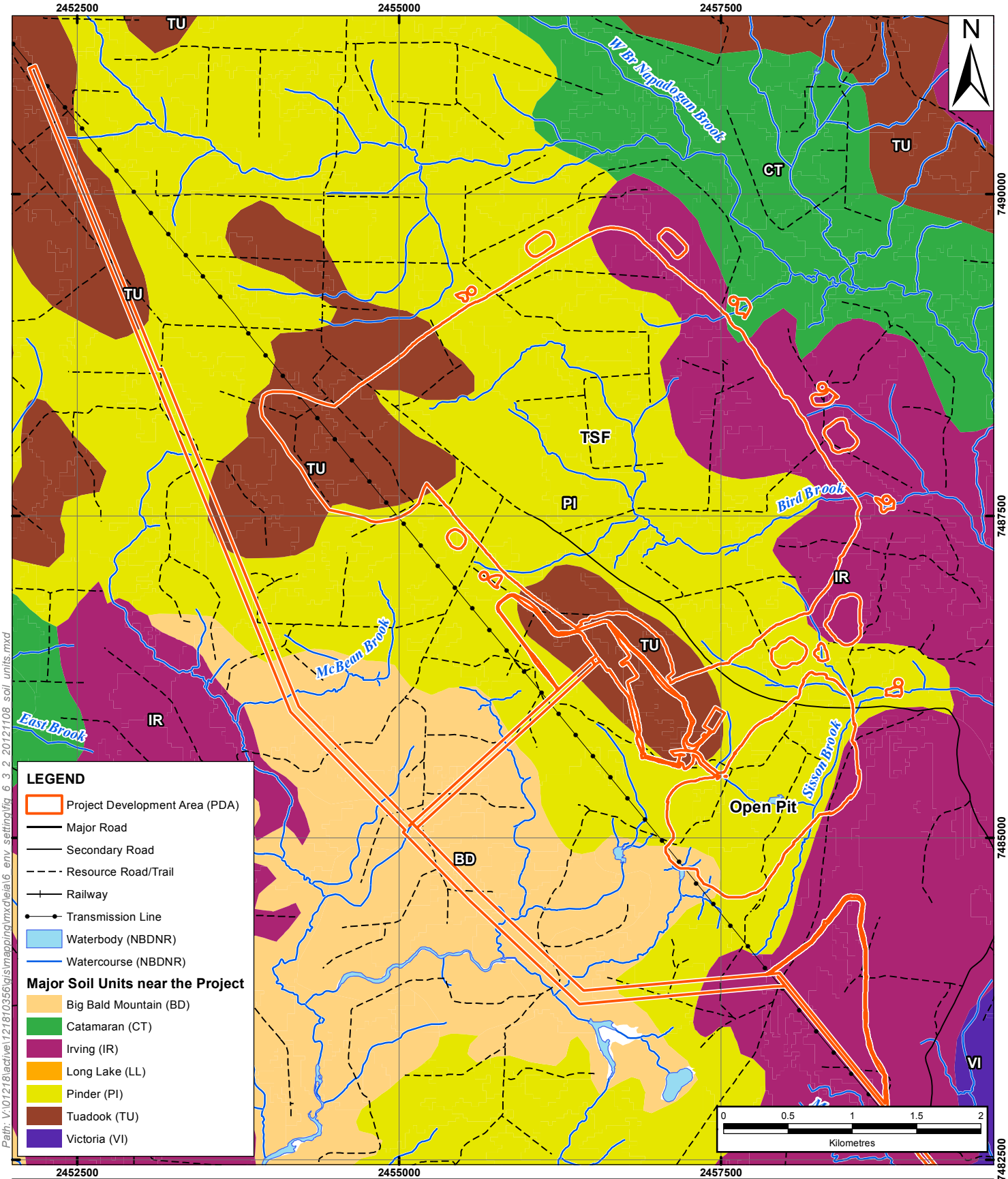
- The majority of the soils near the Project are composed of the Pinder soil unit, which is derived primarily from parent rock of igneous origin, with lesser amounts of metasedimentary rocks. Pinder soils are typically coarse-textured, and formed in highly stony residual materials. Elevated areas such as hillcrests and upper slopes demonstrate colluvial or till material.

- The eastern portion of the Project location is composed of the Irving soil unit which is derived primarily from parent rock of igneous origin, with lesser amounts of metasedimentary rocks. Irving-type soils have a silt loam texture and are composed of well- to imperfectly-drained non-compacted till.

- High elevation areas in the Project location are composed of the Tuadook soil unit. This soil type developed on lodgement till, and has a texture from loam to silt loam, with some coarse fragments. Tuadook soil parent material composition and structure, high in quartz and feldspars, is slow weathering, with slow nutrient release, and rugged topography. Soils are typically compact to a depth of 30 to 65 cm.

- The Big Bald Mountain soil unit is found in the southwestern portion of the Project location. Big Bald Mountain soils are rocky residual, and shallow, formed from the *in situ* weathering of granitic rocks, typically in areas where bedrock outcrops are common, such as hill crests and upper slopes. Soil texture is coarse, including sandy loam, gravel, and stones.

- One small area to the northeast of the Project location, where a small tributary flows into West Branch Napadogan Brook, is composed of the Catamaran soil unit. The Catamaran soil unit is derived primarily from parent rock of igneous origin, with lesser amounts of metasedimentary rocks. Catamaran soils are coarse-textured lodgment tills, occurring in mid-slope positions with low to moderate amounts of coarse fragments, and are compact to a depth of 30 to 65 cm.



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

Major Soil Units near the Project Sisson Project: Environmental Impact Assessment (EIA) Report, Napadogan, N.B. Client: Northcliff Resources Ltd.	Scale: 1:40,000	Project No.: 121810356	Data Sources: NBDNR	Fig. No.: 6.3.2	Stantec
	Date: (dd/mm/yyyy) 08/11/2012	Dwn. By: JAB	Appd. By: DLM		

Map: NAD83 CSRS NB Double Stereographic

6.3.1.3 Bedrock Geology

Geology maps published by the New Brunswick Department of Natural Resources (NBDNR 2007) show that the Project is underlain by four main bedrock units (Figure 6.3.3 and Table 6.3.1).

Table 6.3.1 Summary of Bedrock Geology Information

Bedrock (Figure 6.3.3)	Description
Howard Peak Granodiorite	Grey, medium-grained, foliated, hornblende-biotite granodiorite locally grading to gabbro; cataclastic granite is abundant along the western margin of the pluton.
Meductic Group	The Meductic Group includes, in ascending order: • Porten Road Formation - mainly light greyish pink, porphyritic rhyolitic flows and breccia; • Eel River Formation - mainly greyish green andesitic breccia and stratified volcaniclastic rocks; • Oak Mountain Formation – mainly dark green, porphyritic basaltic flows and bedded hyaloclastite; and • Belle Lake Formation – light grey to olive-green, feldspathic wacke interstratified with medium to dark grey shale.
Baskahegan Lake Formation / Woodstock Group	Light grey to light green, medium- to thick-bedded quartzite; grey to greenish grey, thin- to medium-bedded quartz wacke; olive green silty shale and minor red sandstone and shale. The wacke beds are normally graded with laminated tops and locally exhibit load casts, current ripples, and flame structures.
Nashwaak Granite	Light grey to light pink, medium-grained, equigranular to seriate, biotite granite, grading northward into muscovite-biotite granite. A small area of garnetiferous muscovite-bearing granite occurs on Spruce Peak (NTS 21 J/06E) on the southern margin of the pluton. Hornblende is locally present in the biotite granite along the Southwest Miramichi River (NTS 21 J/10W).

Source: New Brunswick Bedrock Lexicon (2012).

The Sisson ore deposit is centred on a north-trending contact between undated, but inferred Acadian age, intrusions to the west and Cambrian to Ordovician metavolcanic and metasedimentary rocks to the east (Knight Piésold 2012e). From west to east, the host rocks to mineralization in the Sisson deposit comprise:

- a quartz diorite phase of the Howard Peak Granodiorite;
- a gabbro phase of the Howard Peak Granodiorite;
- interbedded felsic, intermediate and minor mafic metavolcaniclastic rocks;
- Biotite metawacke with minor interbeds of felsic, intermediate and mafic metavolcaniclastic rocks; and
- Siliceous metasedimentary rocks which include wackes, siltstones, and quartzites.

The metavolcaniclastic and metasedimentary rock types within the Sisson deposit strike north-northeast and dip steeply to the east-southeast. Faults in the Project area are limited and are not expected to be high permeability conduits for groundwater flow, based on information obtained during geotechnical drilling (Knight Piésold 2012e).

6.3.1.3.1 Seismicity

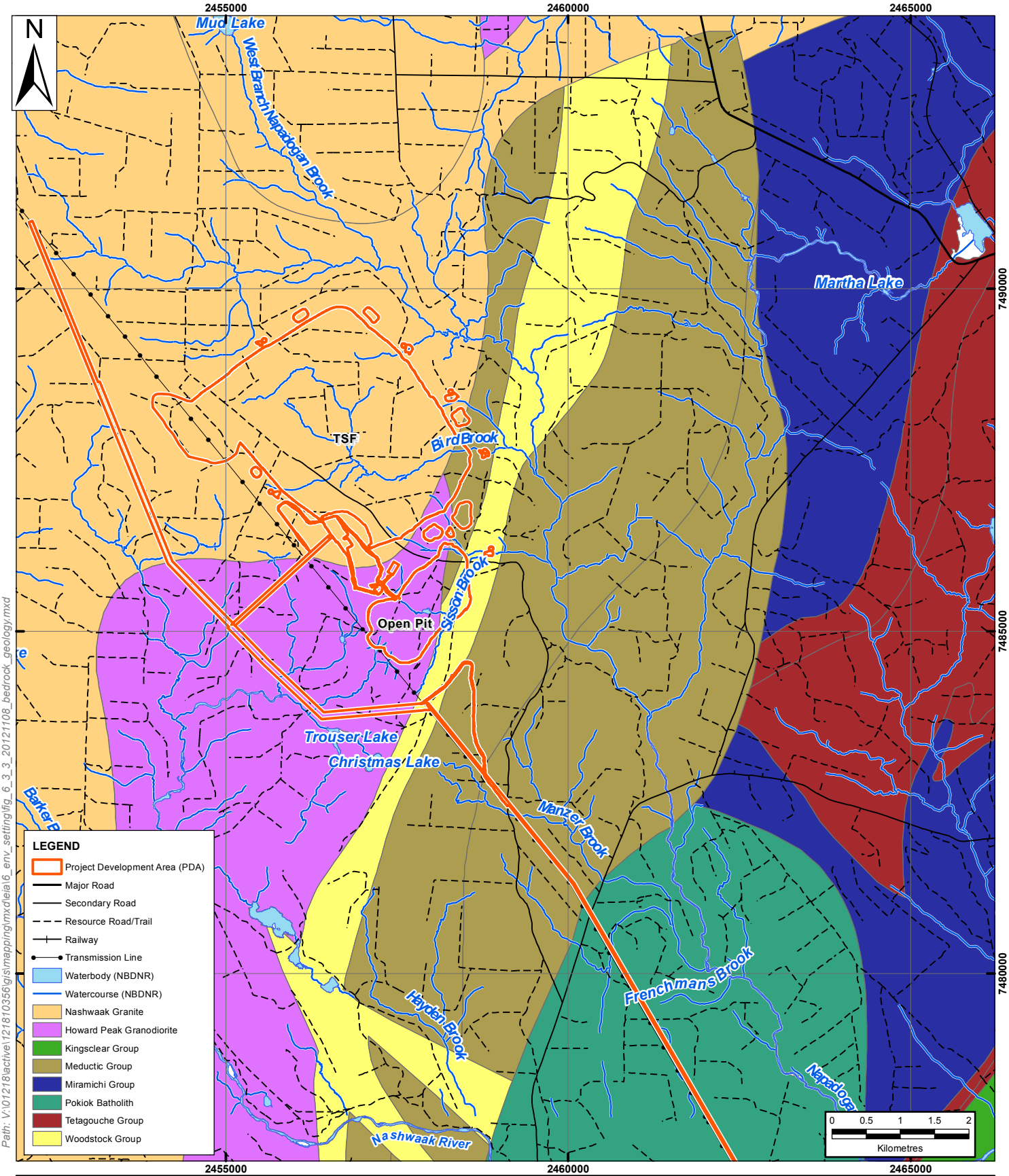
Seismicity is the characterization of the likelihood and potential magnitude of seismic events, caused by movements in tectonic plates that form the Earth's crust. Eastern Canada is located in a stable continental region within the North American tectonic plate and has a relatively low rate of seismic activity. However, moderate to large earthquakes have occurred in the region and will occur in the future. The seismicity of eastern Canada is typical of an intra-plate region, which is characterized by generally low levels of seismic activity and earthquakes apparently randomly distributed in location and time. The correlation between recorded earthquakes and geological features in the region is not well known or understood. Seismic activity in the region is thought to be related to regional stress fields, with earthquakes concentrated in regions of crustal weakness (Fader 2005).

The Project lies within the Northern Appalachians seismic zone, one of five seismic zones in southeastern Canada, where the level of historical seismic activity is low. Historical seismic data recorded throughout eastern Canada has identified clusters of earthquake activity. Earthquakes in New Brunswick generally cluster in three regions: the Passamaquoddy Bay region, the Central Highlands (Miramichi) region, and the Moncton region (Burke 2011).

The largest earthquake instrumentally recorded in New Brunswick was a magnitude 5.7 event (on the Richter scale) on January 9, 1982, located in the north-central Miramichi Highlands. This earthquake was followed by strong aftershocks of magnitudes 5.1 and 5.4. Prior to 1982, other moderate earthquakes with estimated magnitudes in the range of approximately 4.5 to 6.0 occurred in 1855, 1869, 1904, 1922, and 1937 (Basham and Adams 1984). The 1869 and 1904 earthquakes were both located within the Passamaquoddy Bay region, with estimated magnitudes of 5.7 and 5.9, respectively (Fader 2005). The maximum credible earthquake magnitude for the Northern Appalachians region is estimated to be magnitude 7.0, based on historical earthquake data and the regional tectonics (Adams and Halchuk 2003).

Figure 6.3.4 shows the recorded historical seismicity of New Brunswick and surrounding regions from 1985 to 2011. Over the 10 year period between September 2002 and September 2012, approximately 160 seismic events have been recorded within 100 km of the Project. These events range in magnitude from <1 to 3.7 on the Richter scale, with the majority being recorded in the McAdam area in southwestern New Brunswick (Earthquakes Canada 2012).

A total of 612 earthquakes have been recorded in the Northern Appalachian seismic zone from September 2011 to September 2012 (Figure 6.3.5) (Earthquakes Canada 2012). Of the events recorded in the Northern Appalachian seismic zone, 79 events were recorded for the same 12 month period. The strongest of these events occurred in Bathurst on March 30, 2012, with a magnitude of 3.4.



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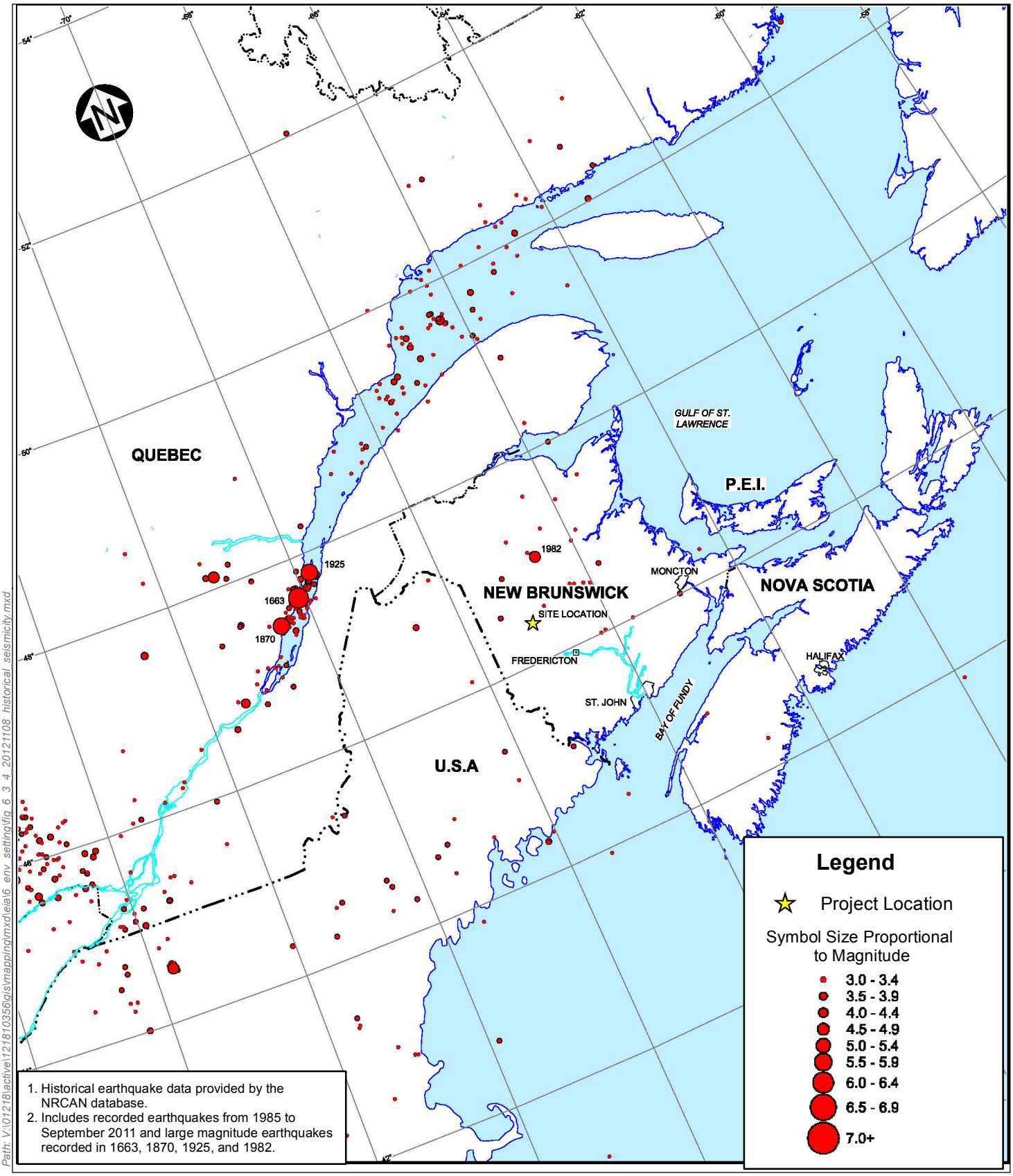
NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Bedrock Geology Sisson Project: Environmental Impact Assessment (EIA) Report, Napadogan, N.B.	Scale: 1:75,000	Project No.: 121810356	Data Sources: NBDNR	Fig. No.: 6.3.3	Stantec
	Date: (dd/mm/yyyy) 08/11/2012	Dwn. By: JAB	Appd. By: DLM		
Client: Northcliff Resources Ltd.					

Map: NAD83 CSRS NB Double Stereographic



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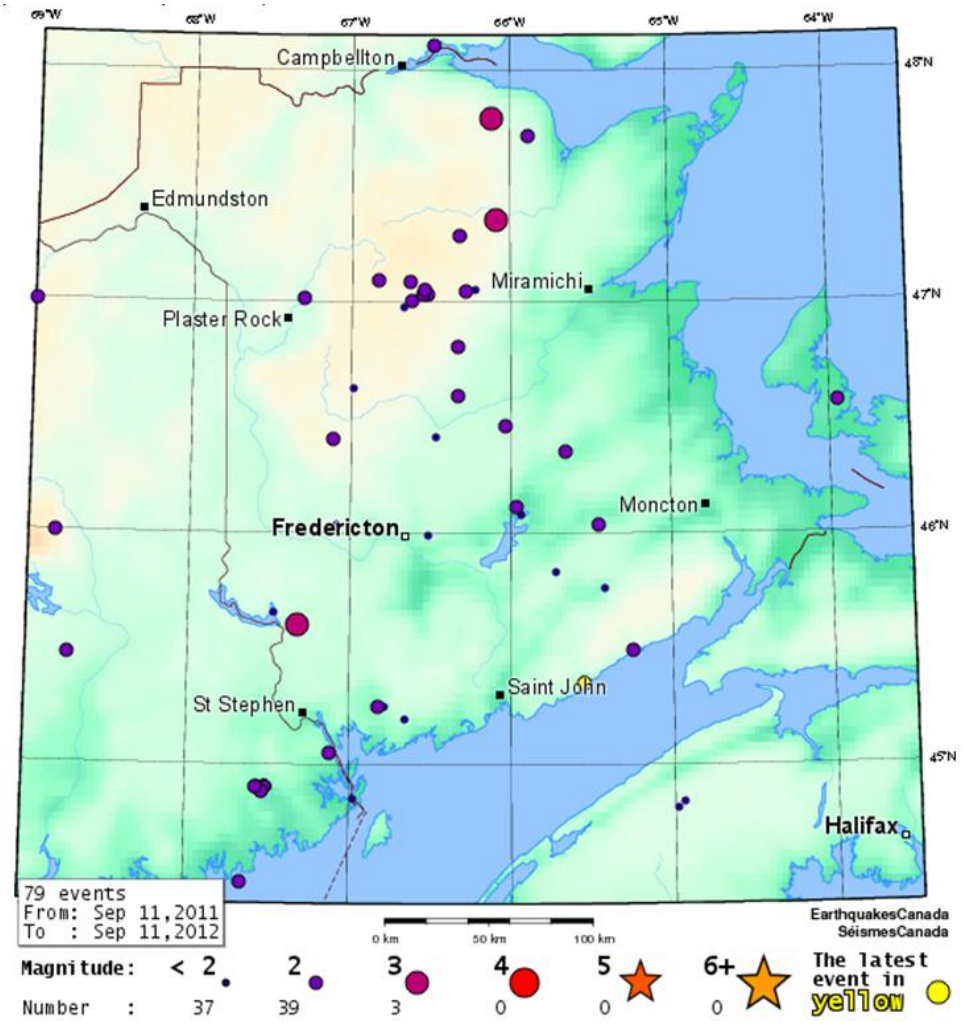
NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Historical Seismicity of New Brunswick and Surrounding Regions Sisson Project: Environmental Impact Assessment (EIA) Report, Napadogan, N.B. Client: Northcliff Resources Ltd.	Scale: NTS	Project No.: 121810356	Data Sources: NRCAN	Fig. No.: 6.3.4	Stantec
	Date: (dd/mm/yyyy) 08/11/2012	Dwn. By: JAB	Appd. By: DLM		

Map: NAD83 CSRS NB Double Stereographic



Source: Earthquakes Canada (2012).

Figure 6.3.5 Earthquakes within New Brunswick, September 2011-September 2012

6.3.2 Atmospheric Environment

The Atmospheric Environment comprises the layer of air surrounding the Earth's crust, up to approximately 10 km above the Earth's surface, and is generally characterized in terms of Climate and Air Quality.

6.3.2.1 Climate

The climate of New Brunswick can be generally characterized as continental in the central and northern regions of the province, with more of a moderated climate in the southern and eastern regions of the province due to influence from the Atlantic Ocean.

The climate normals from 1971-2001 for the Fredericton Airport weather station are provided in Table 6.3.2 (Environment Canada 2012b). The Fredericton Airport weather data are considered to be an accurate representation of average weather conditions in central New Brunswick. Daily mean temperatures recorded at the Fredericton Airport range from -9.8°C to 19.3°C, although daily extreme ranges from -35.6°C to 37.2°C have been recorded by the station. The average annual precipitation is 1,143.3 mm, of which 77.5% is in the form of rain. Extremes in daily precipitation occur in August and September and are in the range of 124.0 mm to 148.6 mm.

A meteorological station has been operated at the Sisson Project site since 2007 (Photo 6.3.2), to the south of the ore deposit. This station collects data for wind speed, wind direction, relative humidity, temperature, solar radiation, barometric pressure, snow depth, and precipitation. The mean annual temperature is estimated to be 3.3°C, with minimum and maximum mean monthly temperatures of -16.6°C and 20.0°C occurring in January and July, respectively. The mean annual precipitation is estimated to be 1,350 mm based on a comparison of site data with regional data from the Juniper station. On average, it is estimated that 75% of precipitation falls as rain, and 25% falls as snow. Precipitation is very evenly distributed throughout the year, with July being the wettest month averaging 127 mm, and February being the driest month averaging 83 mm (Knight Piésold 2012d).

Photo 6.3.2 Sisson meteorological station.

Table 6.3.2 Climate Normals – Fredericton Airport (1971-2001)

Station Location - Lat.: 45º52'N, Long.: 66º32'W, Elev.: 20.7 m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Temperature													
Daily Mean (°C)	-9.8	-8.2	-2.4	4.3	11.1	16.2	19.3	18.4	13.1	7	1.1	-6.3	5.3
Daily Maximum (°C)	-4	-2.3	3	9.7	17.5	22.8	25.6	24.7	19.5	12.8	5.6	-1.1	11.2
Daily Minimum (°C)	-15.5	-14.1	-7.8	-1.1	4.7	9.6	13	12.1	6.7	1.2	-3.5	-11.4	-0.5
Extreme Daily Maximum (°C)	14.1	18.6	22.2	30.3	35.2	35.3	36.7	**37.2**	33.9	27.8	21.1	15.9	--
Date (yyyy/dd)	1983/11	1994/20	1962/30	1990/27	1977/23	2001/27	1952/15	**1975/02**	2001/09	1968/16	1956/01	2000/17	--
Extreme Daily Minimum (°C)	-35.6	-37.2	-28.9	-15.1	-6.7	-0.6	1.7	1.3	-3.9	-8.9	-20.2	-33.8	--
Date (yyyy/dd)	1971/19	1962/02	1982/01	1995/05	1951/18	1971/06	1962/03	1978/28	1971/27	1959/22	1996/30	1989/30	--
Precipitation													
Rainfall (mm)	46.2	32.2	48.1	64.1	94.2	88.6	87.1	89.8	94.5	96	85.5	59.4	885.5
Snowfall (cm)	70.2	50.6	54.4	22.5	1.5	0	0	0	0	1.5	18.5	57.3	276.5
Precipitation (mm)	109.6	79.2	102.7	87.4	95.9	88.6	87.1	89.8	94.5	97.7	103.2	107.8	1143.3
Extreme Daily Precipitation (mm)	70.7	51.8	58.8	58.7	83.8	69.9	69.1	**148.6**	124	60.2	81	81.3	--
Date (yyyy/dd)	2000/04	1970/04	1984/14	1954/17	1961/27	1954/27	1970/11	**1989/05**	1999/22	1976/09	1960/01	1967/04	--
Other													
Daytime Relative Humidity (%)	62.2	56.6	56.3	53.4	52	54.1	55.5	55.9	58	58.6	64.7	66.8	57.8
Mean Wind Speed (km/h)	12.7	13	14.6	14.3	13.6	12	10.8	10	10.9	11.8	12.4	12.6	12.4
Most Frequent Wind Direction	W	W	W	W	S	S	S	S	S	S	W	W	S
Extreme Wind Gust Speed (km/h)	119	121	105	100	97	**132**	105	93	105	117	116	103	--
Date (yyyy/dd)	1962/27	1976/02	1959/23	1977/03	1961/28	**1971/30**	1974/03	1991/02	1960/13	1963/29	1963/30	1968/05	--

Notes:
Bold denotes an all-time record.

Source: Environment Canada (2012b).

6.3.2.2 Air Quality

The New Brunswick Department of Environment and Local Government (NBDELG), operates a network of ambient air quality monitoring stations in various regions of the province. The results are documented annually in the publication by the NBENV entitled "New Brunswick Air Quality Monitoring Results", the most recent of which is available for the 2010 calendar year (NBDELG 2012b).

Ambient air quality in New Brunswick can generally be characterized as good most of the time, with few exceedances of the provincial ambient air quality objectives or Canada-wide Standards. In 2010, compliance with the ambient air quality objectives was greater than 98% for all contaminants measured (NBDELG 2012). NBDELG has observed gradual improvement in air quality in the province in recent years when compared to historical levels, with 2010 having the highest levels of compliance with the provincial objectives on record.

There are no substantive industrial sources (which tend to release air contaminants) of air contaminants located near to the Project. Thus, sources of air contaminants in the immediate vicinity of the Project are generally associated with vehicle and home heating emissions. The nearest industrial facilities to the Project are the Napadogan veneer plant previously mentioned, the former Juniper Sawmill (now decommissioned), and the J.D. Irving sawmills located in Deersdale (approximately 12 km north of the Project) and Doaktown (approximately 75 km east of the Project)—both of which have ceased operations. The AV Nackawic pulp mill is also approximately 44 km southwest of the Project (Environment Canada 2010).

Given than the rate of compliance with the ambient air quality standards in the province overall and the lack of nearby industrial emissions sources, the air quality in the vicinity of the Project is very good, as evidenced by ambient air quality monitoring data collected for the Project and as expected given the rural character of the area (Section 8.2).

6.3.2.3 Sound Quality

Given the largely rural area of the Project, existing sound pressure levels are expected to be typical of sound pressure levels in a rural area. Sources of existing sound in the area are expected to be primarily related to vehicle traffic on provincial Highway 107, wildlife and wind noise and as well as local anthropogenic sounds, *e.g.,* all-terrain vehicles, snowmobiles, and heavy equipment and power tools related to the forestry activity in the area.

Sound pressure levels measured over 24-hour periods in the vicinity of the Project in fall 2011 ranged from 30.6 dB_A to 54.7 dB_A, expressed as a 24-hour equivalent sound pressure levels (L_{eq}). The daytime sound pressure levels in the Project were between 59.1-62.4 dB_A expressed as a 1-hour L_{eq}, with the highest level recorded approximately 2 km northeast of the Project location. Nighttime sound pressure levels range from 47.0 dB_A to 59.0 dB_A expressed as a 1-hour L_{eq}, with the highest level measured at the intersection of Route 107 and the Four Mile Brook Road (Stantec 2012c).

6.3.3 Water Resources

The water resources of the Nashwaak River watershed are described in this section. This includes a description of water availability and quality for both groundwater and surface water resources.

6.3.3.1 Local Watersheds

The Sisson Project is located within the Nashwaak River watershed, which has a drainage area of approximately 1,700 km^2 (Figure 6.3.6). The Nashwaak River flows approximately 110 km from Upper Nashwaak Lake, southward and eastward through the village of Stanley, then southward to its confluence with the St. John River at Fredericton (NBDELG 2007).

Two hydrometric stations operated by the Water Survey of Canada actively monitor the streamflow conditions within the Nashwaak River watershed: the Narrows Mountain Brook gauge, and the Nashwaak River gauge at Durham Bridge (Environment Canada 2012b). The Narrows Mountain Brook gauge has operated since 1971, receives surface water from a drainage area of 3.9 km^2, and records a mean annual flow of 0.09 m^3/s (period of record 1972-2011). The Nashwaak River gauge has operated since 1961, receives surface water from a drainage area of 1,450 km^2, and records a mean annual flow of 36.6 m^3/s (period of record 1961-2011).

Four main sub-watersheds are in or near the Project location: Bird Brook, Sisson Brook, McBean Brook and West Branch Napadogan Brook. Bird, Sisson, and West Branch Napadogan brooks all contribute to Napadogan Brook, whereas McBean Brook lies southwest of the Project and flows generally southwest to the Nashwaak River (Figure 6.3.7). West Branch Napadogan Brook, East Branch Napadogan Brook, the Lower Napadogan Brook, and the Nashwaak River are considered to be navigable; most other named and other unnamed watercourses in these sub-watersheds would likely be considered minor waters, or not navigable at all. Mean annual flows in Napadogan and McBean Brook watersheds (Figure 6.3.7) have been estimated to be 3.19 and 1.16 m^3/s, respectively (Knight Piésold 2012d).

6.3.3.2 Surface Water Quality

The surface water quality in the Nashwaak watershed has been characterized between 1996 and 2007 using the Water Quality Index at 17 locations in the watershed, including one location on Napadogan Brook (NBDELG 2007). The water quality in the watershed was characterized as “good” at eight of these locations (including Napadogan Brook), and “excellent” at the other nine locations.

Samples of surface water collected for the Project show that the water is generally very soft, containing low concentrations of dissolved minerals, and often having low pH. Surface water was typically clear, with generally non-detectable total suspended solids concentrations (<5 mg/L), and low turbidity (usually around 1 NTU). Nutrient concentrations in surface water were also generally very low (Knight Piésold 2012e).

6.3.3.3 Groundwater

The groundwater resources within the Nashwaak Watershed are limited almost exclusively to fractured bedrock. Groundwater yields near the Project were estimated from regional groundwater maps (NBDOE 1980) to be generally low (less the 0.4 L/s), coinciding with volcanic geology where the ore body is located. Higher groundwater yields are expected in the granite-type bedrock to the west of the Project, and in the sandstones farther to the east, near Stanley.

The New Brunswick Department of Environment has collected groundwater quality data from domestic wells since 1994, and prepared maps of the concentrations of different parameters in groundwater (NBENV 2008). A review of the maps show that very few wells have been installed near the Project, the closest well on record being located about 11 km northwest of the Project, near Nashwaak Lake. The next closest domestic wells on record are located more than 18 km from the Project. Concentrations above the Guidelines for Canadian Drinking Water Quality (GCDWQ; Health Canada 2012a) for antimony, arsenic, iron, manganese, and nitrate were observed in domestic wells in the same hydrogeologic map unit as the Project. Water quality samples collected from monitoring wells installed for the Project also exceed the GCDWQ for arsenic, iron, and manganese (Knight Piésold 2012e).

6.3.4 Aquatic Environment

The Aquatic Environment comprises the rivers, streams, and lakes within Central New Brunswick and the aquatic species that live within them. It also includes the physical and chemical properties of water and sediment in these watercourses and waterbodies, upon which the aquatic life depends.

6.3.4.1 Water Quality

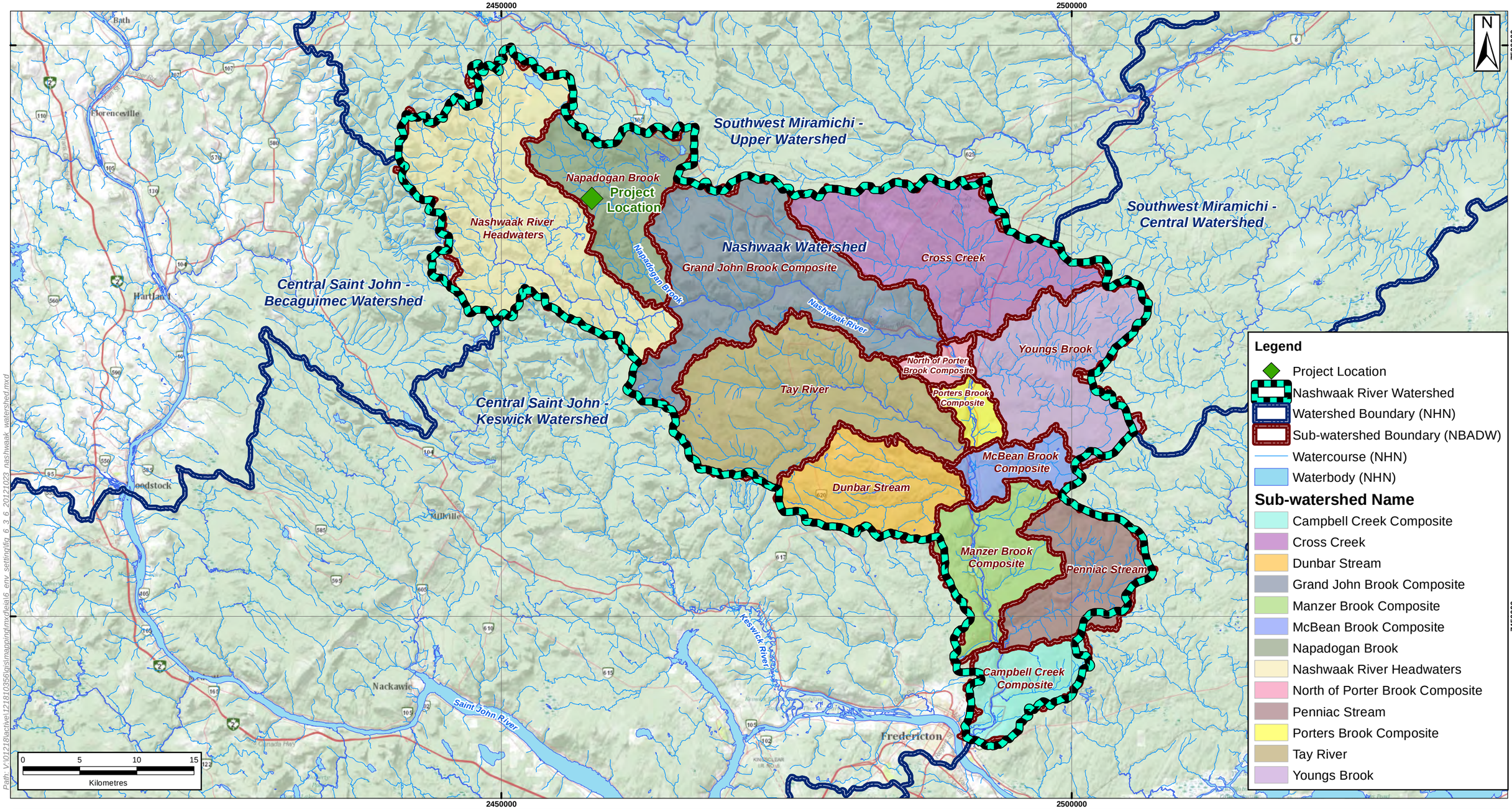
Overall, water quality within the Nashwaak River watershed, as recorded by NBDELG (2007), is considered to be high, as would be expected for this relatively rural and undeveloped area in central New Brunswick. Key indicators of water quality including dissolved oxygen, *E. coli*, nitrate, and pH seldom exceed the CCME Freshwater Aquatic Life Guidelines, indicating that surface waters are, in general, suitable for supporting a variety of fish populations (NBDELG 2007). These observations are consistent with data collected by Northcliff and Stantec in various watercourses surrounding the Project location, as summarized in Section 8.5.2.

6.3.4.2 Sediment Quality

Stantec collected composite fine-grained sediment samples from depositional areas for laboratory analysis during the aquatic baseline surveys. In general, sediment samples collected had moderate organic content, with lower total inorganic carbon. The predominant extractable metals present in sediment samples collected from the Project area included aluminum, calcium, magnesium, iron, and manganese (Stantec 2012d).

6.3.4.3 Fish and Fish Habitat

Fish habitat surveys conducted in the watercourses in the vicinity of the Project (Bird Brook, Sisson Brook, McBean Brook, and the east and west branches of Napadogan Brook) collected data on water flow, depth, overhead cover, temperatures, substrate composition, and other key parameters in accordance with standard NBDNR and DFO methods (Hooper *et al.* 1995). Watercourses contain species of fish that would be expected of a central New Brunswick watershed, including brook trout (*Salvelinus fontinalis*), American eel (*Anguilla rostrata*), Atlantic salmon (*Salmo salar*) (limited to the West and East Branches of Napadogan Brook and at the mouth of Bird Brook), sea lamprey (*Petromyzon marinus*), slimy sculpin (*Cottus cognatus*), blacknose dace (*Rhinichthys atratulus*), pearl dace (*Margariscus margarita*), creek chub (*Semotilus atromaculatus*), common shiner (*Luxilus cornutus*), white sucker (*Catostomus commersonii*), and longnose sucker (*Catostomus catostomus*).



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

Nashwaak River Watershed and its Sub-watersheds

Sisson Project:
Environmental Impact Assessment (EIA) Report, Napadogan, N.B.

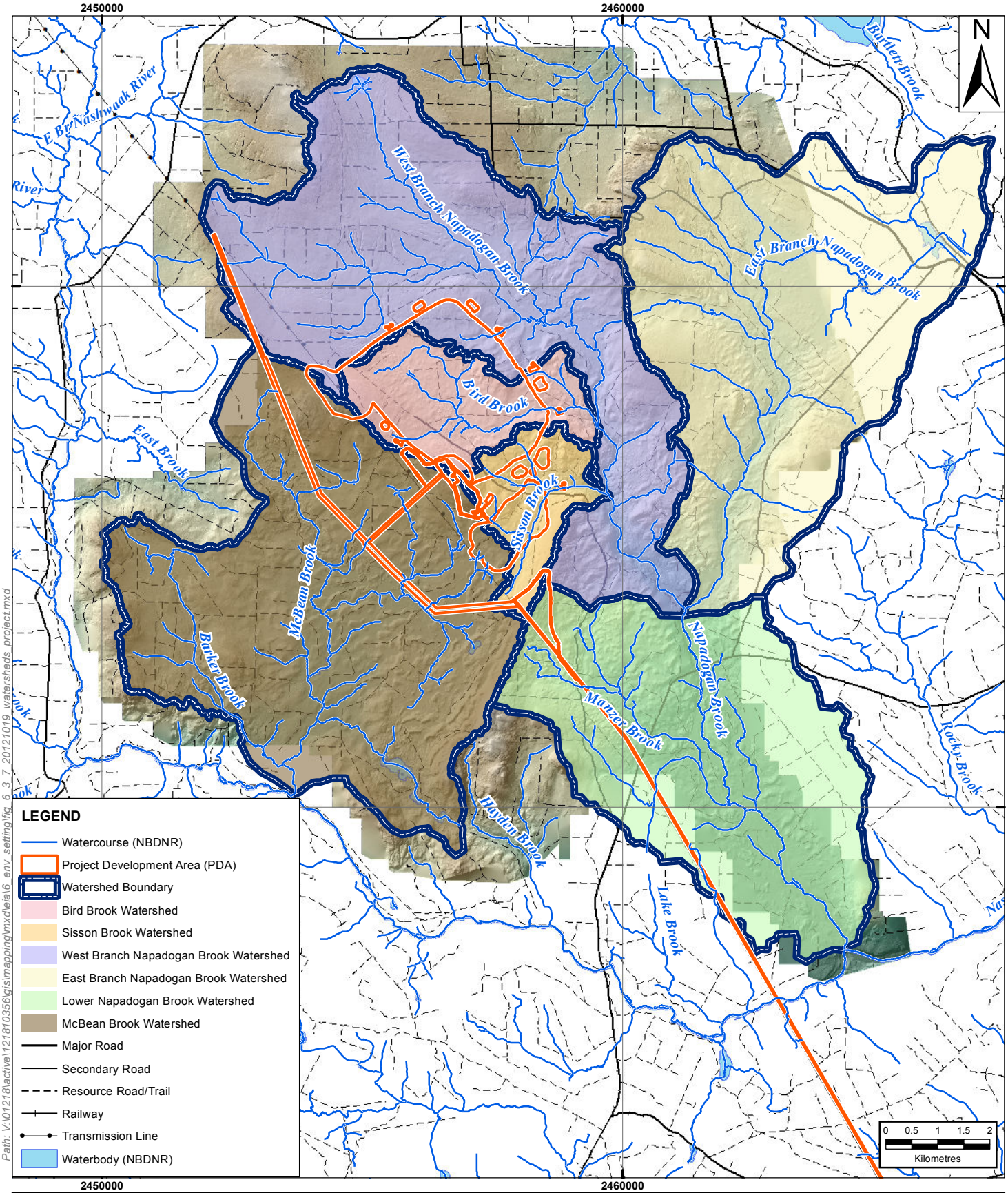
Client: Northcliff Resources Ltd.

Scale:	Project No.:	Data Sources:	Fig. No.:
1:325,000	121810356	NBDNR	6.3.6

Date: (dd/mm/yyyy):	Fig. By:	Appd. By:
23/10/2012	JAB	DLM

Stantec

Coordinate System: NAD 1983 CSRS New Brunswick Stereographic



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

Watersheds near the Project Sisson Project: Environmental Impact Assessment (EIA) Report, Napadogan, N.B. Client: Northcliff Resources Ltd.	Scale: 1:100,000	Project No.: 121810356	Data Sources: NBDNR Leading Edge Geomatics Ltd.	Fig. No.: 6.3.7	Stantec
	Date: (dd/mm/yyyy) 19/10/2012	Dwn. By: JAB	Appd. By: DLM		

Map: NAD83 CSRS NB Double Stereographic

Overall, fish habitat found in surveyed reaches of watercourses in the vicinity of the Project was of good quality, and typical of that expected for a rural and undeveloped area of central New Brunswick. Temperature and substrate conditions were suitable for fish to survive and reproduce (Stantec 2012d). Further details are provided in Section 8.5.2.

6.3.4.4 Fish Resource Use

There is no known commercial fishery in the Nashwaak River watershed, but there is an extensive recreational sport fishery within the Nashwaak River and some of its tributaries. There is an open season for smallmouth bass from May 1 to October 15. Fishing is permitted for brook trout in most rivers, brooks and streams of New Brunswick, including the Nashwaak River and its tributaries, from April 15 to September 15. Fishing is also permitted for the following non-sport fish within the Lower Saint John Recreational Fishing Area (which includes the Nashwaak River and its tributaries) during periods of the year when there is a sport fishery open, should these species be present: burbot (*Lota lota*), American eel (*Anguilla rostrata*), gaspereau/alewife (*Alosa pseudoharengus*), muskellunge (*Esox masquinongy*), chain pickerel (*Esox niger*), American shad (*Alosa sapidissima*), rainbow smelt (*Osmerus mordax*), striped bass (*Morone saxatilis*), white perch (*Morone americana*), whitefish (*Coregonus* spp.), yellow perch (*Perca flavescens*), and sturgeon (*Acipenser* spp.). There is no open fishing season for Atlantic salmon anywhere in the Nashwaak River watershed (NBDNR 2013).

6.3.5 Terrestrial, Vegetated, and Wetland Environment

6.3.5.1 Ecoregions

The Central Uplands Ecoregion includes two geographically separate but ecologically similar areas: the Madawaska Uplands in northwestern New Brunswick and the Caledonia Uplands in the southeast part of the province near the Bay of Fundy. The Caledonia Uplands area is located approximately 140 km to the southeast of the Madawaska Uplands. The Project is located in the southern portion of the Madawaska Uplands (Figure 6.3.8).

The plateaus of the southern part of the Madawaska Uplands differ from the steeper slopes found in the northern portion of the ecoregion. Generally, watercourses in the northern part of this region flow into the St. John River, whereas those in the southern part of the region primarily flow east and eventually into the Miramichi River. Rivers in the extreme south of the Madawaska Uplands are an exception; these flow into the Nashwaak River, which empties into the St. John River. This ecoregion is at a relatively higher elevation than other ecoregions in New Brunswick, resulting in a somewhat cooler climate that is mediated somewhat by primarily south-facing slopes. The higher elevation and cooler temperatures lead to higher precipitation amounts than are generally found in neighbouring regions (NBDNR 2007).

Within the Madawaska Uplands, the Beadle Ecodistrict, which encompasses the Project location, is characterized by broad valleys, rolling hills, and many lakes. Like the Central Uplands Ecoregion as a whole, the Beadle Ecodistrict has a cool, wet climate, and elevations ranging from 300 m amsl in the south to 600 m amsl in the north (NBDNR 2007).

Approximately 92% of the Beadle Ecodistrict is forested, including forested wetlands (NBDNR 2007). Forests in the ecodistrict transition from coniferous to tolerant hardwood stands. Granite-derived soils

with imperfect to poor drainage are typically dominated by black spruce and balsam fir; slopes and hilltops are dominated by sugar maple, yellow birch, and beech. Mixedwood stands are found in transition zones. Calcareous soils are not indicated in the ecodistrict. Correspondingly, species such as eastern white cedar and white spruce are scarce (Colpitts *et al.* 1995; NBDNR 2007).

6.3.5.2 Vegetation and Rare Plants

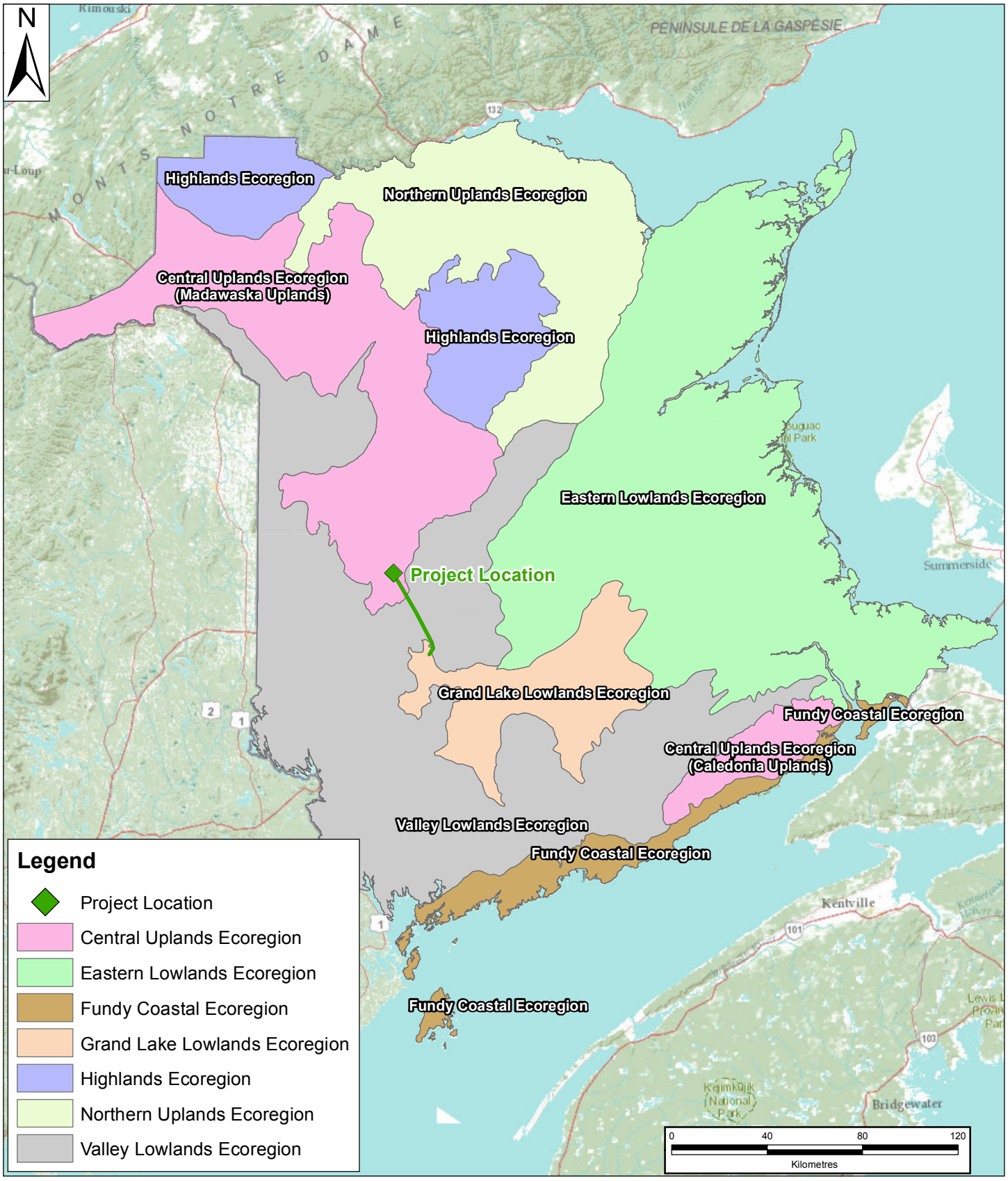
Warmer south-facing slopes in the vicinity of the Project support some southern tree species not seen in nearby colder ecoregions, such as balsam fir (*Abies balsamea*); red, white, and black spruce (*Picea rubens*, *P. glauca*, and *P. mariana*); and tolerant hardwoods such as sugar maple (*Acer saccarum*), yellow birch (*Betula alleghaniensis*), and beech (*Fagus grandifolia*) (NBDNR 2007). Eastern white cedar (*Thuja occidentalis*) is common in calcareous soils, where they occur, in particular in the Little Main Restigouche and Grand River watersheds in the northern part of the Madawaska Uplands. Common understory shrub species include mountain maple (*Acer spicatum*), striped maple (*A. pensylvanicum*), and hobblebush (*Viburnum lantanoides*) (Stantec 2012f). The well-drained soils on higher slope positions support tolerant hardwood stands, although they are lacking in many of the species indicative of rich sites that are found in more northerly areas of the province (Stantec 2012g).

Forests in the Beadle Ecodistrict have been logged since the late 1700s (NBDNR 2007) which has led to a mosaic of young forest stands in the area of the Project. Forestry is still the main economic industry for the region despite the recent closures of sawmills in the communities of Juniper and Deersdale. In addition to the Project, other mineral occurrences and prospects have been found in the ecodistrict, including the small Burnthill tungsten-molybdenum deposit north of Napadogan that was mined for a few years in the mid-1950s (Stewart *et al*. 2011; Lang, J. Personal communication, February 24, 2012).

6.3.5.3 Wetlands

The Central Uplands Ecoregion contains many different wetland types, particularly in southern areas where the landscape is less constrained by steep slopes. Common wetland types include shrub riparian wetlands dominated by alder (*Alnus* spp.), open water wetlands, and peatlands (NBDNR 2007).

The majority of wetlands as mapped by NBDNR near the Project (Figure 6.3.9) are forested, which is typical of the Beadle Ecodistrict and Central Uplands Ecoregion, although there is a conspicuous absence of eutrophic wetlands such as cedar swamps compared to other ecodistricts in the Ecoregion, reflecting the lack of calcareous and predominance of granitic bedrock formations (Stantec 2012g). The forested wetlands are generally poor in nutrients, low in plant diversity, and largely dominated by black spruce and balsam fir with ericaceous shrub understory. There is some minor peat formation in these wetlands, and while the hydrologic input to these maintains wetness with some consistency in lower lying areas, it is not sufficiently wet and/or drainage is not suitable to allow bog formation. The scarcity of bogs in the area of the Project is typical of the Central Uplands Ecoregion. Evidence of beaver activity of varying ages is nearly ubiquitous along watercourses that do not follow ravines. This activity has shaped the hydrology and vegetation communities of the wetlands in the vicinity of the Project.



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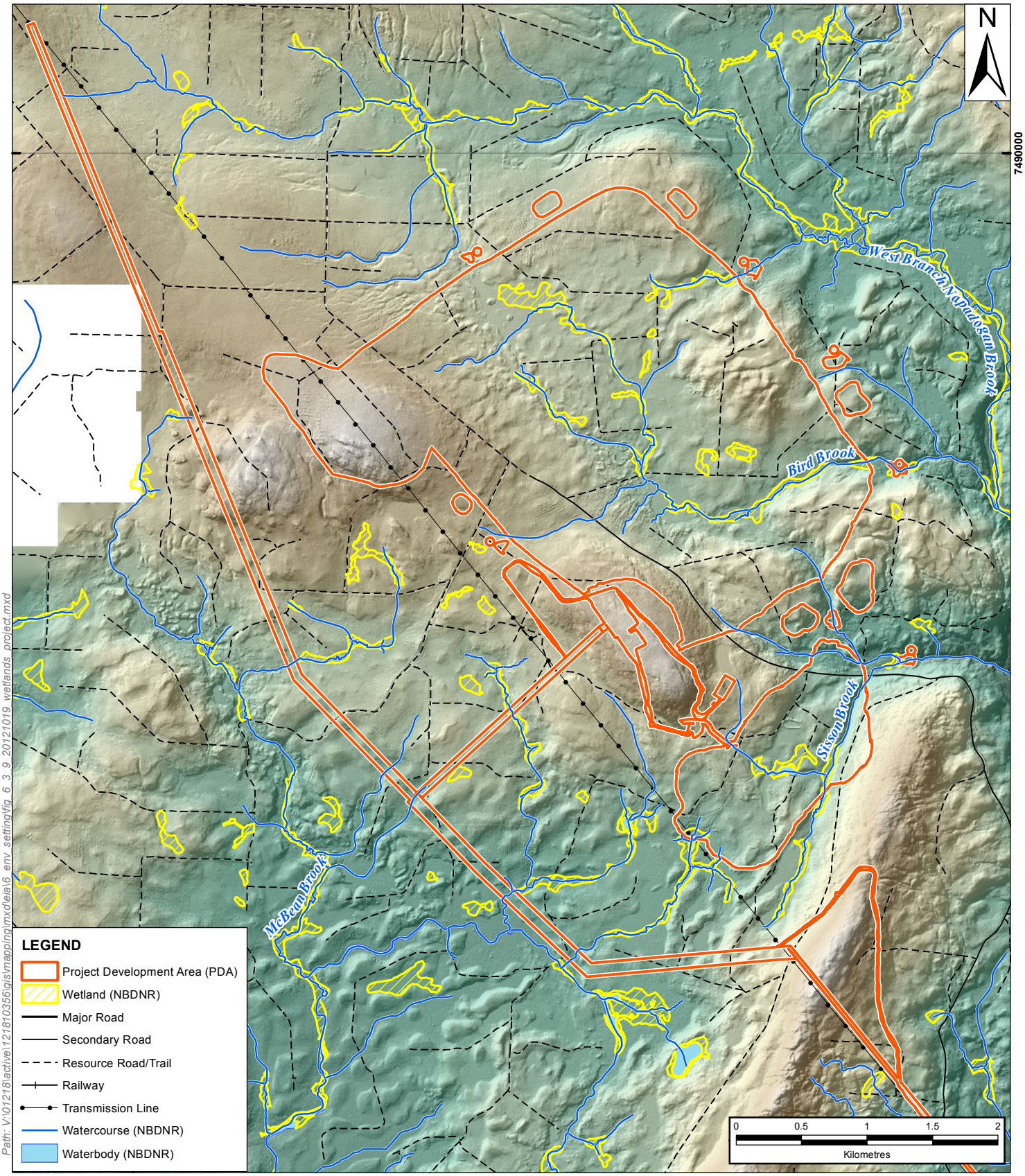
NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Ecoregions of New Brunswick Sisson Project: Environmental Impact Assessment (EIA) Report, Napadogan, N.B. Client: Northcliff Resources Ltd.	Scale: 1:2,200,000	Project No.: 121810356	Data Sources: NBDNR ESRI Online	Fig. No.: 6.3.8	Stantec
	Date: (dd/mm/yyyy) 22/11/2012	Dwn. By: JAB	Appd. By: DLM		

Map: NAD83 CSRS NB Double Stereographic



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

Wetlands near the Project Sisson Project: Environmental Impact Assessment (EIA) Report, Napadogan, N.B.	Scale: 1:40,000	Project No.: 121810356	Data Sources: NBDNR	Fig. No.: 6.3.9	Stantec
Client: Northcliff Resources Ltd.	Date: (dd/mm/yyyy) 19/10/2012	Dwn. By: JAB	Appd. By: DLM		

Map: NAD83 CSRS NB Double Stereographic

While the poor drainage in lower slope positions support relatively simple black spruce communities, these conditions are also conducive to wetland formation which have elevated potential for species of conservation concern (SOCC) and species at risk (SAR) (Stantec 2012g). Further detail on SAR and SOCC in the vicinity of the Project is provided in Sections 8.6 and 8.7.

6.3.5.4 Wildlife and Wildlife Habitat

A typical assemblage of wildlife is present within the Project area, including moose (*Alces alces*), white-tailed deer (*Odocoileus virginianus*), American black bear (*Ursus americanus*), eastern coyote (*Canis latrans*), American mink (*Mustela vison*), beaver (*Castor canadensis*), striped skunk (*Mephitis mephitis*), porcupine (*Erethizon dorsatum*), raccoon (*Procyon lotor*), and varying hare (*Lepus americanus*). Small mammals such as red squirrel (*Tamiasciurus hudsonicus*), voles, shrews and mice are also common and widespread in the Project area (Stantec 2012f).

A variety of herpetile species are also present including salamanders, frogs, toads, and snakes. One herpetile species, Wood Turtle (*Glyptemys insculpta*) is listed as Threatened in the *Species at Risk Act* (*SARA*) and NBDNR General Status Ranks. Wood turtle has been recorded previously by AC CDC north of the Project area within the Miramichi River watershed. Wood turtle are considered a semi-aquatic species, and prefer riparian areas with patchy cover, and clear meandering watercourses with gravely-sandy substrate and banks. No wood turtles were observed in the field surveys conducted in the Project area (Stantec 2012f).

The terrestrial habitat in the vicinity of the Project consists primarily of immature and young forest as a result of decades of historic forestry activity in the area (Figure 6.3.10). The older forests are mostly mature softwood, while the mid-developed forests are dominated by immature-old hardwood and immature-young softwood. Sapling softwood makes up the majority of the young forest stands near in the overall Project area (Stantec 2012f).

The NBDNR has identified 14 deer wintering areas (DWAs) located in proximity of the Project, ranging in size from 38.5 ha (Little Clearwater Brook) to 1,714 ha (Nashwaak), all of which are associated with watercourses or water bodies (Figure 6.3.10). The DWA closest to the Project is the Napadogan Brook DWA, a 446-ha DWA located predominantly along the East Branch Napadogan Brook and partially along the West Branch Napadogan Brook, approximately 0.5 km east of the Fire Road. The existing 345 kV transmission line (Line 3011) between Keswick and northern New Brunswick is currently routed through the Nashwaak DWA to the southeast of the Project location (Figure 6.3.10), and as part of the Project, this 50 m corridor will be widened by an additional 25 m to accommodate the new 138 kV transmission line for the Project. None of the other DWAs will be affected by the Project. NBDNR manages for DWA in forest management plans to ensure there is an adequate supply to support populations regionally.

The NBDNR has identified Old Spruce Fir Habitat (OSFH) blocks near the Project (Figure 6.3.10). Two of these overlap with DWAs (*i.e.,* the Gorby Gulch, Lake Brook and Nashwaak DWAs). The three OSFH blocks range between 743 and 776 ha in area. As with the Nashwaak DWA, the widening of the existing transmission line corridor to construct the new 138 kV transmission line for the Project will affect one of these OSFH blocks (Figure 6.3.10). None of the other OSFH blocks will be affected by the Project.

6.3.5.4.1 Birds

The existing data sources identified a combined total of 114 bird species that could be potentially present in the area near the Project (Stantec 2012f). Field studies for breeding and nesting birds identified 93 bird species in the Project area through point-count surveys conducted in 2011. Ten of these species were identified to be either at risk, rare, or uncommon (Table 6.3.3). An abundance of preferred nesting and breeding habitat is available in the vicinity of the Project for these species.

Table 6.3.3 Species At Risk and Species of Conservation Concern with Records Near the Project

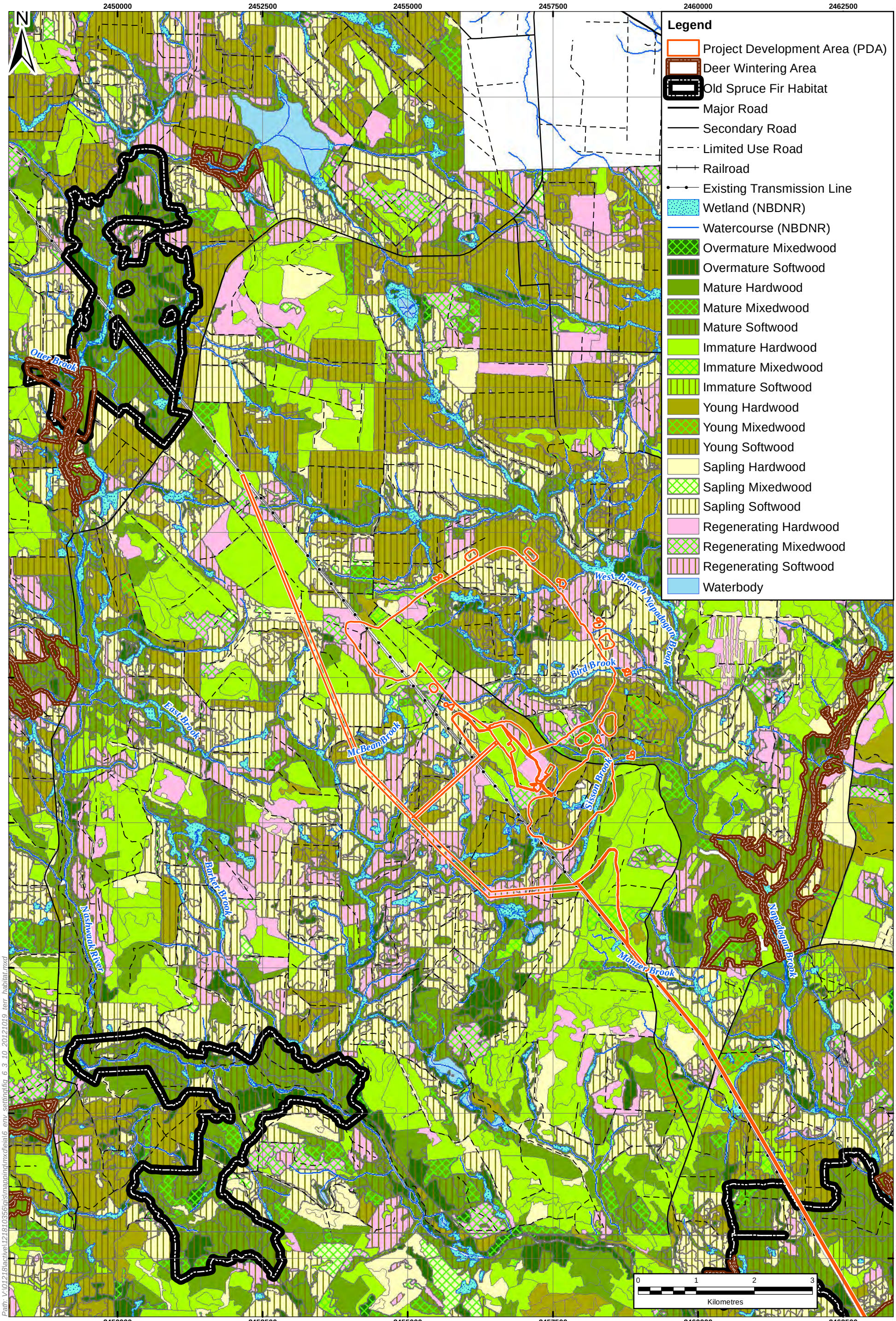
Common Name	Scientific Name	NBDNR Status	NB *SARA* Status	COSEWIC Status	*SARA* Status
Bald Eagle	*Haliaeetus leucocephalus*	At Risk	Regionally Endangered	Not At Risk	N/A
Common Nighthawk	*Chordeiles minor*	At Risk	-	Threatened	Schedule 1 (Threatened)
Chimney Swift	*Chaetuar pelagica*	At Risk	-	Threatened	Schedule 1 (Threatened)
Olive-sided Flycatcher	*Contopus cooperi*	At Risk	-	Threatened	Schedule 1 (Threatened)
Canada Warbler	*Wilsonia canadensis*	At Risk	-	Threatened	Schedule 1 (Threatened)
Barn Swallow	*Hirundo rustica*	Sensitive	-	Threatened	N/A
Eastern Bluebird	*Sialia sialis*	Sensitive	-	Not At Risk	N/A
Great-crested Flycatcher	*Myiarchus crinitus*	Sensitive	-	-	-
Pine Grosbeak	*Pinicola enucleator*	Sensitive	-	-	-
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Secure	-	-	-

Source: Stantec (2012f).

6.3.5.5 Environmentally Sensitive Areas

Included in the AC CDC data is information on environmentally significant areas (ESAs) as originally classified by the Nature Trust of New Brunswick in 1995 (Tims and Craig 1995). Between 1993 and 1995, the Nature Trust of New Brunswick identified over 900 sites of environmental importance across the province based on presence of rare species, rich species diversity, representativeness, and their geology and ecological vulnerability.

While ESAs do not have legal protection, they are used by non-government organizations, consultants and government departments in project planning. One ESA classified as significant for birds is located near the Project: the Miramichi Lake ESA (ESA #472), which includes the lake and surrounding wetlands, approximately 8 km to the northeast of the Project. At the time of its designation in the mid-1990s, this ESA supported one nesting pair of Bald Eagle (*Haliaeetus leucocephalus*), two nesting pair of Osprey (*Pandion haliaetus*), and a small colony (approximately six nests) of Great Blue Heron (*Ardea herodias*).



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

Terrestrial Habitats near the Project Sisson Project: Environmental Impact Assessment (EIA) Report, Napadogan, N.B. Client: Northcliff Resources Ltd.	Scale: 1:60,000	Project No.: 121810356	Data Sources: NBDNR	Fig. No.: 6.3.10	Stantec
	Date: (dd/mm/yyyy) 19/10/2012	Dwn. By: JAB	Appd. By: DLM		

Map: NAD83 CSRS NB Double Stereographic

6.4 SOCIOECONOMIC SETTING

This section provides a brief overview of the socioeconomic setting of Central New Brunswick.

6.4.1 Demographic Overview

A demographic overview of New Brunswick as a whole and the regions in the vicinity of the Project (Stantec 2012i) is provided in the sub-sections that follow.

6.4.1.1 Population

The 2011 Census (Statistics Canada 2012e) reported a population of 751,171 in New Brunswick, up 2.9% since the 2006 Census (Table 6.4.1).

Table 6.4.1 Population and Population Change: New Brunswick, York County, and Carleton County, 2006-2011

Location	Population 2011 [a]	Population 2006 [a]	Percent Change
Provincial Total	751,171	729,997	2.9%
York County	97,238	90,026	8.0%
Fredericton	56,224	50,535	11.3%
Stanley	1,322	1,404	-5.8%
Douglas Parish [b]	6081	5,774	5.3%
Millville	307	303	1.3%
Carleton County	27,019	26,632	1.5%
Juniper [c]	981	959	2.3%
Woodstock	5,254	5,113	2.8%
Hartland	947	947	0.00%

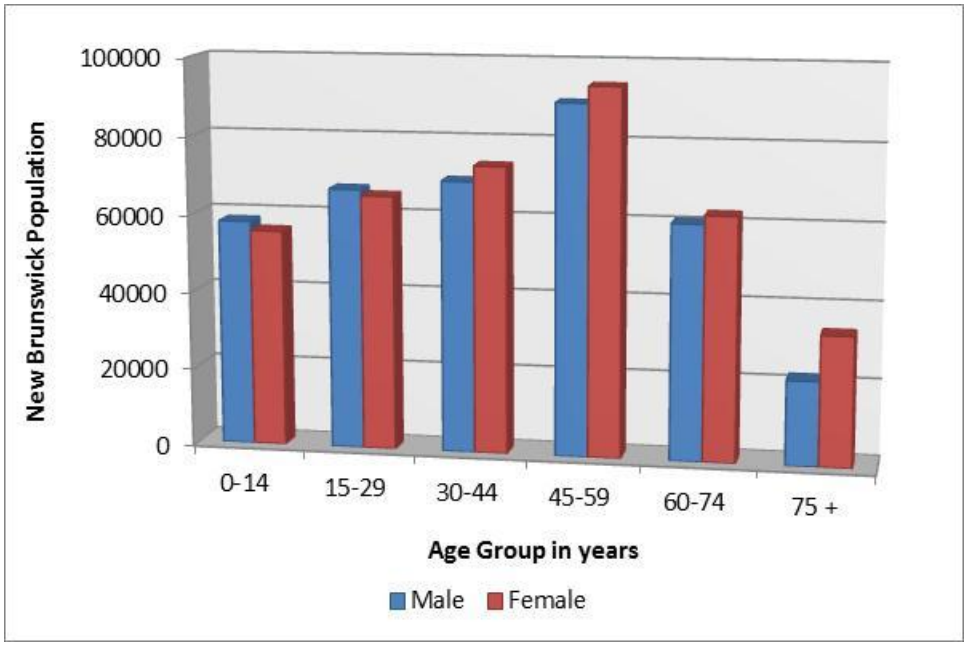
Notes:
[a] Numbers are rounded by Statistics Canada and are reported herein exactly as they are reported by Statistics Canada. Totals may not necessarily add up as a result of rounding.
[b] Data discussed includes the communities of Burtts Corner and Napadogan.
[c] Data supplied by Statistics Canada is described for the Parish of Aberdeen.

Source: Statistics Canada (2012e).

The York County census division includes the City of Fredericton, the Town of Nackawic, the Village of Stanley, and nearby rural areas (Statistics Canada 2012e). The population of York County increased by approximately 8.0% from 2006 to 2011, while the overall population of New Brunswick increased by approximately 2.9% for the same period. The greatest increase (11.3%) was in Fredericton, the capital city of New Brunswick, and the largest decline (5.8%) was in Stanley, the largest village close to the Project. The population of York County accounts for 13% of New Brunswick's total population.

The 2011 population of New Brunswick is displayed graphically by gender and age group in Figure 6.4.1. In 2011, the median age in New Brunswick was 43.7 years, up from 38.6 years in 2001. The percentage of individuals age 20-34 was 17.3% in 2011, down from 19.4% a decade earlier. Individuals in the 50-64 age range accounted for 23.5% of the total population in 2011, up from 17.5% in 2001. These findings suggest that the population of New Brunswick is aging, and young individuals are leaving the area (Stantec 2012i; Statistics Canada 2002).

Carleton County includes the communities of Juniper, Woodstock and Hartland and accounted for 3.6% of New Brunswick's population (Statistics Canada 2012e). The population of Carleton County increased 1.5%, to 27,019, in 2011, this was a reversal in the declining trend of 2% between 2001 and 2006 (Statistics Canada 2007).



Source: Statistics Canada (2007).

Figure 6.4.1 Population by Gender and Age Group, New Brunswick, 2011

6.4.1.1.1 Population Distribution

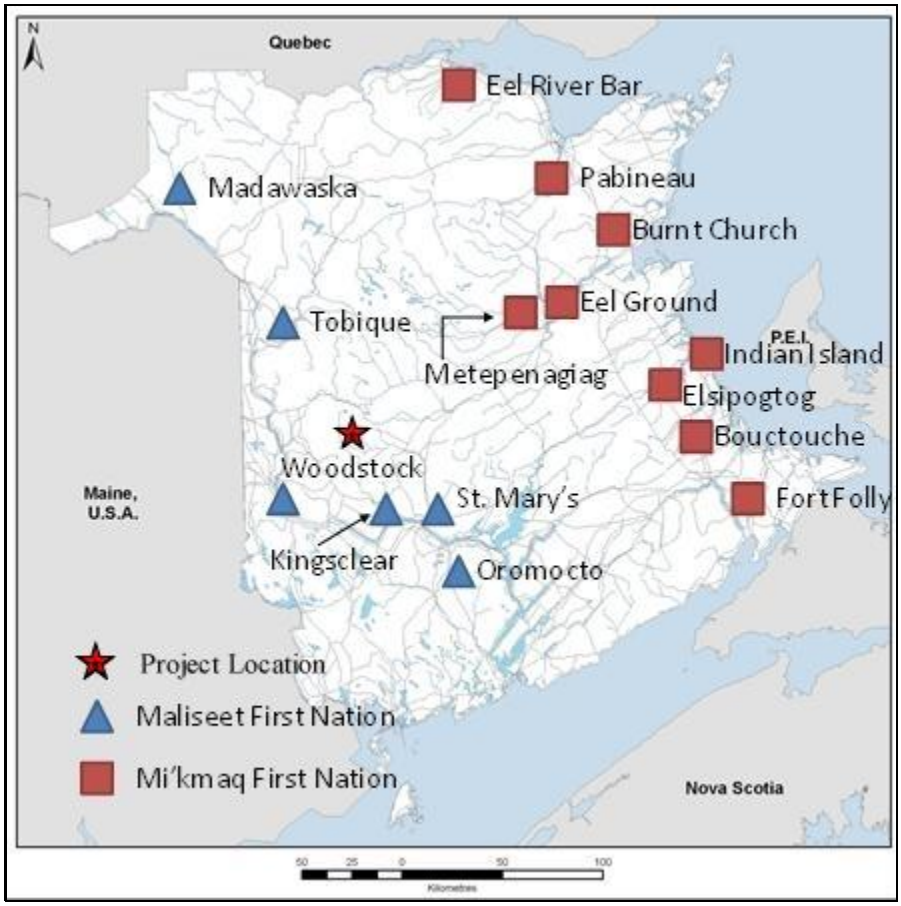
In 2011, approximately 16.5% of New Brunswick's population lived in York and Carleton counties. From 2006 to 2011 the population in those counties rose by 0.6% to 124,257, while the provincial population rose by 2.9% during that same period. The Statistics Canada publication "Population Projections for Canada, Provinces and Territories 2009-2036" predicts that these trends will continue over the next 24 years, showing a small increase in population, with an average of 1.3% between 2011 and 2036, and with the median age increasing steadily (Statistics Canada 2007). These data amplify the continuing decline of small villages and rural areas with the greatest increases in population being recorded in urban centres.

The City of Fredericton is the largest community in York County. Between 2006 and 2011, the population of Fredericton increased by 11.3% (Statistics Canada 2012e). This trend is consistent with national-level changes but is higher than the provincial average (Table 6.4.1) (Statistics Canada 2012e).

The Town of Woodstock is the largest community in Carleton County with a population of 5,254 in 2011, an increase of 2.8% from 2006 (Statistics Canada 2012e).

6.4.1.1.2 Aboriginal Population

The locations of First Nation communities in New Brunswick, including the Maliseet and Mi'kmaq communities, are shown in Figure 6.4.2. The Aboriginal communities located near the Project are Maliseet. There are six Maliseet First Nations in New Brunswick: Madawaska Maliseet First Nation; Tobique First Nation; Woodstock First Nation; St. Mary's First Nation; Kingsclear First Nation; and Oromocto First Nation (Aboriginal Affairs and Northern Development Canada 2012).



Source: Jacques Whitford Stantec (2009).

Figure 6.4.2 First Nations Communities in New Brunswick

As of 2006, the last year for which Census data is currently available in this category, approximately 2.4% of people (17,655 individuals) living in New Brunswick were reported as being of Aboriginal descent (Table 6.4.2) (Statistics Canada 2007). The largest on-reserve Maliseet community is the Tobique First Nation (Table 6.4.3) (Aboriginal Affairs and Northern Development Canada 2012).

Table 6.4.2 Aboriginal and Visible Minority Population: New Brunswick, York County, and Carleton County, 2006

Location	Aboriginal [a]	Visible Minority [a]
Provincial Total	17,655	13,345
York County	2,365	3,815
Carleton County	640	245

Notes:
[a] Numbers are rounded by Statistics Canada.
2011 Census data not yet published for this category.

Source: Statistics Canada (2007).

Table 6.4.3 Population of Selected New Brunswick Aboriginal Communities (Maliseet), 2012

First Nation Community	Population On-Reserve	Population Off-Reserve
Madawaska Maliseet First Nation	145	170
Tobique First Nation	1,449	701
Woodstock First Nation	290	647
St. Mary's First Nation	842	874
Kingsclear First Nation	679	274
Oromocto First Nation	301	335

Source: Aboriginal Affairs and Northern Development Canada (2012).

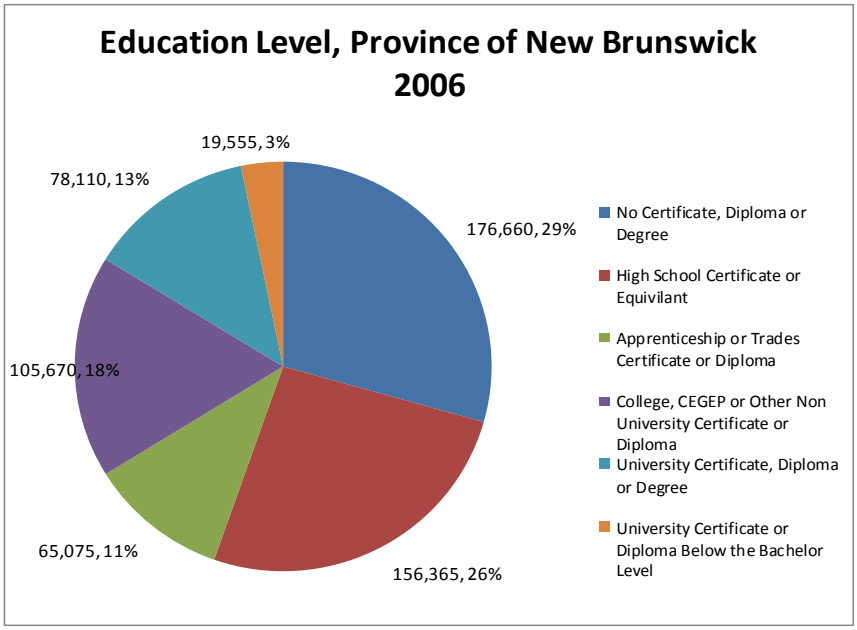
There also exist nine Mi'kmaq Aboriginal communities primarily along the northern and eastern coasts of New Brunswick, but these are located at a considerable distance from the Project.

6.4.1.1.3 Visible Minorities

Census data from 2006 indicate that approximately 1.8% of people living in New Brunswick are visible minorities (defined by Statistics Canada as persons, other than Aboriginal peoples, who are non-Caucasian in race or non-white in colour) (Table 6.4.2).

6.4.1.2 Education

In 2006 (the latest year for which this Census dataset is available at the time of writing), 29% of the province's adult population had not completed high school (Figure 6.4.3), and 13% had a university certificate, diploma or degree (Statistics Canada 2007). Just over half of New Brunswick's working population (those aged 25 to 64 years of age) had completed some form of post-secondary education as of 2006 (GNB 2011a).



Source: Statistics Canada (2007).

Figure 6.4.3 Education Level: New Brunswick, 2006

6.4.1.3 Employment and Income

The median income for all Census families in New Brunswick in 2006 (the latest year for which this Census dataset is available at the time of writing; Table 6.4.4) was $52,878, while the provincial median income for all persons aged 15 years and over was $22,000 (Statistics Canada 2007). In 2006, the median income for all Census families and for persons aged 15 years and older was higher in York County than in Carleton County. Within the counties, both types of income were lowest in Stanley Parish and the Village of Millville, and highest in Fredericton and Douglas Parish. Males had higher median income than females (Table 6.4.4) (Statistics Canada 2007).

Table 6.4.4 Incomes in New Brunswick, York County, and Carleton County, 2006

Location	Median Income - All Census Families	Median Income - Persons 15 Years and Over	Male	Female
Provincial Total	$52,878	$22,000	$28,019	$17,586
York County	$59,447	$24,536	$30,272	$20,294
Fredericton	$60,705	$24,718	$30,094	$21,604
Stanley Parish[a]	$36,958	$17,522	$21,553	$14,410
Douglas Parish[b]	$60,328	$26,738	$30,144	$21,127
Millville	$37,477	$17,000	$20,084	$12,932
Carleton County	$50,528	$21,442	$27,581	$17,189
Aberdeen Parish[c]	$$52,630	$22,302	$29,510	$17,188
Woodstock	$53,290	$21,320	$28,400	$17,403
Hartland	$52,394	$23,912	$31,375	$20,079

Notes:
[a] Data discussed include the Village of Stanley.
[b] Data discussed include the communities of Burtts Corner and Napadogan.
[c] Data discussed include the community of Juniper.

Source: Statistics Canada (2007).

6.4.2 Economic Activity

The New Brunswick economy has traditionally been largely based on natural resource development, centred on its energy, natural resources, and manufacturing industries. Tourism and communication technology industries also contribute substantially to the provincial economy. Although forests occupy 85% of the province's land (equivalent to 6.1 million hectares) and have been an economic mainstay throughout its contemporary history, the forestry sector has become less of an economic driver in recent years due to a decreasing contribution to employment from this sector and global economic forces. This decline has occurred over the past decade with the closure of several lumber and pulp and paper mills throughout the province, including, most recently, the closures of the Juniper Lumbermill and the Deersdale Sawmill, both located near the Project.

The province's major employment sectors include:

- mining, energy, and oil and gas;
- commercial fisheries and aquaculture;
- forestry;
- agriculture;
- tourism; and
- military.

New Brunswick has seen a steady increase in its Gross Domestic Product (GDP) over the decade spanning 2001 to 2010. The increase in GDP from 2006 to 2010 was approximately 14%. Strong exports and manufacturing led the province out of recession in 2010. Higher energy prices, production from the Canaport LNG terminal, and a resurgence in potash exports contributed to the improvement. Real economic activity was estimated to have increased 2% in 2010 due to stronger than anticipated growth in exports. Although the province led the country in export and manufacturing sales growth, it lagged in other areas. New Brunswick was one of only two provinces to show job losses in 2010, while growth in average weekly earnings and retail sales failed to keep pace with the rest of the country (NBDF 2011). Based on third quarter information, real GDP growth in New Brunswick in 2011 was 1.2%. Retail sales showed healthy growth, up 4.8% over 2010, compared to the national increase of 3.5%. New Brunswick's job market was weak in 2011, with employment falling by 4,000 as gains in part-time employment were not enough to offset full-time losses (NBDF 2012).

6.4.3 Labour

In 2006 (the latest year for which this Census dataset is available at the time of writing), the labour force of the province was 382,970 (Table 6.4.5). The participation rate (*i.e.*, the percentage of the working-age population employed or actively looking for employment) in the province was 63.7% in 2006, a nominal increase from 63.1% in 2001 (Statistics Canada 2002; 2007). While urban areas like Fredericton are thriving, unemployment in rural areas is high, particularly Stanley Parish at 24.8% (Table 6.4.5).

Table 6.4.5 Labour Force Characteristics: New Brunswick, York County, and Carleton County, 2006

Location	Total Population 15 years and Over	Labour Force	Employed	Participation Rate (%)	Employment Rate (%)	Unemployment Rate (%)
Provincial Total	601,420	382,970	344,770	63.7	57.3	10
York County	75,040	50,830	47,145	67.7	62.8	7.3
Fredericton	42,560	28,840	26,940	67.8	63.3	6.6
Stanley Parish[a]	1,510	825	615	54.6	40.7	24.8
Douglas Parish[b]	4,730	3,320	3,060	70.2	64.7	7.7
Millville	245	160	145	65.3	59.2	9.4
Carleton County	21,390	14,105	13,140	65.9	61.4	6.8
Aberdeen Parish[c]	790	520	445	65.8	56.3	15.4
Woodstock	4,140	2,565	2,380	62	57.5	7
Hartland	715	505	460	70.6	64.3	7.9

Notes:
[a] Data discussed include the Village of Stanley.
[b] Data discussed include the communities of Burtts Corner and Napadogan.
[c] Data supplied by Statistics Canada include the community of Juniper.

Source: Statistics Canada (2007).

Of the 20 industry sectors identified by the New Brunswick Department of Finance, the most significant job growth in the province over the 2001 to 2006 period came from construction (which increased by 3,500 jobs) and administrative and support services (+3,500), followed by retail trade (+2,900) and health care and social assistance (+2,800). During the same period, employment declines occurred in manufacturing (-3,200); agriculture, forestry, fishing and hunting (-700); and utilities (-300) (Government of New Brunswick 2006).

From 2001 to 2006, the unemployment rate in the Atlantic Provinces dropped from 12.5% to 10%. The 10% unemployment rate was still higher than the national average of 6.6%. As of October 2011, New Brunswick's Central Economic Region had an unemployment rate of 7.9%, while the unemployment rate in the Northwest Economic Region was 7.5%. Labour force statistics for the economic regions are reported as three-month moving averages.

6.4.4 Land and Resource Use

6.4.4.1 Local Planning

Land use and development in the province of New Brunswick is governed by the *Community Planning Act* (for private land) and the *Crown Lands and Forests Act* (for Crown land). Incorporated areas are subject to the *Municipalities Act*.

The Project is not located within the boundaries of an incorporated municipality, or within a Local Service District (LSD). Nearby communities in the vicinity of the Project include Juniper, Glassville, Florenceville-Bristol, Woodstock, Millville, and Stanley.

The local area consists mainly of provincial Crown land that has a variety of uses determined by the provincial government. With the exception of portions of the proposed transmission line to be built to service the Project, the Project is located entirely on Crown land. The majority of land in and around

the Project has been routinely used for forestry activities for more than a century. Timber is presently being harvested in the vicinity of the Project, and logging vehicles frequently travel to, from, and through the local area.

6.4.4.2 Industrial, Commercial, and Institutional Land Use

Commercial land and resource use in the vicinity of the Project consists primarily of forestry-related activities such as timber harvesting. There are also several outfitting and guiding businesses offering services during the hunting season near the Project. There is a low level of commercial activity that includes cabins available for short- and long-term rental, convenience stores, and several restaurants.

Industrial land use is limited, and includes the Napadogan veneer mill and the Deersdale Sawmill; the latter recently ceased operations.

There is no known institutional land or resource use in the immediate vicinity of the Project.

6.4.4.3 Residential Land Use

There are no permanent residences located in the immediate vicinity of the Project. The closest residences to the Project appear to be located in Napadogan, which is a small community, located along Highway 107, approximately 10 km to the northeast of the Project.

There are approximately 39 recreational campsite leases, including cabins, in the vicinity of the Project. The closest cabin to the Project is located approximately 1.5 km to the east of the proposed location of the open pit. These cabins are not serviced by the New Brunswick electrical grid, though some appear to operate generators. The cabins may be used at any time of the year.

6.4.4.4 Recreation

Evidence of recreational land use is present throughout much of the Project site and surrounding area. Forestry roads and trails are used opportunistically for snowmobiling, ATV use, and hiking. Recreational fishing of brook trout occurs seasonally in various watercourses within and surrounding the Project site.

The Project area is used for hunting a variety of game, including deer, moose, black bear, ruffed grouse and woodcock, as well as for trapping (*e.g.,* hare snaring). The hunters and trappers using these resources are generally residents of the surrounding communities, though some tourists also hunt for bear and moose, sometimes through the services of the local guides and outfitters (Stantec 2012i).

6.4.5 Community Services and Infrastructure

6.4.5.1 Housing and Accommodation

6.4.5.1.1 Private Dwellings

In 2006, there were 295,960 occupied private residential dwellings in New Brunswick. Seventy-five percent of these were owned, and 25% of them were rented. In 2011, there were 314,005 occupied private dwellings in the province (Statistics Canada 2012b). The Multiple Listings Service (MLS)

average housing price in New Brunswick increased by 1.8% from $157,240 in 2010 to $160,000 in 2011 (CMHC 2011a).

The number of private dwellings occupied by residents in York County in 2006 was 37,155, of which 73% (26,970) were owned and 27% were rented. The average value of an owned dwelling in York County in 2006 was $153,664, approximately 23% above the provincial average. In 2006, renters in York County paid an average of $699 each month (Statistics Canada 2007d). In 2011, there were 40,375 occupied private dwellings in the County (Statistics Canada 2012e).

Carleton County had 10,374 occupied private dwellings in 2006. The majority of these (81%) were owned, and 18% were rented. The average rent in the area was $545 each month, and the average value of an owned dwelling was $106,406 (Statistics Canada 2007). In 2011, there were 10,895 occupied private dwellings in Carleton County (Statistics Canada 2012e).

6.4.5.1.2 Housing Starts

There were an estimated 3,100 housing starts in New Brunswick in 2011, a decrease of 24.4% from 2010. MLS sales were also down 4.1%, from 6,702 in 2010 to 6,425 in 2011 (CMHC 2011a).

The provincial Rural Planning District Commission (RPDC) provides building inspection, development and planning services to unincorporated areas of New Brunswick within its jurisdiction on behalf of the Minister of Environment and Local Government. In 2011, the RDPC issued 350 building permits in rural areas of York County. In 2010-11, the RPDC approved plans for 224 subdivisions ranging in size from one lot to 34 lots (Stantec 2012i). In 2011, RPDC issued 144 construction permits in Carleton County. In 2010-11, there were plans to develop 85 subdivisions, with the largest having four lots (Stantec 2012i).

6.4.5.1.3 Affordable Housing

The New Brunswick Department of Social Development is the government agency responsible for the province's social assistance and affordable housing programs. Social housing programs administered by the department include public housing, rent supplement, rural and native housing programs, non-profit and cooperative housing programs, a federal/provincial repair program, an energy efficiency retrofit program, an affordable rental housing program, home completion and home ownership assistance programs, and other housing loan programs (New Brunswick Department of Social Development 2011).

The latest available Statistics Canada Census numbers in this category (2006) indicate that the province of New Brunswick has 29,400 households in core housing need (New Brunswick Housing Corporation n.d.). Core housing need refers to households with problems related to adequacy (*i.e.,* housing requires major repairs), suitability (*i.e.,* housing does not have enough bedrooms for the size and make-up of resident households) and/or affordability (*i.e.,* housing costs more than 30% of total before-tax household income). Based on these statistics, New Brunswick has the second lowest percentage of households in core housing need in the country, after Alberta (CMHC 2009). Affordability is the major housing problem for low-income households in New Brunswick. However, there also exists an adequacy problem as over 40% of households in need reside in inadequate dwellings. New Brunswick's high level of adequacy need is caused by four factors: the age of

New Brunswick's housing stock, the preponderance of home ownership units owned by low-income households, the absence of province-wide building code enforcement, and the rural nature of New Brunswick (New Brunswick Housing Corporation n.d.).

6.4.5.1.4 Temporary Accommodations

There are approximately 500 hotels, inns, vacation homes, bed-and-breakfasts, and fishing and hunting lodges in New Brunswick, and 36 of these temporary accommodations are located in York and Carleton Counties. Of these, 64% are located in Fredericton where there are 20 hotels, motels and resorts, and six bed-and-breakfasts, inns, and tourist homes. Though not accounted for as accommodations, there are also two campgrounds in the Fredericton area (Stantec 2012i).

There are no motels, hotels, inns, or bed and breakfasts in the Village of Stanley. The two closest accommodation options to Stanley are the River's Edge campground and the Riverbend Bed and Breakfast/Inn in Durham Bridge, approximately 26 km from Stanley.

Neither Napadogan nor Burtts Corner has temporary accommodations. The closest options are the On the Pond Country Retreat in Mactaquac, and the Riverside Resort and Conference Centre in Keswick. Located in Millville are MacFarlane Sporting Camp (a hunting and fishing lodge offering cabin/log style accommodation), as well as Larsen's Log Lodge (a country retreat with five suites). An inn and a motel are also located in Nackawic, and a bed and breakfast is located in Nortondale.

There are several accommodation options in Woodstock, including bed and breakfasts, inns, hotels, motels, cottages, and campgrounds. Accommodations in Hartland include the Ja-Sa-Le Motel, the Covered Bridge Bed and Breakfast, and Brigitte's Bed and Breakfast (Stantec 2012i).

The main listing for accommodations in the Juniper area is for the Governor's Table/Paper Birch Lodge, a facility that offers a number of cabins. It is located on the Miramichi River. Other nearby options include the River Country Campgrounds and Cabins in Wicklow, and the Shamrock Suites in Florenceville-Bristol, a 19th Century home conversion that offers private nightly, weekly and monthly accommodations.

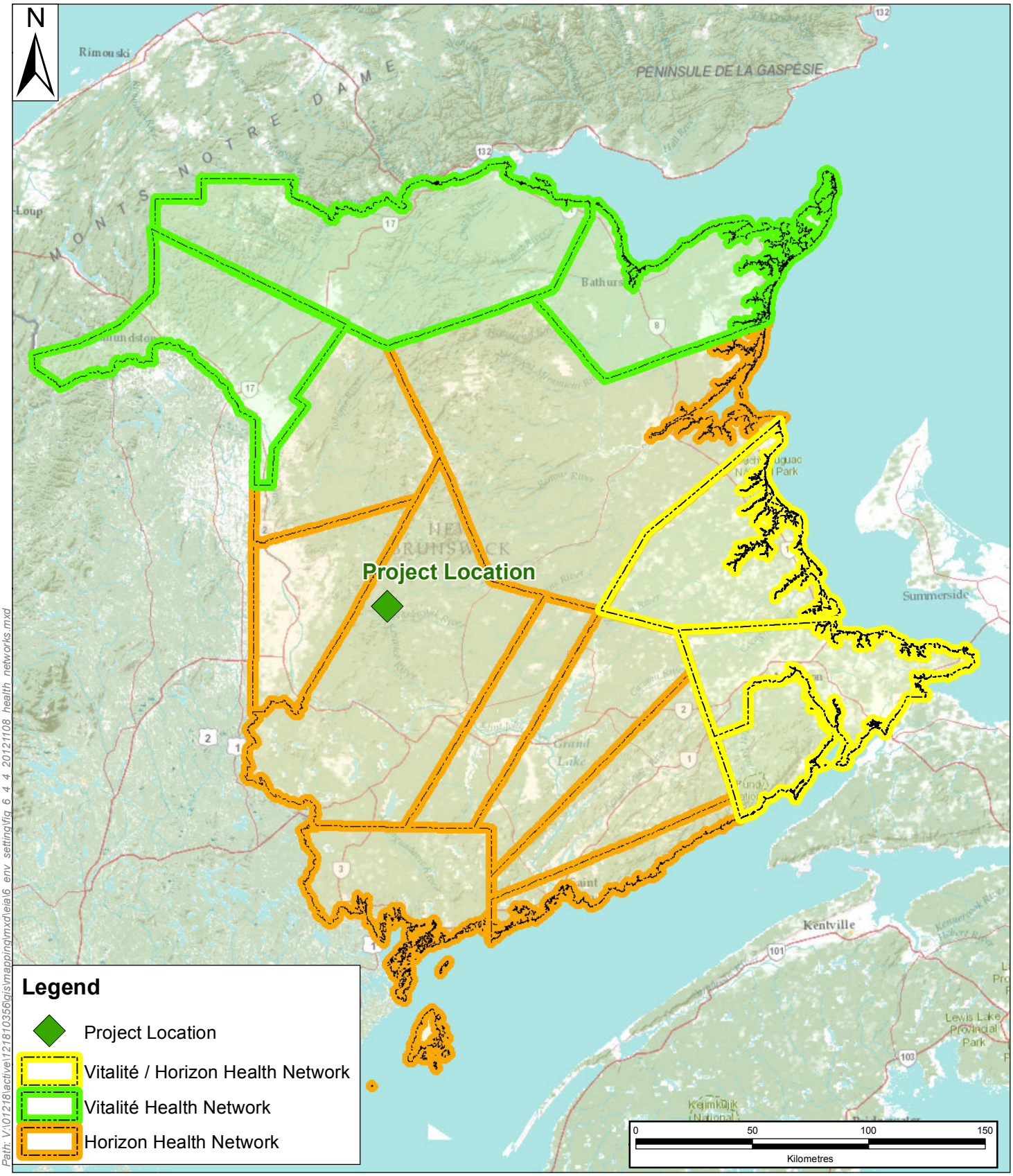
Finally, there are a number of outfitters operating throughout Carleton County that offer accommodations.

6.4.5.2 Public Infrastructure

6.4.5.2.1 Health Administration

In 2008, New Brunswick's eight former Regional Health Authorities (RHAs) merged to form two new RHAs to deliver health services within New Brunswick: Horizon Health Network (Horizon) and Vitalité Health Network (Vitalité). The areas managed by Horizon Health Network and Vitalité Health Network are outlined in Figure 6.4.4.

Horizon, which operates all of the healthcare centres in York and Carleton Counties, includes 12 hospitals, with more than 1,600 beds, and over 100 facilities, clinics and offices. It provides medical services ranging from acute care to community-based health services (Horizon Health Network 2011a).



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New Brunswick Health Networks Sisson Project: Environmental Impact Assessment (EIA) Report, Napadogan, N.B. Client: Northcliff Resources Ltd.	Scale: 1:2,250,000	Project No.: 121810356	Data Sources: SNB ESRI Online	Fig. No.: 6.4.4	Stantec
	Date: (dd/mm/yyyy) 08/11/2012	Dwn. By: JAB	Appd. By: DLM		

Map: NAD83 CSRS NB Double Stereographic

The Vitalité Health Network provides health care and services to nearly 250,000 people in northern and southeastern New Brunswick. It has 11 hospitals, a psychiatric hospital centre, six community facilities, four addiction treatment centres, and 11 main offices for the Extra-Mural Program, which specializes in home visits (Vitalité Health Network 2011).

The Government of New Brunswick's Hospital Services Branch within the Department of Health is responsible for ensuring the availability of hospital services through planning, funding, and monitoring the ongoing operational needs of the two Regional Health Authorities with their healthcare facilities.

In the Fredericton area, Horizon operates a network of health facilities and services that include a regional hospital (the Dr. Everett Chalmers Hospital), a community hospital, and 11 community health centres and clinics. There is a veterans' health unit and the Stan Cassidy Rehabilitation Centre, which are tertiary centres of rehabilitation services for the Province of New Brunswick. Over 3,500 employees and over 220 physicians work in the Fredericton area, assisted by more than 500 volunteers (Horizon Health Network 2011b).

In other parts of York County, there are community healthcare centres and clinics in the Village of Stanley as well as in Nackawic. These and other community health centres provide primary care, chronic disease management, health promotion, disease prevention, and community development (Horizon Health Network 2011b).

In Carleton County, the Upper River Valley Hospital located in Waterville, north of the Town of Woodstock, is the newest hospital in New Brunswick with 45 beds. It receives approximately 30,200 emergency patients annually, providing services to Woodstock and surrounding communities including 24/7 emergency, ambulatory care, breast screening, cardiac testing, laboratory, maternal and child services, ophthalmology, outpatient oncology and palliative care (Horizon Health Network 2011c). The acute care occupancy rate at the Upper River Valley Hospital was 118% in 2010-11 and 108% the previous year (Horizon Health Network 2011b).

6.4.5.2.2 Community Programs

New Brunswick provides comprehensive addiction and mental health services, including a range of acute, inpatient, outpatient, and community services. Programs are organized in the areas of assessment and crisis intervention, children and youth, adult, geriatrics, and community care.

In the Fredericton area, there are approximately 55 inpatient acute care beds at the Dr. Everett Chalmers Regional Hospital to provide psychiatric and addictions services. The hospital also offers emergency mental health services. Other addiction and mental health services in the area include children and youth treatment programs, gambling and methadone treatment programs, and individual and family and group counseling.

There are three Addiction and Mental Health Services centres in the Fredericton area, and one Mobile Mental Health Crisis Intervention Team. There are two Addiction and Mental Health Service centres in Woodstock, and one Mobile Mental Health Crisis Intervention Team (Horizon Health Network 2011b).

6.4.5.2.3 Public Health

Public Health Services of the New Brunswick Department of Health prevent, manage and control communicable diseases, promote healthy lifestyles and healthy families, and provide environmental protection. The services offered by Public Health include anonymous HIV/AIDS testing; communicable disease prevention, management, and control; early childhood initiatives; a healthy learners program; health emergency planning; immunization; and a sexual health program (Horizon Health Network 2011b).

There are four public health units in the Fredericton Area and one in Woodstock (Horizon Health Network 2011b).

6.4.5.2.4 Extra-Mural Program

The Government of New Brunswick's Extra-Mural Program provides a comprehensive range of coordinated healthcare services for individuals of all ages for the purpose of promoting, maintaining, and/or restoring health within the context of their daily lives or to enable individuals with terminal illnesses to remain at home. This is accomplished through the provision of services in the home, schools and community, and includes acute care, palliative care, chronic care, long-term care, rehabilitation, and home oxygen therapy. Extra-Mural units are located in Fredericton and Woodstock (Horizon Health Network 2011b).

6.4.5.3 Emergency Services

6.4.5.3.1 Ambulance Services

Ambulance New Brunswick Inc. (ANB) is contracted by the Department of Health to provide air and land ambulance services in New Brunswick (New Brunswick Department of Health 2011).

There are over 80 ANB stations throughout the province, including one in Stanley and a fleet centre/paramedic station/regional office in Fredericton. Construction is currently underway on a station in Hartland (ANB 2011).

In 2009-10, ANB had a fleet of 134 vehicles operating out of its 80 stations. It employed approximately 1,000 people, including paramedics, critical care nurses, and medical transportation dispatchers. In the 2009-10 fiscal year (*i.e.,* April 2009 to March 2010), it received 93,062 calls, a decrease of approximately 15,000 calls from 2008-09 fiscal year. During the 2010-11 fiscal year, ANB received 94,063 calls, an increase of approximately 1,000 calls over the previous year (ANB 2010; 2011). The air ambulance service currently employs nine full-time critical care flight nurses, three part-time and three casual employees. In the 2009-10 fiscal year, the air ambulance service responded to 724 calls, including 554 patient transfers. In the 2010-11 fiscal year, they completed 564 patient transfers out of 719 requests for service (ANB 2010; 2011).

ANB's contract with the Department of Health says that in 90% of calls, the ambulance must reach an urban caller within nine minutes and a rural caller within 22 minutes. All performance requirements were met in the 2010-2011 fiscal year, and in ANB's western region, response times were achieved for over 95% of all calls (ANB 2011).

6.4.5.3.2 Policing Services

The New Brunswick RCMP, or "J" Division, is comprised of a variety of professional employees specifically trained to address policing needs in New Brunswick communities. As of January 1, 2011, the New Brunswick RCMP had 928 regular members, 87 civilian members, and 160 public-service positions responsible for providing policing service to provincial residents. It operates out of 12 district offices, 57 satellite offices, and seven federal offices. Its provincial headquarters are located in Fredericton. “J” Division maintains 530 established vehicles, 80 snowmobiles/all-terrain vehicles, and 17 boats to patrol 98% of the New Brunswick land mass, 400 km of land border and 2,300 km of coastline in partnership with other law enforcement agencies (RCMP 2008; 2011).

Based on a regional policing model, each district consists of several detachments located within a specified geographic region of the province. There are 11 RCMP districts (or regional police forces) in New Brunswick (Figure 6.4.5). The Codiac Regional RCMP also operates a district office. Each district is overseen by a District Commander (the RCMP equivalent of a Chief of Police) in charge of operations for that area (RCMP 2011).

The two RCMP districts within York and Carleton Counties are District 2 (Oromocto) and District 7 (Carleton-York). District 2 (Oromocto) lies in the central part of the province, including an office in Stanley. District 7 (Carleton-York) is in the western central region and includes offices in Hartland and Woodstock.

6.4.5.3.3 Fire Protection

The Fredericton Fire Department has five stations and 118 employees. The Department services the City of Fredericton and eight LSDs under a Fire Protection Services Agreement with the Province. It also has mutual aid agreements with neighbouring municipalities to provide them with dispatch services.

The Fredericton Fire Department responded to 3,626 calls for service in 2010, 3.5% fewer than in 2009. This was the lowest number of calls received by the department in four years. Most of the calls for service were for medical assistance, with 1,948 calls in 2010. This number was a decrease of 3.6% from 2009, and represented another four-year low. There were 446 fire calls in 2010, down 9.5% from 493 in 2009. Of the 446 fire calls, 28 were for actual structure fires, one of the lowest numbers in the last 10 years. The Department also responded to 23 calls under the Provincial Local Service District Agreement and four calls under the Capital District Mutual Aid Agreement (Fredericton Fire Department 2011).

The Villages of Stanley and Millville each have volunteer fire departments with 25 and 18 members, respectively. The Stanley Fire Department has two pumper trucks and a rescue vehicle with first responder medical equipment on-board. The Millville Fire Department has one rescue vehicle and two fire trucks, and it is in the process of purchasing new rescue equipment. There is also a volunteer fire department in Burtts Corner with approximately 15 members (Stantec 2012i).

There is a fire department in Woodstock, which consists of four full-time drivers, a full-time fire chief, a deputy chief, two captains, a lieutenant, and 22 volunteer firefighters. The Woodstock Fire Department provides 24-hour emergency fire protection and rescue services to the Town of Woodstock and adjacent rural communities. It also has mutual aid agreements with neighbouring municipalities to provide them with dispatch services.

The Hartland Fire Department has one station with 32 volunteer fire fighters for fire/accident response and an eight-person volunteer rescue team. The Department does not employ any full-time staff. It owns three tanker/pumper combination vehicles with water capacity ranging from 4,000 to 9,500 litres. The Hartland Fire Department has recognized a need for ongoing equipment replacement and upgrades. The Town of Hartland's municipal plan for 2009-13 has identified that purchasing new fire department equipment will be a project in 2012 (Town of Hartland 2009).

There is also a volunteer fire department in Juniper that has 12 members and no full-time staff. The department owns two tanker/pumpers, each with 5,500 litre water capacity, and one rescue van.

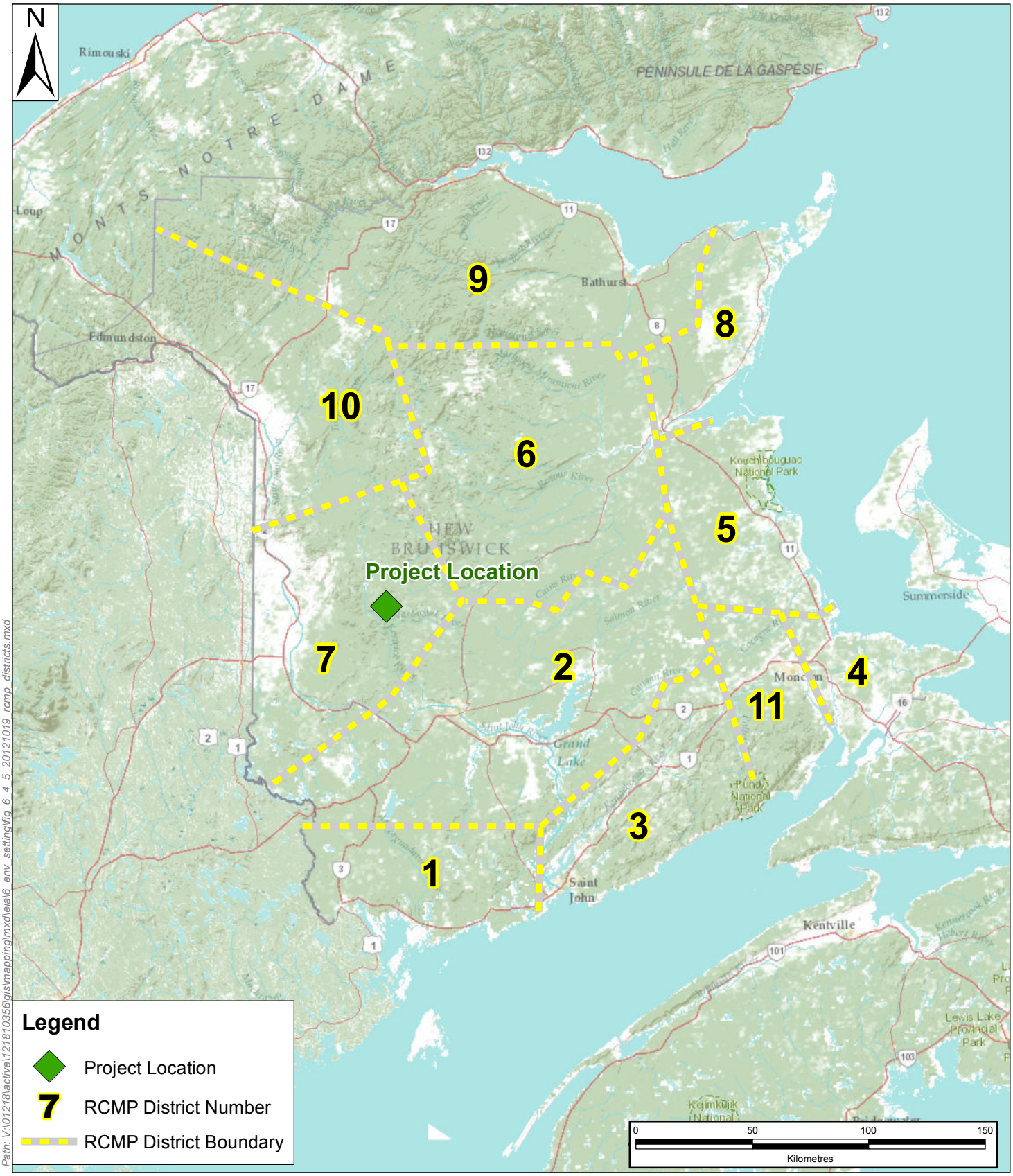
6.4.6 Heritage Resources

6.4.6.1 Built Heritage

A search of the register of Canada's Historic Places (CRHP 2012), and a review of New Brunswick Historic Places (NBHP 2010) did not reveal any registered built heritage places or historic sites in the vicinity of the Project. As of the time of writing, there were no provincial Historic sites listed in the communities of Juniper, Maple Grove Station, Centreville, Williamsburg, Currieburg, Boyds Corner, Stanley, Cross Creek, Deersdale, or Half Moon (NBHP 2010). There are no National Parks or National Historic Sites in the vicinity of the Project (Parks Canada 2008).

The Historic Places Section of the New Brunswick Department of Tourism, Heritage and Culture indicates there are few built heritage structures near the Project. Two structures in the Community of Napadogan were added to the NBHP (formerly the Canadian Inventory of Historic Buildings database) in 1989. These structures include the Old Railway Office in Napadogan (built in 1908), and the Old Round House (estimated build date of 1908) (Stantec 2012j).

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



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RCMP Jurisdictions, New Brunswick Sisson Project: Environmental Impact Assessment (EIA) Report, Napadogan, N.B. Client: Northcliff Resources Ltd.	Scale: 1:2,250,000	Project No.: 121810356	Data Sources: SNB, ESRI Online	Fig. No.: 6.4.5	Stantec
	Date: (dd/mm/yyyy) 19/10/2012	Dwn. By: JAB	Appd. By: DLM		

Map: NAD83 CSRS NB Double Stereographic

6.4.6.2 Palaeontological Resources

The sedimentary rock units within the Project site are from the Cambrian to Early Ordovician Periods. The Early Ordovician Meductic Group is comprised of igneous formations within the Meductic Group which do not contain fossils, and the Porten Road Formation which is primarily a porphyritic rhyolitic flow and breccia, would not contain fossils (Stantec 2012j). The Belle Lake Formation of the Meductic Group is fossil-bearing and known to contain graptolite fossils (Fyffe *et al.* 1983 as cited by Randall Miller 2011); however, it is located outside of the Project site. The Cambrian-Early Ordovician Woodstock Group located within the Project area includes the Baskahegan Lake Formation, a grey to green turbiditic sandstone and shale with minor red sandstone and shale. The Woodstock Group resembles the Grand Pitch Formation of central Maine, which contains the Cambrian trace fossil Oldhamia (Neuman 1984, as cited by Randall Miller 2011).

6.4.6.3 Archaeological Resources

There are no known archaeological sites in the vicinity of the Project; however, it must be acknowledged that no professional archaeological survey of this area had even been undertaken prior to this EIA. An Archaeological Potential Map provided by the Archaeological Services unit of the New Brunswick Department of Tourism, Heritage and Culture indicates that the lands bordering all watercourses in the vicinity of the Project, within a distance of 80 m (and 100 m at watercourse confluences) of the watercourses, have been determined to have high or medium potential for archaeological resources, subject to confirmation through walkover and shovel testing. A visual assessment of these areas was conducted by Stantec in 2011, and shovel testing to determine the presence of archaeological resources in these areas is planned prior to ground disturbing activities (Stantec 2012j). Shovel testing commenced in the Fall of 2012.

6.4.7 Transportation and Transportation Infrastructure

New Brunswick's transportation network connects New Brunswick and the Atlantic provinces with the major markets in central Canada through Québec, the northeastern United States through Maine, and internationally through its two major ports at Saint John and Belledune.

6.4.7.1 Road

New Brunswick has a network of well-maintained highways, with many kilometres of four-lane expressway connecting the major centres via the Trans-Canada Highway (Route 2) as well as Routes 1, 7 and 15. The main major highway near the Project is a collector highway, Route 107, and various forestry roads can also be used to access the Project location and to connect to other major highways in the province.

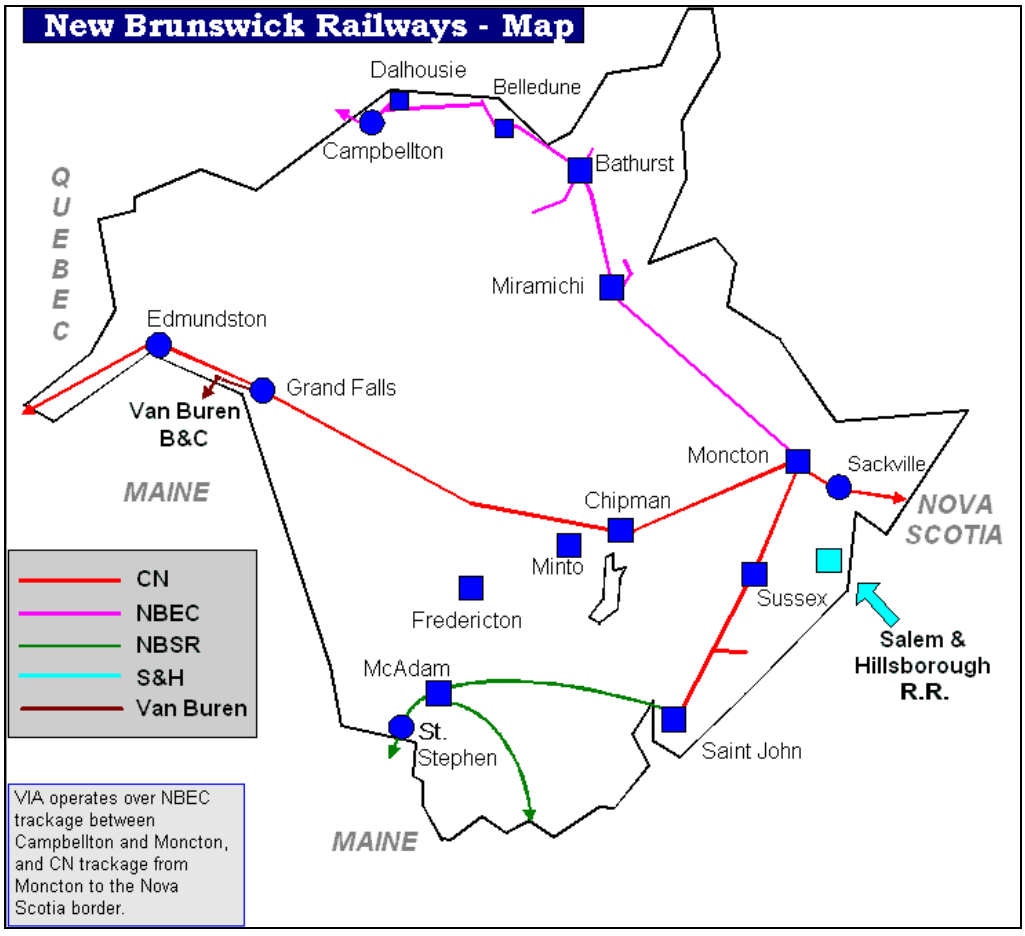
Route 107 connects with Route 8 at Nashwaak Bridge to the east of the Project, through Cross Creek, the Village of Stanley, Napadogan, and Juniper, before intersecting with Route 105 at Florenceville-Bristol to the west of the Project site. Route 107 has an approximate length of 100 km.

Local highways are maintained by the New Brunswick Department of Transportation and Infrastructure (NBDTI), and fill out the highway network and connect small communities and areas to major highways. These roads are subject to seasonal weight restrictions and lower speed limits, particularly as they

cross smaller communities. The speed limit is generally 80 km/h or lower depending on road design standards. Forest resource roads on Crown land are the responsibility of the New Brunswick Department of Natural Resources (NBDNR), who often delegate the responsibility for their maintenance to the holders of Crown leases for timber management.

6.4.7.2 Rail

New Brunswick has three rail freight routes that tie into national and international transportation routes (Figure 6.4.6). Rail freight within New Brunswick is primarily provided by Canadian National Railway (CNR), and is a vital component of New Brunswick's transportation network. The federally-regulated service provides an important link between New Brunswick and the national railway system including major markets in central and western Canada, the northeastern United States, as well as a connection to Atlantic Canada's major ports. A major regional intermodal terminal is operated by CNR in Moncton, which services users from New Brunswick, Prince Edward Island, and parts of Nova Scotia. There is also a transload facility located in Edmundston, New Brunswick (Figure 6.4.6). CNR's mainline in conjunction with New Brunswick's other shortline railways, moves 97% of Atlantic Canada's international freight traffic (Atlantic Gateway 2010).



Source: TrainGeek.ca (2011).

Figure 6.4.6 New Brunswick Railways

In addition to CNR, New Brunswick has two provincially regulated rail-freight shortline carriers, New Brunswick East Coast Railway (NBEC) and New Brunswick Southern Railway (NBSR). The NBEC connects the CNR mainline at Moncton with the northern shore of New Brunswick, including stations in Campbellton and through to Québec.

The NBSR operates from the Port of Saint John and the Maine border, and continues through the New England states to Montréal and Québec (Figure 6.4.6). The NBSR is a member of the Irving Group of companies based in Saint John. NBSR delivers freight rail services to various industrial and commercial customers and offers direct intermodal service between Saint John, New Brunswick and Ayer, Massachusetts (NBSR 2012). NBSRs closest station to the Project is a reloading station located in McAdam, approximately 90 km south of the Project.

6.4.7.3 Ports

New Brunswick has four marine cargo ports located in Saint John, Belledune, Bayside, and Dalhousie, collectively capable of handling over 30 million tonnes of cargo annually.

The Port of Saint John is located approximately 140 km south of the Project, and is eastern Canada's second largest container port and the fourth largest port by tonnage in Canada. The Port of Saint John offers deep water service year-round through the Bay of Fundy. In 2011, the Port of Saint John handled more than 27 million tonnes of cargo (Saint John Port Authority 2012).

The Port of Belledune is located approximately 170 km north of the Project. The Port of Belledune also offers year-round service, and is a deep water point of access through the Gulf of St. Lawrence. In 2011, the Port of Belledune completed an important expansion which included the construction of two new terminals; a Roll-on/Roll-off terminal and a fourth terminal for barge traffic. For the calendar year 2011, the Port of Belledune handled approximately 2.1 million tonnes of cargo from approximately 105 vessels (Port of Belledune 2012).

New Brunswick's two smaller marine ports located at Bayside and Dalhousie provide shallow port facilities. The Port of Bayside provides services to the aggregate, lumber, paper products, frozen fish, potatoes, salmon, fish feed, and fertilizer industries. The Port of Dalhousie's primary commodity is fuel oil for the Dalhousie Generating Station (now slated for decommissioning).

6.4.7.4 Air

New Brunswick has three airports that are part of the National Airport System, located at Fredericton, Moncton, and Saint John. The Greater Moncton International Airport is New Brunswick's centre for air cargo activity in Atlantic Canada, as a result of its central location and access to integrated cargo services (Province of New Brunswick n.d.)

Four smaller, municipally owned and operated airports located in Saint-Léonard, Charlo, Bathurst, and Miramichi currently provide courier and charter services.