5.11 Labour and Economy

5.11.1 Rationale for Selection as Valued Environmental Component

Labour and Economy was selected as a VEC to assess the potential interactions between Project activities and the current labour and economic conditions within the areas that may be affected as a result of the Project.

"Labour" refers to the supply base and the demand of the direct skilled and non-skilled labour requirements of the Project, as well as the direct labour income generated and the indirect creation of labour in other economic sectors. "Economy" refers to the changes to the production base of the region and province other productive sectors generated by the Project expenditures on materials and services attained within the local, regional and provincial economies. This also includes the net Project labour income expenditures resulting from changes in expenditure patterns in local and regional markets. "Economy" also refers to the productivity and cost saving benefits to the local economy from an improved infrastructure.

In this section, the environmental and economic effects of the Project activities on Labour and Economy resulting from the construction, operation, and maintenance, as well as accidents, malfunctions and unplanned events are assessed.

5.11.2 Environmental Assessment Boundaries

5.11.2.1 Spatial and Temporal

The spatial boundary of the Project for the Labour and Economy VEC is the regional economy of Carleton and Victory counties in the upper Saint John River Valley of New Brunswick. Due to technical limitations described in the next section, the indirect "spin-off" effects of Project expenditures on materials, services and labour may extend beyond the local region to the rest of the Province.

The temporal boundaries of the Labour and Economy VEC include the four year construction period of the Project, as described in Section 3.0, and operations and maintenance in perpetuity.

5.11.2.2 Administrative and Technical

The Project is located within Carleton and Victoria counties. The estimation of monetary value and employment numbers associated with changes in economic sectors affected by the construction, operation and maintenance, malfunctions, accident and unplanned events and incidents, are beyond the administrative scope of this study. To quantify economic effects would entail very time consuming and costly market research and analysis, which would extend well beyond the administrative time line boundaries of this study. Statistics Canada maintains an Input-Output model of the production input and output of all National and Provincial economic sectors. This input-output model can be used to measure the indirect "spin-off" labour and economic effects of an extraneous change in activity, as is the case with the injection of Federal and Provincial public expenditures into the highway construction economic sector. The input-output model analysis is limited to sectoral results at the Provincial level only.

Much of the data used in this CSR was gathered and generated from various government and non-government organizations (*e.g.,* the Carleton Victoria Forest Products Marketing Board (CVFPMB), an administrative and wood supply management area that encompasses the Carleton and Victoria Counties of New Brunswick). It must also be noted that personal communications from various individuals during public and stakeholder interviews form part of the data set. The validity of unconfirmed data was weighed by the authors for its applicability and reliability for use in this EA.

As presented in Section 5.8 Land Use, the spatial information used for the detailed assessment of Project-related environmental effects on both agriculture and forestry includes the proposed TCH footprint (1,054 hectares including access roads), in the context of twenty digital map tiles (78,894 ha) based on NBDNR 1996 and 2000 aerial photography ("Assessment Area") that provides a larger contextual view of the area traversed by the Project. Agriculture and forestry data are based on land-use and forest cover information from the digital data, while sector and economic information is based on NB Department of Agriculture, Fisheries and Aquaculture and Statistics Canada 2001 Agriculture Census data. Forestry activities span rotations in excess of fifty years and agricultural activities are based on shorter crop rotation schedules - three to five years covers most productions. Assumptions used reflect current sectoral soil and water conservation best management practices (BMPs).

Data on the affected regional economy of western New Brunswick was obtained from stakeholder consultations and from published documents. It is the professional judgment of the study team that this data will be sufficient to characterize the extent of labour and economy environmental and economic effects generated by the Project to support the environmental assessment.

5.11.3 Residual Effects Rating Criteria

A *significant residual environmental effect* on the economy is one where the Project induces adverse changes in regional employment and/or the regional economy of western New Brunswick (or the upper Saint John River valley).

A *significant residual environmental effect* on labour is one where the Project results in an adverse change in regional employment in the Upper Saint John River valley and/or the regional employment of western New Brunswick.

A *significant residual economic effect* for the forestry and agriculture components of Labour and Economy is one that affects the regional sector's ability and viability, such that processing facilities would close or curtail operation with a loss of employment, or modify commodity prices and or the producer's ability to access market.

5.11.4 Existing Conditions

5.11.4.1 Population

The Project is primarily located in New Brunswick's Carleton County and the southern portion of Victoria County. The 2001 population of Carleton County is 27,184. The major community in southern Victoria County is Perth-Andover with a population of 1,908. The area population has grown approximately 1% since the previous census in 1996. Table 5.11.1 provides a summary of the towns and villages within the Assessment Area.

Table 5.11.1 Communities and Carleton County Populations - 2001

Community	Population	Residential Dwellings
Bath	592	230
Bristol	719	295
Centreville	535	240
Florenceville	762	295
Hartland	902	345
Woodstock	5,195	2,165
Woodstock First Nation	250	90
Sub Total Community	8,958	3,660
Carleton County (total)	27,184	10,175
Perth-Andover	1,908	810

Source: Statistics Canada 2001 Census

The population of the Assessment Area is primarily located outside the towns and villages, reflecting its rural character and agriculture land use.

5.11.4.2 Labour Force

The 1996 labour force of the Region (the Enterprise Carleton Region, which includes most of Carleton County and the York County communities of Canterbury and Meductic) is 13,910 or 64% of the population fifteen years or older. The June 2003 unemployment rate for the Woodstock to Edmundston region was 9.8% compared to 10.6% for the Province and 7.7% for Canada (recent unemployment rates are only available for economic regions and major centres). The Carleton region has generally had one of the lowest unemployment rates in the Province. The most recent unemployment rate for Carleton County (census day 2001) was 8.6% versus the Provincial rate of 12.5%.

Table 5.11.2 summarizes the employment by major industry sectors for the Carleton region.

Table 5.11.2 Enterprise Carleton Region 1996 - Employment by Major Sector

Major Sectors and Industries	Employment by Sector	Share of Total Employment Carleton	Share of Total Employment Province
Manufacturing (food, clothing, wood products, equipment etc.)	2,480	17.8%	13.0%
Retail Trade	1,490	10.7%	12.7%
Health and Social Services	1,135	8.2%	10.7%
Hospitality and Other Services	1,600	11.5%	13.6%
Agriculture and Related	1,295	9.3%	2.4%
Transportation and Storage	1,055	7.6%	4.8%
Construction	855	6.1%	6.8%
Education Services	780	5.6%	7.4%
Government	660	4.7%	8.4%
Logging and Forestry	445	3.2%	2.1%
Other	2,115	15.2%	18.1%

Comparing the employment by industry sector to the Provincial figures illustrate the importance of manufacturing, agriculture, forestry, and transportation to this Region. Industrial sectors, such as construction, retail, and hospitality services that will supply labour and services to the Project, are also important to the Region.

The median income (population 15 years and over) for Carleton County is $18,139 (2001 census) compared to the provincial average of $18,257 and the Canadian average of $22,120.

5.11.4.3 Tourism and Hospitality Sector

The Provincial government's inventory of tourism establishments identified 34 accommodation businesses (motels, hotels, bed and breakfasts) 6 campgrounds and 11 outfitters along both sides of the Saint John River Valley between Woodstock and Perth Andover. Other tourism related businesses include restaurants, various retail operations, numerous festivals, farmers markets, art galleries, golf

courses and museums. The major tourism attractions in the Upper Saint John River tourism region include the Hartland Covered Bridge and the Grand Falls Gorge.

The Saint John River valley is a major New Brunswick tourism route. The peak tourism season for this area is June through September. During this period, hotel/motel roofed accommodation occupancy rates are typically above Provincial averages, whereas they are generally lower during the remainder of the year.

Most visitors are traveling by road and are on a tour of Atlantic Canada when they pass through the region (average trip duration is 17.5 nights away from home). The major tourism markets (origin of tourists) are Ontario 40%, Quebec 22%, and the US 20%. Many visitors (52%) to New Brunswick are making their first visit. Many travelers have done research before they left home, but have not completely planned their trips. In other words, they have flexibility in terms of where and how long they stop along the way. Sixty-six percent had not made advanced reservations for accommodations (New Brunswick Department of Tourism and Parks 2001).

The area offers a range of attractions and activities (*e.g.*, hiking, biking, hunting, fishing, boating, camping), but likely the biggest attraction is the scenic drive along the River. However, the Upper Saint John River Valley does not have a major attraction that makes the area a major tourist destination. Many attractions, hospitality facilities and communities rely on the pass through traffic making unplanned stops. For this reason, visibility from the highway, highway signage and visitor information centres are important factors in attracting visitors.

5.11.4.4 Regional Public Services

Health Services

The Perth-Andover to Woodstock area is part of New Brunswick's Health Region 3. The Region is served by local hospitals located in Bath, Perth Andover and Woodstock. Ambulance Services for the area are provided from Plaster Rock, Tobique, Perth-Andover, Florenceville and Hartland. The major health care facility for Health Region 3 is located in Fredericton.

Fire Fighting Services

Firefighting services for the Perth-Andover to Woodstock region are located in Florenceville, Bath, Glassville, Bristol, Hartland, Perth Andover, Centreville, Lakeville, Plaster Rock, Debec, Maliseet and Woodstock. These firefighting services cover both incorporated municipalities and local service districts. The local service districts that do not have firefighting service contract with neighboring jurisdictions to provide the service on a cost sharing basis.

Transportation and Traffic Network

The existing TCH from Perth-Andover to Woodstock is a two-lane primary arterial highway that extends through the region. It serves two purposes. It is a national highway that carries through traffic between eastern New Brunswick and the other Atlantic Provinces, Maine, and the rest of Canada. It also serves as a local highway and carries local traffic to and from the region, as well as "door-to-door" and farm traffic within the region. As such, the mix of traffic along this section of the existing TCH can be very hazardous. The rate of fatalities along the existing two-lane TCH is as much as five times that of the Provincial average fatality rate along four-lane divided highways, as the proposed TCH. Table 5.11.3 below presents a comparison of the historic levels of traffic accidents along the existing TCH versus Provincial four-lane divided highways (NBDOT 2002).

Table 5.11.3 Historic Average Accident Rates by Severity

Highway Segments	Accident Rate by Severity (Acc/100 MVK)*		
	Fatal	Injury	Property Damage Only
Perth-Andover to Florenceville	1.2	10.0	27.4
Florenceville to Woodstock	1.5	17.1	36.0
Four-lane divided highways in New Brunswick	0.3	9.9	24.9

*Accidents per 100 million vehicle-kilometres

Traffic volumes along the existing TCH range from 4,200 to 8,800 vehicles per day, with the highest volumes in the Woodstock area where local traffic is highest. Through traffic between Perth-Andover and Woodstock is in the range of 3,000 to 3,500 vehicles per day. The remaining traffic traveling to and from the region will use sections of both the existing TCH and the proposed TCH. Trucks currently make up 27% to 34% of the total traffic along the existing TCH. Most trucks, with the exception of local industry and delivery trucks, will divert to the proposed new TCH (NBDOT 2002).

Highway traffic conditions are classified into six levels of service (LOS) ranging from LOS A (excellent free flowing operating conditions) to LOS F (substantial delay and stop and go traffic conditions). At LOS D or worse conditions, improvements to the highway are warranted, and at LOS E the highway is operating at capacity. Presently the segment of the existing TCH from Perth-Andover to Florenceville is operating at a level of service (LOS) D and the segment from Florenceville to Woodstock at LOS E. Upon completion of the proposed TCH the traffic diversion will result in LOS A conditions on the proposed TCH, while the existing TCH segments from Perth-Andover to Florenceville and Florenceville to Woodstock will operate at LOS A and C, respectively (NBDOT 2002).

The diversion of the through traffic diversion from the existing TCH to the proposed TCH will result in improved safety and service levels along both highways.

5.11.4.5 Agriculture

Agriculture is a major factor in terms of both the landscape and economy through most of the area of the proposed TCH route. Over the last fifty years agriculture in Carleton and Victoria counties has grown to become the most important production area in the province (G. Maicher, DAFA, pers. comm. 2003).

In 2001, Carleton and Victoria counties accounted for over 52% of the provincial field crop (excluding grain and oilseed) operations. Nationally, New Brunswick is fourth in potato area planted and second in yield. Potatoes account for 25% of all farm cash receipts ($104 million in 2001) in New Brunswick, with dairy ranked second at 17% (NB Potato Statistics Update, B. Ouellette, DAFA, documentation).

Statistics Canada's 2001 Census data reports 380 farms in Carleton County and 169 in Victoria County which combined represent over 21% of the provincial farm population. Twenty five per cent of New Brunswick farms with gross farm receipts of more than $250,000 are in Carleton County.

Most of the agriculture production in Carleton and Victoria counties is on the west side of the Saint John River and is potato or potato related through crop rotation. The importance of this crop continues to increase and more land is being recovered, rejuvenated and placed into potato production. Between 1991 and 2001 there has been a 15% increase in potato production area (NB Potato Statistics Update, Benoît Ouellette, DAFA, documentation) partly from the conversion of forestland to agriculture.

The agriculture sector in Carleton and Victoria counties account for an estimated 80% of the provincial potato production, 85% of all the grain production, and 75% of all the beef production (stakeholder consultations, pers. comm. 2003).

Both potatoes and beef are highly dependent on transportation for low cost, given that they are low priced commodities, and for product freshness. Eighty percent of potatoes produced are exported or shipped to central Canada. New Brunswick beef is exported or transported to Guelph, Ontario for slaughter and processing. Any imported feed has a $30/tonne transportation cost associated with it.
Potatoes going to the United States are subject to a series of inspections for such issues as crop infections and bio-terrorism under the Homeland Security Program and the Food and Drug Inspection Agency (FDA), which adds cost and time to the delivery and may affect freshness (P. MacDonald, Potatoes NB, pers. comm.).

Statistics Canada 2001 Census Consolidated Subdivisions (CCS) states that there are 126 farm operations in the Assessment Area representing 5% of the provincial farm population. These operations represent 12% of the Provincial field crop producers (potatoes) and 5% of the Provincial beef cattle producers.

As discussed in Section 5.8.4.4 Agriculture, farmland in the Assessment Area is among the most productive in the province. According to the Canada Land Inventory (CLI), 97% of the land in the Assessment Area is a CLI Class 4 or better and, according to Statistics Canada (2001 Census), farms in the Assessment Area are larger operations with 11 percent of farms having a land base greater than 453 ha compared to 9 percent in Carleton County and 3 percent provincially.

Agriculture and Labour

The consolidation of farms (combining several farms through acquisition or lease) has decreased the numbers of farmers but increased the size of farms substantially. It is not uncommon for several traditional farms to be combined into one larger parcel and for a farm to have several separate large parcels often many kilometers apart (Stakeholder consultations).

Farm consolidation and the resulting larger sophisticated highly mechanized farm operations require medium priced skilled labour during the different stages of production. Traditionally the peak demand is during the harvest. Operators have sought to diversify their business activities in part to provide year round employment to at least a portion of their labour force. The school year begins in mid-August with the Potato Break occurring during the harvest period in September. While mechanization has reduced the labour intensity of the harvest, there are periods of high demand for skilled and semi-skilled labour to supplement the regular labour force during harvest. This need is partly filled with a school-aged labour force and hence the need for the Potato Break.

The strong industrial (mostly agriculture based) sector draws part of its labour force from outside the population centres. This affects the availability and cost of local labour. Seventy five percent of Carleton County businesses are outside municipal boundaries and there is considerable commuting between communities (CRDC 1999). The agri-food industry (McCain Foods) is a major contributor to the economic profile supporting the manufacturing and transportation sectors. Carleton County has more truck-transport operators per capita than anywhere in Canada. Many potato producers have transport tractor-trailers or their own trucking business (G. Melanson, Enterprise Carleton Region, pers. comm. 2003).

5.11.4.6 Forestry Resources

The forest sector in Carleton and Victoria Counties directly employs over 1,000 people in logging, forest management and secondary processing (CRDC 1999).

The Carleton-Victoria Forests Products Marketing Board (CVFPMB) administers the marketing of the majority of the forest products harvested within the two counties, as well as the delivery of forest management services to private woodlot owners. The Annual Allowable Cut (AAC), harvest from

private woodlots in the two counties, represents approximately 314,000 m^3, all species combined (NBDNRE 1995), from a forest land base of approximately 185,000 ha (NBDNRE 1989). Assuming an average of $50 per m^3, the value of logs and pulpwood delivered from private woodlots to mills this represents $15.7 million of gross revenues per year to woodlot owners, logging and trucking businesses.

As a result of the proximity to United States and other New Brunswick forest products markets, competition for wood has resulted in higher stumpage values within the CVFPMB than the provincial average (Agfor Inc. 2003).

Approximately 1,300 hectares of forest lands are silviculturally treated annually within the CVFPMB area on private woodlots in the Carleton and Victoria counties (NBDNRE 2002b) valued at approximately $750,000 to $1,000,000 per year.

Christmas Trees

Approximately 175,000 Christmas trees are produced annually in the Assessment Area. With the majority being exported to the US and some as far as Mexico (A. Watson, pers comm.).

Maple Producers

Although there are several maple syrup producers in the region there are none identified within the proposed TCH alignment.

5.11.5 Environmental Effects Analysis

5.11.5.1 Project-VEC Interactions

Table 5.11.4 Project Activity – Environmental Effects Interaction Matrix – Labour and Economy

Potential Interactions Between Project Activities and Environmental Effects **Valued Environmental Component: LABOUR AND ECONOMY**				
Project Activities and Physical Works (see Table 4.1 for list of specific activities and works)	**Potential Environmental Effects**			
	Change in Employment	**Change in Commercial Employment and GDP**	**Change in Agriculture**	**Change in Forest Resources**
Construction				
Site Preparation	✓	✓	✓	✓
Roadbed Preparation	✓			
Surfacing and Finishing	✓			
Watercourse Crossings Structures	✓			
Ancillary Structures and Facilities Construction	✓		✓	✓

Table 5.11.4 Project Activity – Environmental Effects Interaction Matrix – Labour and Economy

Potential Interactions Between Project Activities and Environmental Effects **Valued Environmental Component: LABOUR AND ECONOMY**				
Project Activities and Physical Works (see Table 4.1 for list of specific activities and works)	**Potential Environmental Effects**			
	Change in Employment	**Change in Commercial Employment and GDP**	**Change in Agriculture**	**Change in Forest Resources**
Operation				
Winter Safety				
Proposed TCH Presence	✓	✓		
Maintenance				
Proposed TCH Maintenance	✓	✓		
Vegetation and Wildlife Management				
Accidents, Malfunctions and Unplanned Events				
Construction			✓	✓
Operation		✓	✓	✓
Maintenance			✓	✓
Other Planned Development	✓	✓	✓	✓

5.11.5.1.1 Construction

The interaction of the environmental effects of the construction activities and physical works of the Project with the Labour and Economy VEC is summarized in Table 5.11.4 and described below.

Employment

The Project will inject an estimated $200 million of net construction expenditures and create construction labour employment throughout all phases of the four-year construction period, which will affect employment levels locally and throughout the Province. This will result in positive environmental and economic effects.

Commercial Activity

All of the Project construction activities are expected to result in an increase in the requirements for commercial accommodations, meals, other supplies and services. Local community businesses will benefit from the sale of goods and services to construction contractors and workers during all construction phases of the Project. This will result in positive economic effects.

Forest Resources

As presented in section 5.8.5.1.1, all of the environmental effects to the forest resource will occur or be initiated during the site preparation (clearing) portion of the Construction phase. The environmental effects centre around the removal of forest landbase resulting in a loss of production to the landowner and forest cover in general. During the site preparation stage of construction the following adverse environmental effects to the forest resources may occur.

As discussed in Section 5.8 Land Use, the proposed TCH's construction area, 7365 ha of forest land will be cleared, including 340 ha of young and 186 ha of immature forest. The clearing will generate 33,000 m^3 of softwood and 42,500 m^3 of hardwood for the commercial forest products market. This represents about 10-14% of the AAC for private woodlots in Carleton and Victoria counties. Portions of woodlots will be severed, possibly resulting in economically in-operable remnant parcels. The loss of forest land represents substantially less than one percent of the forest land base in Victoria and Carleton counties.

During construction, competition will exist between forestry contractors and road building contractors for local heavy equipment and truck operators.

Agriculture

As discussed in Section 5.8 Land Use, all of the environmental effects to the agriculture resource will occur or be initiated during the site preparation (clearing) of the construction phase. The environmental effects centre around the removal of and/or access to agriculture land resulting in a loss production to the landowner, during the site preparation stage of construction. As discussed in Section 5.8 Land Use, the proposed TCH's construction area will remove 223 ha of agricultural land, recently developed agriculture land or infrastructure from production.

As discussed in Section 5.8 Land Use, the proposed TCH's construction will sever farm operations resulting in transportation and access routes to agriculture land being disrupted or interfered with during construction.

Competition will exist between farm operations and road building contractors for heavy equipment and truck operators and general labour. This will be particularly evident during potato harvest (last two weeks of September) when there is an increased demand for medium cost semi- and skilled labour. The longer construction season and generally better wages will be factors.

Ancillary Structures and Facilities Construction

The same adverse environmental effects will occur during the construction of any Ancillary Structures and Facilities Construction, however these sites have not been identified at the time of report preparation therefore the magnitude of the individual adverse environmental effects will vary. It must be noted that many of the ancillary facilities will be temporary and thus some of these areas (such as temporary work areas) may be returned to use by either the forestry or agricultural industry sectors.

5.11.5.1.2 Operation

The interaction of the environmental effects of the Project operation with the Labour and Economy VEC is summarized in Table 5.11.4, and described below.

Employment

The presence of the proposed TCH will interact with employment within the region due to the potential redistribution of economic activity. The presence of the proposed TCH may create some employment and business losses along the existing TCH, but some, or all, of the employment losses along the existing TCH may be offset by the gains in employment from commercial activity generated adjacent to the proposed TCH alignment, primarily at interchanges.

Commercial Activity

By-Passed Businesses

The proposed TCH will primarily be new alignment, which will result in diversion of most long distance traffic that passes through the region from the existing TCH to the proposed TCH. The presence of the proposed TCH will affect traffic on the existing TCH. The composition of traffic on the existing TCH will shift from its current mix of local and through traffic to a traffic stream largely composed of local residents and businesses. This is expected to affect commercial activity of the businesses that primarily cater to the highway traffic, such as restaurants, accommodations and service stations. The existing conditions of Section 5.8 Land Use identifies the existing types of commercial businesses along the existing TCH, along with other tourism related businesses located within the Project boundaries.

Tourism Sector

Most tourists and visitors pass Perth-Andover to Woodstock through the area on their way to major destinations, such as the Bay of Fundy, PEI or Halifax. Decisions by these pass-through tourists to visit Saint John River Valley attractions, or find accommodations and services, are often made on the spur of

the moment as they drive along. Many attractions and facilities, such as the Hartland Covered Bridge depend on visibility and easy access to attract a portion of their tourism market. The presence of the proposed TCH will divert some traffic from the existing TCH to the proposed TCH, which will reduce the visibility and accessibility of some of the area's tourist attractions.

New TCH Commercial Development

The presence of the proposed TCH will attract some new commercial development that will benefit from good access to the proposed TCH, primarily at new interchanges, as well as more efficient highway access to domestic and trans-border markets. New commercial activity is expected to develop to serve the proposed TCH users including restaurants, accommodations, retail outlets and service stations. These highway user services are expected to take place at or near the identified interchanges, such as the development currently taking place at the Perth-Andover interchange.

Other Businesses

The presence of the proposed TCH will provide many businesses within the region that serve external area markets and/or receive product from external sources an improved and more efficient highway to conduct their business.

Forest Resources

Most of the environmental and economic effects to the forest resource will occur or be initiated during the site preparation (clearing) of the construction phase due to the removal of forest landbase. Although the environmental effects of the loss of the currently forested land or forest harvesting will continue in perpetuity, this effect is considered in the compensation for any loss to landowners and therefore the environmental effects of this loss are only considered in the construction phase of the Project. As discussed in Section 5.8 Land Use, operating costs may increase for woodlot owners who have will have severances because of having to transport forest products longer distances or having to float (move) equipment to separate work locations.

During the operational period positive economic effects to the forest sector may arise from improved transportation of wood products from the landowner to the processing facility (mill) and from the facility to market (D. Crabbe. pers. comm. 2003). The Assessment Area's proximity to the US results in significant volumes of both roundwood and processed wood moving across the Maine-New Brunswick border.

Agriculture Resources

Most of the environmental effects to the agriculture resource will occur or be initiated during the site preparation of the construction phase. Although the environmental effects of the loss of land currently being used for agricultural purposes will continue in perpetuity, this effect is considered in the compensation for any loss to landowners and therefore the economic effects of this loss are only considered in the construction phase of the Project. The economic effects centre around the removal of and/or access to agriculture land resulting in a loss production to the landowner.

5.11.5.1.3 Maintenance

The interaction of the maintenance activities of the Project with the Labour and Economy VEC is summarized in Table 5.11.4, and described below.

Employment

The proposed 70.7 kms of four-lane highway will be a net addition to the Provincial highway network. This will require additional annual expenditures on maintenance equipment, materials, services and labour that will continue in perpetuity. The Province will require additional employees to conduct ordinary ongoing summer and winter maintenance, and periodic resurfacing activities, beginning immediately upon the opening of the proposed TCH operations.

Commercial Activity

Businesses that supply materials, equipment and services for regular annual highway maintenance activities, such as fuel, sand and salt, asphalt patching, and any out-sourced services will be positively affected by the expanded highway network. This activity will recur in perpetuity.

Periodic highway resurfacing or reconstruction (approximately 15-year cycles) will generate commercial activity among paving contractors.

5.11.5.1.4 Accidents, Malfunctions and Unplanned Events

The interaction of the accidents, malfunction and unplanned events along the proposed TCH with the Labour and Economy VEC is summarized in Table 5.11.4, and described below.

Commercial Activity

Accidents, malfunctions and unplanned events, such as vehicle accidents, could result in short term business interruptions.

Forest Resources

As discussed in Section 5.8 Land Use, incremental harvesting is an unplanned event that is in-progress since approximately 2001 and therefore difficult to quantify at this time. Incremental harvesting will remove more forest cover than required for the Project.

Agriculture

Accidents, malfunctions and unplanned events (*e.g.,* fire, hazardous material spill) could results in interruptions to agriculture.

5.11.5.2 Environmental Effects Analysis and Mitigation

5.11.5.2.1 Construction

The potential environmental (and economic) effects of construction on Labour and Economy are characterized in Table 5.11.5. Potential mitigation measures during Project construction, are also provided. The following provides a detailed discussion of these potential effects.

Table 5.11.5 Environmental Effects Assessment Matrix for Labour and Economy (Construction)

Environmental Effects Assessment Matrix **Valued Environmental Component: LABOUR AND ECONOMY** **Phase: Construction**							
Project Activity (See Table 4.1 for list of specific activities and works)	**Potential Environmental Effects**	**Mitigation**	**Magnitude**	**Geographic Extent**	**Duration/Frequency**	**Reversibility**	**Ecological/Socio-Cultural and Economic Context**
Site Preparation	Change in Commercial Activity (A) (P)	• Purchase of commercial properties in footprint will allow business to relocate	1	1	5/1	R	2
	Change in Employment (P)	• Preference given to the use of local and Provincial labour	2	2	5/1	R	2

Table 5.11.5 Environmental Effects Assessment Matrix for Labour and Economy (Construction)

Environmental Effects Assessment Matrix
Valued Environmental Component: LABOUR AND ECONOMY
Phase: Construction

Project Activity (See Table 4.1 for list of specific activities and works)	**Potential Environmental Effects**	**Mitigation**	**Magnitude**	**Geographic Extent**	**Duration/Frequency**	**Reversibility**	**Ecological/Socio-Cultural and Economic Context**
	Change in Agriculture (Land taken out of production) (A)	• Land Acquisition: Open and early communication with landowners • Time (as construction schedule permits) for landowner to exercise mitigating options • Compensation for market value of land • Provision of access to severed properties, where necessary	2	2	5/6	1	2
	Change in Agriculture (Operations) (A)	• Accommodation to allow agriculture operations access to adjoining or severed lands during construction • Notice to adjust crop rotations to reduce access conflict and to reduce potential for loss of revenue • Scheduling construction around harvesting, where possible	2	1	3/1 or 2	R	2
	Change Forest Resources (Land Taken Out of Production) (A)	Land Acquisition: Open and early communications with landowners • Time (as construction schedule permits) for landowner to exercise mitigating options • Compensation for market value of land • Provision of access to severed properties, where necessary	2	2	2/1	1	2
	Change in Forest Operations (A)	• Reasonable accommodations made to allow forestry operations access to adjoining lands during construction	2	2	3/1	R	1
Surfacing and Finishing	Change in Commercial Activity (P)	• No enhancement measures necessary	1	1	5/1	R	2
	Change in Employment (A)	• None recommended	2	2	5/1	R	2
Watercourse Crossings Structures	Change in Commercial Activity (P)	• No enhancement measures necessary	1	1	5/1	R	2
	Change in Employment (P)	• None recommended	2	2	5/1	R	2

Table 5.11.5 Environmental Effects Assessment Matrix for Labour and Economy (Construction)

Environmental Effects Assessment Matrix
Valued Environmental Component: LABOUR AND ECONOMY
Phase: Construction

Project Activity (See Table 4.1 for list of specific activities and works)	**Potential Environmental Effects**	**Mitigation**	**Magnitude**	**Geographic Extent**	**Duration/Frequency**	**Reversibility**	**Ecological/Socio-Cultural and Economic Context**
Ancillary Structures and Facilities Construction	Change in Commercial Activity (P)	• No enhancement measures necessary	1	1	5/1	R	2
	Change in Employment (P)	• None recommended	2	2	5/1	R	2
	Change in Forest Resources (Land Taken Out of Production) (A)	• Land Acquisition: Open and early communications with landowners • Time (as construction schedule permits) for landowner to exercise mitigating options • Compensation for market value of land • Provision of access to severed properties • Reasonable accommodations made to allow forestry operations access to adjoining lands during construction	2	1	3/1	1	2
	Change in Forest Resources (Operations) (A)	• Reasonable accommodations made to allow forestry operations access to adjoining lands during construction	2	1	4/1	R	2
	Change in Agriculture (Land Taken Out of Production) (A)	• Land Acquisition: Open and early communications with landowners • Time (as construction schedule permits) for landowner to exercise mitigating options • Compensation for market value of land • Provision of access to severed properties, where necessary	2	2	5/6	1	2
	Change in Agriculture(Operations) (A)	• Accommodation to allow agriculture operations access to adjoining or severed lands during construction • Inform farmers of construction schedule • Scheduling construction around harvesting, where possible	2	1	3/2	R	2

Table 5.11.5 Environmental Effects Assessment Matrix for Labour and Economy (Construction)

Environmental Effects Assessment Matrix
Valued Environmental Component: LABOUR AND ECONOMY
Phase: Construction

Project Activity (See Table 4.1 for list of specific activities and works)	**Potential Environmental Effects**	**Mitigation**	**Magnitude**	**Geographic Extent**	**Duration/Frequency**	**Reversibility**	**Ecological/Socio-Cultural and Economic Context**

Key:

Magnitude:
1 = Low: *e.g.,* employment and business opportunities are affected for eighteen months.
2 = Medium: *e.g.,* employment and business opportunities affected for more than eighteen months but less than the life of the Project.
3 = High: *e.g.,* employment and business opportunities affected for longer than the life of the Project or irreversibly.

Geographic Extent:
1 = <1 km^2
2 = 1-10 km^2
3 = 11-100 km^2
4 = 101 - 1,000 km^2
5 = 1,001 - 10,000 km^2
6 = >10,000 km^2

Duration:
1 = <1 month
2 = 1 - 12 months
3 = 13 - 36 months
4 = 37 - 72 months
5 = >72 months

Frequency:
1 = <11 events/year
2 = 11 - 50 events/year
3 = 51 - 100 events/year
4 = 101 - 200 events/year
5 = >200 events/year
6 = continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological/Socio-cultural and Economic Context:
1 = Relatively pristine area or area not adversely affected by human activity.
2 = Evidence of adverse environmental effects.

N/A = Not Applicable
(A) = adverse
(P) = positive

Employment

The construction phase of the Project will inject an estimated $200 million of net construction expenditures during the four-year period and will have a positive economic effect locally and throughout the Province. It will result in $188 million of spin-off economic activity within the Province, a net contribution to the Provincial Gross Domestic Product (GDP).

A portion of the direct and indirect expenditures will be spent within the local region for the purchase of materials, equipment and services, which will spin-off employment in other sectors. The Carleton-Victoria region has well-established trucking and prominent equipment production and sales industries. It should be well positioned to provide trucking and other construction equipment services. The Province is also well endowed with highway construction contractors, represented by the New Brunswick Road Builders Association, that are prepared for the proposed TCH construction opportunity.

The Project will create about 1,750 person-years of employment and generate approximately $50 million of direct labour income. Some of this employment will be drawn from the local labour force, while most of the rest will be supplied from elsewhere within the Province. The labour income will produce another $18 million of spin-off expenditures. The indirect spin-off labour generated by the direct Project expenditures and labour income will result in just under 1,700 person-years of additional employment in other economic sectors distributed throughout the Provincial economy.

The positive effects of the Project on employment during all construction phases will occur over a planned four-year period. The economic effects of highway construction are generally realized immediately, and end within a year of Project completion. Due to the magnitude and intensity of the construction Project (over 70.7 kms of four-lane highway to be built over four years) and the present high levels of employment of the region's labour force, it is highly likely that construction contractors and labour will be brought in from outside of the local area.

Project construction will increase the demand for skilled and semi-skilled labour at existing businesses in the area. Competition between farm operations and road building contractors for heavy equipment and truck operators and general labour is expected. This will be particularly evident during potato harvest (last two weeks of September) when there is an increased demand for medium cost semi- and skilled labour. The longer construction season and generally better wages will be factors. The mitigation is through scheduling. During the last two weeks of September, medium cost skilled and semi-skilled labour are needed to harvest potatoes. Scheduling construction activities to accommodate the temporary demand for labour and the increased local traffic may be useful.

The potential economic effects of the Project construction on employment are generally and overall very positive at the local regional and Provincial levels. To enhance these positive economic effects the Province can stipulate the Provincial content requirements in the contracts, as was done for the Fredericton to Moncton Highway Project.

Commercial Activity

The Project construction, with an estimated cost of $200 million over four years, is expected to translate into substantial benefits to the existing businesses in the area, including those on the existing TCH. Housing and feeding the workforce will translate into business for motels, hotels, restaurants, caterers and retail outlets over the life of the Project. Other businesses will benefit through the supply of other goods and services such as construction companies, construction materials, suppliers, heavy equipment companies (supply and service), security, engineering services and others.

All of the Project construction activities are expected to result in an increase in the requirements for commercial accommodations, meals, other supplies and services. Local community businesses will benefit from the sale of goods and services to construction contractors and workers during all construction phases of the Project. Although actual formulas to ascribe construction Project economic effects on local communities are not available, it is widely known that large construction projects provide an economic boost to the local areas. For example, highway projects consume local gravel and/or quarried stone, and hire local skilled trades workers and casual labourers, as direct input to the projects. In addition, construction project workers from outside the locale generate additional revenue to local service industry businesses, such as restaurants, service stations, convenience stores, hotels, etc.

These economic effects will take place along the entire length of the Project, particularly in the larger communities where most of these businesses are located. These positive incremental commercial economic effects of the Project will also be received by some of the most vulnerable businesses, those accommodation, restaurant, and service station businesses along the existing TCH.

The extent and location of the positive commercial economic effects will not be fully known until the construction is under way. However, of the estimated $200 million of direct expenditures on this Project, approximately $45 million will be spent on construction employment. In addition, the direct expenditures will spin-off over $167 million of indirect expenditure activity within the Province. Although there is no means to quantify the monetary value retained within the local area, highway construction projects are known to spin-off considerable amounts of local economic activity. These positive commercial activity effects will occur throughout all the construction phases.

The Project is expected to result in a number of economic effects on the commercial activity within the area during the construction phases. Project construction will increase the demand for goods and services from some existing businesses in the area, such as restaurants, accommodations, retail outlets and service stations located along the existing TCH and local communities.

Three businesses within the proposed TCH RoW that were identified in Section 5.8 Land Use have already been relocated. These three businesses within the proposed TCH RoW represent a small portion of the commercial sector in the area and the effect on the regional economy was not significant.

Overall, with planned mitigation, the environmental and economic effects of construction on Labour and Economy (commercial activity) are considered positive.

Forest Resources

As discussed in sections 5.8, most of the environmental effects to the forest resource will occur or be initiated during the site preparation. The potential economic effects centre around the removal of and/or access to forest landbase during construction resulting in a loss of production to the landowner and forest cover.

As discussed in Section 5.8 Land Use, the proposed TCH's construction area, 7365 ha of forest land, which represents 0.93% of the forest within the Assessment Area and 0.4% of the CVFPMB wood supply area plus any ancillary features will be cleared. Portions of woodlots may be severed, which may result in economically in-operable remnant parcels; approximately 490 ha of forest lands will be considered remnants, representing 0.62% of the Assessment Area and 0.3% of the CVFPMB's forest lands, including 340 ha of young and 186 ha of immature forest. Landowners will be compensated for

this loss. This amount of young forest is reflective of the forest condition within the Assessment Area and wood supply area.

Harvesting of some of this volume has been in progress since 2001 and is expected to continue until 2004/2005. According to the CVFPMB, these annualized volumes spread-out over three or four years are within normal fluctuations and are not expected to disrupt the local private woodlot operators' access to markets.

The primary mitigation for productive forest land loss is through compensation of landowners for both the lands acquired, used or otherwise affected by the proposed TCH at market value, and the forest resource on those lands. Landowners will be clearly and consistently informed as to their rights, options and the methods of valuation as they pertain to the New Brunswick *Expropriation Act* and NBDOT's methods of valuation and negotiation.

Most woodlot owners are also facing a business decision that is imposed on them by the Project. There are commonly situations whereby landowners may elect to harvest or arrange to have that portion of the property harvested rather than receive compensation for standing timber to be cleared. As allowed by the construction schedule, NBDOT will allow time for the landowner to organize and implement clearing options in a timely manner consistent with existing operations.

Access to Forest Lands

Not all land will be acquired by NBDOT. There will be properties that will be severed and the construction of the proposed TCH and access roads may take two to three years to complete. As allowed by the construction schedule, NBDOT will provide on-going forestry operations with safe access across the RoW at certain periods of the year, when required.

Summary for Forest Resources

Overall, in consideration of the planned mitigation, the potential environmental and economic effects of construction on Labour and Economy (for forest resources) are considered not significant.

Agriculture Resources

As discussed in sections 5.8, most of the environmental effects to the agriculture resource will occur or be initiated during the construction phase. The economic effects centre around the removal of and/or access to agriculture land resulting in a loss of productive capacity and production by the landowner. Because some of the environmental effects will continue beyond the construction phase, the mitigation while initiated during construction, should reflect other Phases of the Project. The primary mitigation is

through landowner compensation at market value for the lands acquired, used or otherwise affected by the proposed TCH.

As discussed in Section 5.8 Land Use, the proposed TCH's construction area will remove 223 ha of agricultural land, recently developed agriculture land or infrastructure from production (0.3% of the annual provincial potato production area).

Landowners will be clearly and consistently informed as to their rights, options and the methods of valuation and negotiation as they pertain to the New Brunswick *Expropriation Act* and NBDOT's compensation methods.

Farms are business/economic interests with land being the source of productive capacity. Those farm operations affected by the Project are also facing a business decision that is imposed on them by the proposed TCH. There are commonly situations whereby farm operators may wish to make adjustments to their operations. As the construction schedule permits, time will allow the landowner to organize and implement the activities in a timely manner consistent with existing operations. NBDOT will work with landowners to plan and accommodate those changes.

Access will be provided to severed properties where required and as practical to allow agriculture to continue.

Overall, with planned mitigation, the potential environmental and economic effects of construction on Labour and Economy (Agriculture Resources) are considered not significant.

5.11.5.2.2 Operation

The potential environmental and economic effects of the Project operation on Labour and Economy are characterized in Table 5.11.6. Potential mitigation measures during Project operation, are also provided. The following provides a detailed discussion of these potential effects.

Table 5.11.6 Environmental Effects Assessment Matrix for Labour and Economy (Operation)

Environmental Effects Assessment Matrix
Valued Environmental Component: LABOUR AND ECONOMY
Phase: Operation

Project Activity (See Table 4.1 for list of specific activities and works)	Potential Environmental Effects	Mitigation	Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological/Socio-Cultural and Economic Context
Proposed TCH Presence	Change in Commercial Activity (A)	• Increased marketing efforts by Provincial and regional economic development organizations to assist existing business to respond to new traffic patterns and opportunities • Highway signage	1	1	5/6	R-1	2
	Change in Employment (A) (P)	• Employment insurance and Placement assistance programs	1	2	2/2	R	2

Key:

Magnitude:
1 = Low: *e.g.,* employment and business opportunities are affected for eighteen months.
2 = Medium: *e.g.,* employment and business opportunities affected for more than eighteen months but less than the life of the Project.
3 = High: *e.g.,* employment and business opportunities affected for longer than the life of the Project or irreversibly.

Geographic Extent:
1 = <1 km^2
2 = 1-10 km^2
3 = 11-100 km^2
4 = 101 - 1,000 km^2
5 = 1,001 - 10,000 km^2
6 = >10,000 km^2

Duration:
1 = <1 month
2 = 1 - 12 months
3 = 13 - 36 months
4 = 37 - 72 months
5 = >72 months

Frequency:
1 = <11 events/year
2 = 11 - 50 events/year
3 = 51 - 100 events/year
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5 = >200 events/year
6 = continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological/Socio-cultural and Economic Context:
1 = Relatively pristine area or area not adversely affected by human activity.
2 = Evidence of adverse environmental effects.

N/A = Not Applicable
(A) = adverse
(P) = positive

Employment

Experience elsewhere has shown that to a large extent economic activity adversely affected along an existing highway will be transferred to the new highway. This activity may be in a different form and location, but the net losses, if any, in employment or commercial activity are generally minor, especially in the context of the overall regional or Provincial economies. While the personal hardships that may result during the business transfer transition (*i.e.*, employees transferred to another business development), should not be overlooked or downplayed, in economic evaluation terms, the redistribution of employment and economic activity is not viewed negatively. Any net job losses would be supported and mitigated under existing federal and provincial social "safety net" programs, such as Employment Insurance. Indirectly, improved road service may induce other businesses to establish or grow due to improved market/transportation access. These positive economic effects may be difficult to

quantify but are expected to occur and would tend to offset any potential adverse economic effect at a regional scale.

Commercial Activity

By-Passed Businesses and Tourism

A comprehensive study in 1999 by the Wisconsin Department of Transportation concluded that the "…wide range of highway by-pass studies carried out around the country provide a generally consistent story. They indicate that highway by-passes are seldom either devastating or the savior of a community business district. The locational shift in traffic can cause some existing businesses to turn over or relocate, but net economic impacts on the broader community are usually relatively small (positive or negative). Communities and business districts that have a strong identity as a destination for visitors or for local shoppers are the ones that are most likely to be strengthened due to the reduction in traffic delays through their centres. However, there is also a broad perception that adequate signage to the by-passed business centre is an important need (and concern) for ensuring its continued success."

Locally, anecdotal evidence from the recently completed Fredericton to Moncton segment of the TCH would seem to support these findings. The City of Fredericton reported last year that tourism figures were up, that being in the face of the expected losses following opening of the new TCH segment that by-passes the City. The Town of Oromocto, previously on the opposite side of the Saint John River from the former TCH, is now well exposed and accessed to the new TCH. It has undergone a commercial boom adjacent to its interchanges, since opening of the highway.

On the other hand, businesses located along the former TCH alignment, dependent on highway traffic business, have not fared as well, and some closures have already taken place. Other businesses, such as service stations have adapted by relocating to sites alongside the new highway alignment, (*e.g.*, the new service station/restaurants at Salisbury and Nevers Road interchanges on the Fredericton to Moncton TCH).

In this context, businesses located directly along the existing TCH between Perth-Andover and Woodstock that have depended on the traveler market are apt to be vulnerable to potential business losses and possible failure. However, the Saint John River valley, along which the existing TCH follows, is a beautiful and significant tourist route of the Province. The reduction in overall traffic may improve its tourist attraction, and with proper signage and promotion may offset some of the potential off-season business losses.

Traffic diversion from the existing TCH to the proposed TCH will result in loss of market to some businesses located on the existing TCH, such as restaurants, accommodations, retail outlets and service

stations. The diversion of heavy trucks and through moving by-pass traffic from the existing TCH could enhance the accessibility and attractiveness of the existing TCH and the Upper Saint John River Tourism region to seasonal; tourists travelling to the area. Through traffic diversion from the existing TCH to the proposed TCH is expected to result in much improved access and suitability to the movement of agricultural equipment on the existing TCH.

The extent of the adverse economic effects of the presence of the proposed TCH on the businesses on or adjacent to the existing TCH will depend on the amount of traffic that is diverted to the proposed TCH, the ability of the establishments to market themselves to the traffic using the proposed TCH, and the reliance of various businesses on the highway traffic versus the local market. Businesses that have a small portion of their business servicing local markets (*i.e.,* not located in or near one of the major communities) are likely to be affected more than those whose business serves a local market as well.

Local traffic and tourists visiting the area will continue to use the existing TCH and require hospitality and other services. The Provincial and local tourism officials are working together to develop and promote regional attractions. These efforts may result in increased visitations to the Upper Saint John River valley region that could replace some or all the lost pass-by traffic tourism market. However, at this point the degree of success that these market development initiatives is not known.

There are numerous businesses that are located on the existing TCH because they require access to the primary highway system. They include a number of trucking companies and manufacturers that have no or very little reliance on the passing highway traffic. However, they need access to the highway system to conduct their business. The existing TCH will continue to provide their businesses access to the proposed TCH interchanges, so there should be little or no economic effect on these companies.

Suggested mitigation measures to address the loss of business for the highway-oriented businesses include the provision of highway signage, increased marketing efforts at the visitor information centres and more advanced marketing/information dissemination to reach Atlantic Canada visitors before they leave home. Regional and Provincial tourism/economic development officials are aware of the implications of the TCH upgrading in respect to potential tourism losses, and are placing greater effort on the identification and marketing of the attractions that will make the Saint John River Valley a destination. The objective of these efforts will be to develop attractions that will result in getting the visitors off the proposed TCH to travel along the more scenic existing TCH route to visit the region's attractions and communities. In support of these efforts, for example, the location of an interchange and connecting road to Hartland was selected to provide good access to bypassed businesses and tourist attractions (*e.g.*, covered bridge). Other interchanges along the Project have been selected in consideration of other community, business and tourism access issues.

The potential to lose tourist/visitor traffic will exist for any community or facility that will be further from the proposed TCH, or have reduced access. This includes a number of hotels, restaurants, campgrounds and attractions such as the Hartland covered bridge. The future success of these attractions and commercial establishments can be enhanced through the development of the Saint John River Valley region as a distinct tourism attraction, to offset the loss of direct access and visibility from the proposed TCH.

The question of whether transportation infrastructure is a driver of economic productivity, or rather a derived demand of other economic drivers has been a long standing topic of debate within the transportation industry. However, there is widespread agreement that productivity gains are correlated with highway infrastructure improvements, and that they are important. The level of service improvements of the proposed TCH will enhance the productivity of commercial and industrial sectors that are dependent on the long haul movement of production inputs and their output production to markets outside of the region.

Recent works have established methods to measure the extent of productivity gains associated with highway investments. For example, according to the Hickling's Lewis Brod report: *Highway User Benefit Analysis of the National Highway System*, prepared for the Transportation Association of Canada in 1998 (TAC 1998), substantial additional productivity benefits can be attained by the transportation industry and freight shippers and receivers from a highway improvement project. Productivity gains would benefit regional industry through reduced transport time and costs, increased average truck payloads, reduced inventory costs, reduced insurance claims and premiums, and improved competitiveness in downstream markets. No mitigation or enhancement measures will be necessary for these positive economic effects.

Overall, with planned mitigation and some positive outcomes including enhanced transportation efficiency afforded by the Project, the potential environmental and economic effects of Project operation on Labour and Economy (commercial activity) are considered not significant.

5.11.5.2.3 Maintenance

The nature of environmental and economic effects on Labour and Economy that may occur during maintenance activities, and potential mitigation measures to address any adverse effects are summarized in Table 5.11.7.

Table 5.11.7 Environmental Effects Assessment Matrix for Labour and Economy (Maintenance)

Environmental Effects Assessment Matrix
Valued Environmental Component: LABOUR AND ECONOMY
Phase: Maintenance

Project Activity (See Table 4.1 for list of specific activities and works)	Potential Environmental Effects	Mitigation	Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological/Socio-Cultural and Economic Context
Proposed TCH Presence	Change in Commercial Activity (A)	• Signing, detours, temporary access measures	1	2	1/2	R	2
	Change in Employment (P)	• None recommended	1	2	5/2	R	2

Key:

Magnitude:
1 = Low: *e.g.,* employment and business opportunities are affected for eighteen months.
2 = Medium: *e.g.,* employment and business opportunities affected for more than eighteen months but less than the life of the Project.
3 = High: *e.g.,* employment and business opportunities affected for longer than the life of the Project or irreversibly.

Geographic Extent:
1 = <1 km^2
2 = 1-10 km^2
3 = 11-100 km^2
4 = 101 - 1,000 km^2
5 = 1,001 - 10,000 km^2
6 = >10,000 km^2

Duration:
1 = <1 month
2 = 1 - 12 months
3 = 13 - 36 months
4 = 37 - 72 months
5 = >72 months

Frequency:
1 = <11 events/year
2 = 11 - 50 events/year
3 = 51 - 100 events/year
4 = 101 - 200 events/year
5 = >200 events/year
6 = continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological/Socio-cultural and Economic Context:
1 = Relatively pristine area or area not adversely affected by human activity.
2 = Evidence of adverse environmental effects.

N/A = Not Applicable
(A) = adverse
(P) = positive

Employment

Average annual maintenance expenditures for the proposed TCH will exceed $2 million. Over a 20-year period this will result in 325 person-years of direct maintenance labour employment, which will spin-off another 315 person-years of indirect employment in other sectors. Highway maintenance activities are generally conducted by local labourers.

The net gains in annual maintenance labour will represent a net gain in employment within the local/regional and Provincial economies. The net employment will be permanent and largely within the public sector (*i.e.,* jobs with NBDOT), and located at local District Offices and Maintenance Depots, unless contracted out to the private sector. There will be no need for enhancement or mitigation measures.

Major resurfacing and/or reconstruction maintenance activities will occur infrequently (*i.e.*, approximately every 15 years) and could result in business disruptions. The potential delays and changes in traffic patterns are expected to be minor due to normal mitigation measures. These would

include providing temporary access to affected businesses, scheduling to avoid peak seasons and times of day, keeping the highway open by working on one lane at a time, temporary signing and flagging procedures, adherence to EPP and health and safety legislation, and providing public information and alternative routes.

Overall, with planned mitigation the potential environmental and economic effects of Project maintenance on Labour and Economy are considered positive.

5.11.5.2.4 Accidents, Malfunctions and Unplanned Events

The environmental and economic effects on Labour and the Economy that may occur as a result of accidents, malfunctions and unplanned events, and potential measures to mitigate adverse effects, are summarized in Table 5.11.8, and discussed below.

Table 5.11.8 Environmental Effects Assessment Matrix for Labour and Economy (Accidents, Malfunctions, and Unplanned Events)

Environmental Effects Assessment Matrix
Valued Environmental Component: LABOUR AND ECONOMY
Phase: Accidents, Malfunctions and Unplanned Events

Project Activity (See Table 4.1 for list of specific activities and works)	**Potential Environmental Effects**	**Mitigation**	**Magnitude**	**Geographic Extent**	**Duration/Frequency**	**Reversibility**	**Ecological/Socio-Cultural and Economic Context**
Construction	Change in Forest Resources (A) Incremental Timber Harvesting)	• Communication with landowners well in advance • Advise landowners that survey lines may change	2	2	4/1	R	2
Operation	Change in Commercial Activity (A)	• Review emergency response services and plan	1	1	5/1	R	2

Key:

Magnitude:
1 = Low: *e.g.,* employment and business opportunities are affected for eighteen months.
2 = Medium: *e.g.,* employment and business opportunities affected for more than eighteen months but less than the life of the Project.
3 = High: *e.g.,* employment and business opportunities affected for longer than the life of the Project or irreversibly.

Geographic Extent:
1 = <1 km^2
2 = 1-10 km^2
3 = 11-100 km^2
4 = 101 - 1,000 km^2
5 = 1,001 - 10,000 km^2
6 = >10,000 km^2

Duration:
1 = <1 month
2 = 1 - 12 months
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Frequency:
1 = <11 events/year
2 = 11 - 50 events/year
3 = 51 - 100 events/year
4 = 101 - 200 events/year
5 = >200 events/year
6 = continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological/Socio-cultural and Economic Context:
1 = Relatively pristine area or area not adversely affected by human activity.
2 = Evidence of adverse environmental effects.

N/A = Not Applicable
(A) = adverse
(P) = positive

Accidents, malfunctions and unplanned events are expected to be less of a concern with the proposed TCH due to its greater capacity, controlled access, reduction in local and total traffic, and other safety features implicit in its design. As well, the commercial activity will not be directly adjacent and accessed to the proposed TCH, as is the case with the existing TCH. The main mitigation measure to avoid or reduce accidents, malfunctions and unplanned events is the safety elements of the new four-lane divided access-controlled design of the proposed TCH and related structures and facilities. Mitigation measures aimed at minimizing the consequences of accidents, malfunctions and unplanned events are the emergency response measures established to address the range of events. The improved traffic flows to be experienced along the proposed TCH will enhance emergency response measures.

Timber harvesting incremental to the Proposed TCH clearing is an unplanned event already in progress (Section 5.8.5.2.4). NBDOT should inform landowners well in advance with clear compensation considerations (including potential for realignment) and options to minimize or prevent incremental harvesting.

Overall, based on the planned mitigation, the potential environmental and economic effects of Project accidents, malfunctions and unplanned events are considered not significant.

5.11.5.3 Determination of Significance

Based on the consideration of the environmental and economic effects of the individual activities required to construct the proposed TCH, the proposed mitigation and the residual effects significance criteria, the residual effects on Labour and Economy (agriculture and forestry) by the construction activities of the proposed TCH are considered not significant.

The residual environmental and economic effects of the Project on Labour and Economy for all other sections are also considered not significant for all phases assessed. The proposed TCH may result in the closure of some commercial businesses along the existing TCH. This is particularly a concern for businesses with small or non-existent local markets. However, these closures will be offset by new commercial development. The overall sentiment of the existing business community and civic leaders is that the Project will have major benefits in terms of improved transportation for resident and businesses and will lead to new private sector investment.

Table 5.11.9 Residual Environmental Effects Summary Matrix for Labour and Economy

Residual Environmental Effects Summary Matrix
Valued Environmental Component: LABOUR AND ECONOMY

Phase	Residual Environmental Effects Rating*	Level of Confidence	Likelihood	
			Probability of Occurrence	Scientific Certainty
Construction	NS	3	1	3
Operation	NS	3	1	3
Maintenance	NS	3	1	3
Accidents, Malfunctions and Unplanned Events	NS	3	1	3
Project Overall	NS	3	1	3

Key
Residual Environmental Effect Rating:
S = Significant Adverse Environmental Effect
NS = Not-significant Adverse Environmental Effect
P = Positive Environmental Effect

Level of Confidence
1 = Low Level of Confidence
2 = Medium Level of Confidence
3 = High Level of Confidence

Probability of Occurrence: based on professional judgement
1 = Low Probability of Occurrence
2 = Medium Probability of Occurrence
3 = High Probability of Occurrence

Scientific Certainty: based on scientific information and statistical analysis or professional judgement
1 = Low Level of Confidence
2 = Medium Level of Confidence
3 = High Level of Confidence
N/A = Not Applicable
*As determined in consideration of established residual environmental effects rating criteria.

5.11.6 Monitoring and Follow-up

No monitoring or follow-up is recommended. Should Project-related issues be identified in the Labour and Economy sector, NBDOT should follow-up on an issue by issue basis, where appropriate.

5.12 Effects of the Environment on the Project

The definition of an environmental effect under Section 2(1) of the *CEAA* includes any change to the project that may be caused by the environment. The requirement to evaluate this aspect of environmental effects is often overlooked and the guidance documentation of the CEA Agency does not address specifically how the assessment is to be done. The Guidelines (Appendix A) require that environmental hazards potentially affecting the construction and operation phases of the Project be described, such as erosion, wind, floods, severe precipitation events, land or rock slides, unstable soils, seismic events, and soil contamination, and that the predicted effects from these hazards on the proposed Project be documented.

Good engineering design always involves consideration of these types of environmental effects and loadings or stresses on the project. The planning and engineering design for this Project are no exception. The methodologies used for mitigating potential effects of the environment on the Project are inherent in the planning, engineering design, construction, and planned operation of the Project.

5.12.1 Categories of Effects of the Environment on the Project

The types of effects caused by the environment on the Project would likely include the following:

- erosion;
- wind;
- floods;
- severe precipitation including snow drifting;
- land and rock slides and unstable soils
- seismic events;
- soil contamination;
- fog; and
- natural forest fires.

A discussion of each is provided below.

5.12.2 Effects Analysis

There is a number of planning, design and construction strategies intended at minimizing the potential effects of the environment on the Project so that the risk of serious damage to the Project or interruption of service can be reduced to acceptable levels. Mitigation measures include, but are not limited to, designing structures to relevant codes and scheduling of activities to accommodate weather interruptions. All of the construction activities will be taking place out-of-doors and thus weather has been and will be factored into the design, construction and operation of the Project.

A significant effect of the environment on the Project would be one that would result in a long term interruption in service or damage to infrastructure. There are alternative routes that would allow traffic to continue even if the proposed TCH was incapacitated, such as the existing TCH that will be maintained. At this time it is difficult to conceive of an event that would cause a significant disruption to the proposed TCH and yet not affect other transportation routes within the area. For the purposes of this assessment, a significant environmental effect would be one that results in repairs that could not be economically implemented.

5.12.2.1 Building and Design Codes

Specific codes and standards in the National Codes of Canada will address the specific issues related to environmental activities as described below. These codes and their titles are listed in Table 5.12.1.

5.12.2.2 Erosion and Unstable Soils

The potential effects of erosion on the Project may include, but are not limited to:

- erosion causing slope instability;
- sedimentation along drainage channels, resulting in improper function;
- erosion and washout around culverts; and
- degradation and break-up of pavement surface from ice and frost.

The geological setting of the Project area precludes the potential effects of natural erosion on the landscape (*i.e.*, flat rolling hills incised with abundant runoff channels, streams and rivers). Existing roads (*e.g.*, existing TCH) and developments within the Project area have not historically experienced landslides or slope failure.

Construction activities, as described in Section 3.0 of this report, include removal of the vegetative mat and exposure of soils. The rate of erosion of these disturbed/exposed surfaces can be thousands of times the rate from an undisturbed setting. The key to minimizing erosion is to minimize the exposure and extent of disturbance. Erosion potential will be identified during the detailed planning and design phase of the Project. Surveys and geotechnical investigations will be undertaken to identify areas of high erosion potential to ensure that the Project design incorporates appropriate erosion controls in these areas. Standard highway construction practices, techniques, and design strategies such as installation of erosion control structures, work progression, and appropriately sized armour stone for protection against erosion and scour ensure that the effects of erosion are minimized or prevented. A more detailed account of the proposed mitigation for reducing the magnitude and likelihood of erosion is presented in Section 5.3.5.2.1 (Surface Water VEC) and Section 5.4.5.2.1 (Fish and Fish Habitat VEC).

Table 5.12.1 Codes and Standards

CODE OR STANDARDS	TITLE
NBCC	The National Building Code of Canada
CAN/CSA-S6-00	Canadian Highway Bridge Design Code
NB DOT Standard Specifications	New Brunswick Department of Transportation, January 2003
Bridge Code	Ontario Highway Bridge Design Code, 3rd edition
TAC	Geometric Design Guide for Canadian Roads, 1999
RTAC	Drainage Manual Vol. 1, 1982
A5-93	Portland Cement
CAN3-A23.1	Concrete materials and methods of concrete construction
CAN3-A23.2	Methods of test for concrete
CAN3-A23.3	Design of concrete structures for buildings
CAN3-A23.4-00	Precast Concrete – Materials and Construction
CAN3-A23.5-M86	Supplementary Cementing Materials
CAN3-S16.1	Limit states design of steel structures
CSA G30.3-M1983 (R1998)	Cold-Drawn Steel Wire for Concrete Reinforcement
CSA G30.5-M1983 (R1998)	Welded Steel Wire Fabric for Concrete Reinforcement
CSA G30.14-M1983 (R1991)	Deformed Steel Wire for Concrete Reinforcement
CSA G30.15-M1983 (R1998)	Welded Deformed Steel Wire for Concrete Reinforcement
CSA G30.18-M92	Billet-Steel Bars for Concrete Reinforcement
CSA G40.20/G40.21-98	General Requirements for Rolled or Welded Structural Quality Steel
CSA G164-M92	Hot Dip Galvanizing of Irregularly Shaped Articles
CSA-W186	Welding of reinforcing bars in reinforced concrete construction
CSA-C22.1	Canadian Electrical Code
S269.1-75	Falsework for Construction Purposes
S269.3-M1-92	Concrete Formwork
CSA W47.1-92	Certification of Companies for Fusion Welding of Steel Structures
CSA W48 Series	Electrodes
CSA W59-M1989	Welded Steel Construction (Metal-Arc Welding)
American Concrete Institute	
305R-99	Hot Weather Concreting
306R-88 (R1997)	Cold Weather Concreting
315-99	Details and Detailing of Concrete Reinforcement
347R-94	Guide to Formwork for concrete
American Society for Testing and Materials	
C 76-00	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
C 260-00	Standard Specification for Air-Entraining Admixtures for Concrete
C 309-98A	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
C 478-97	Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric)
C 494-99A	Standard Specification for Chemical Admixtures for Concrete
D 1751-99	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (No extruding and Resilient Bituminous Types)
Quality Assurance Code	
CAN/CSA – ISO 9001-00t	Quality management systems-requirements

Erosion of the pavement surface from freeze-thaw processes can result in cracks, potholes, and heaving. To the extent possible, pavement design codes incorporate regional extreme cold temperatures and freeze-thaw action to minimize these effects.

Regular inspections during construction and operation phases will be conducted to verify the effectiveness of the erosion control measures in place and to identify where additional measures or maintenance is required. It is not likely that erosion will have a significant effect on the Project.

5.12.2.3 Wind

Wind is not considered to be a significant factor in the construction of the ground-based portions of the Project. Wind will be a factor in the design of bridges and this is addressed in the building codes listed above. Wind will also be an issue for signage along the proposed TCH and is also addressed in the codes listed in Table 5.12.1.

Wind may be a safety issue during the operational phase of the Project on bridges/interchanges and in-filled valleys and rock cuts along the proposed TCH where there are areas of high exposure or wind tunneling effects. The maximum wind gusts recorded in the region (Fredericton to Saint-Léonard) range from 130 to 135 km/hour and occurred in the months of June and November respectively. The number of days per year when the wind exceeded 63 km/hour ranged from 0.26 in Fredericton to 0.38 in Saint-Léonard (Environment Canada 2002a). Therefore, while high wind events may occur on occasion, sustained high wind events are not frequent. Effects from extreme wind events during operation may be mitigated at the discretion of the NBDOT and RCMP officials with respect to the appropriateness of the temporary closure of these structures during periods of extremely high winds. It is not likely that winds will have a significant effect on the Project.

5.12.2.4 Floods

The Saint John River is currently dammed and/or redirected in several locations for the purposes of generating electrical power. Since the proposed TCH is not located immediately adjacent to the Saint John River, no portion of the proposed TCH is in any danger of flooding from the Saint John River.

The design standards for the larger watercourse crossing structures (*i.e.*, River de Chute, Big Presque Isle and Little Presque Isle Stream, Upper and Lower Guisiguit Brook, Hunters Brook) will accommodate any reasonable anticipated increases in water levels in the respective watercourses they cross. Smaller watercourses crossed by the proposed TCH will be diverted through culverts of various designs (Section 2.2.3). All watercourse crossing structures (including culverts) will be designed to withstand the 1 in 100 year peak discharge event. It is not likely that floods will have a significant effect on the Project.

5.12.2.5 Extreme Precipitation

Precipitation can fall as rain, freezing rain or snow or as some combination of these depending on the time of year. The extreme daily rainfall recorded in the region ranged from 68.4 mm in Saint-Léonard (recorded in August, 1991) to 148.6 mm in Fredericton (recorded in August, 1989) (Environment Canada 2002a). The Fredericton Airport station has been reported data since 1951 while the Saint-Léonard station started reporting data in 1985. This may explain some of the disparity in these values. Extreme rain events during construction can create difficult and unsafe working conditions and may result in work stoppages. Rain is an expected work difficulty and the construction schedule considers delays due to potential rain events. In the event of extreme rain, compliance with Section 4.5 of the EPP and Section 4 of the EFG will ensure that erosion and sedimentation are addressed appropriately to minimize the potential environmental effects. If unusual wet periods or excessive rain events do occur, this can result in Project delays and an associated delay in completion and can result in additional capital cost.

Extreme snowfall can also affect winter construction or contribute to unusual flooding during snowmelt. The extreme daily snowfall recorded in the region ranged from 42.8 cm in Saint-Léonard (recorded in December, 1989) to 78.0 cm in Fredericton (recorded in December 1967) (Environment Canada 2002a). Exceptional early snowfall could delay construction and result in additional work for snow clearing and removal. This could increase construction costs. Early snow cover can minimize or prevent ground freezing and this may affect winter construction intended at improving work progress and accessibility.

Excess water is addressed by the proper sloping of the road surface to allow for run-off. Proper roadbed design prevents settlement and rutting which result in water pooling on the roadbed, potentially leading to hydroplaning. Water control off the road surface is mitigated through ditching along and between the lanes. These issues are addressed in the codes listed in Table 5.12.1.

Thunderstorms can produce extremes of rain and wind, however most of these storms are relatively short-lived. Over the period 1971-2000 there were on average 15 days per year with thunderstorms in the Fredericton area. These particular events were recorded during the months of May, June, July and August (Environment Canada 2002a). However, thunderstorms may occur outside of these months, and are possible during winter months in the Fredericton (and Project) area. Lightning activity in Fredericton has been reported by Environment Canada as 50 lightning flashes per year over an area of 100 km^2. In the same report, the detailed map indicates approximately 15-20 days per year with lightning for both cloud-to-ground and cloud-to-cloud lightning combined, averaged over 1998-2002 (Environment Canada 2003b).

During the operational phase of the proposed TCH, extreme rain may limit visibility. Ice and snow may interfere with the operation of vehicles on the highway. Ice and snow are controlled through

snowplowing, and sand and salting of the roadways. Snow and ice can result in visibility issues. Under extreme conditions operation of the proposed TCH can be temporarily suspended at the discretion of RCMP and NBDOT officials.

However, since the frequency of extreme events is low, this is highly unlikely for this portion of the proposed TCH.

5.12.2.6 Landslides

Landslides are mass movements of soil or rock downslope and are a major natural hazard in Canada. The hazard posed by landslides can be attributable to the impact of rapidly moving debris, the failure of ground directly beneath a structure, or due to secondary effects such as river damming or landslide generated waves. Natural Resources Canada maintains a database of major landslides (http://atlas.gc.ca/site/english/maps/environment/naturalhazards/majorlandslides). Historical reports indicate that landslides have resulted in many deaths in Canada and have caused billions of dollars of direct and indirect damage to Canada's economic infrastructure.

The majority of major landslides recorded in Canada have occurred in or west of Quebec. There are no reported occurrences of major landslides in the Project area. The geology and topography of the Project area (low, flat rolling hills along the river valley and older erosional sediments from weathering of the Appalachian Oregon and subsequent glaciation and resorting during the most recent geological time period) is not susceptible to landslides of this nature.

Rockfalls involve a smaller rock mass that breaks apart and falls, bounces, and rolls on steep slopes. They are a frequent problem along transportation routes and through rocky terrain and could interrupt service along a highway. As such, specific blasting techniques are employed during construction and safe set-backs from steep rocky slopes or cuts are maintained to minimize the potential effects of rockfalls on the Project.

Similarly, debris flows are smaller and less rapid forms of landslides. They occur when a saturated mass of surficial deposits moves down a steep stream channel. Debris flows are frequently triggered by heavy rains. Massive deposits of unstable soils susceptible to this form of landslide do not exist within the Project area. Geological investigations in support of the design of the proposed TCH will identify localized areas of soft soils.

Standard highway designs and construction specifications ensure that all cut and fill areas and ditches are prepared to a stable slope (typically 2:1) and are appropriately stabilized using hydroseed, mulch, erosion control blankets, and in some instances, rock armour to minimize or prevent debris flow. Areas

prone to high surface runoff are identified before and/or during construction and mitigative measures such as rock lined channels and diversion ditches are constructed.

It is not likely that landslides will have a significant effect on the Project.

5.12.2.7 Seismic Events (Earthquakes)

The Geological Survey of Canada maintains a National Earthquake Database (NEDB) containing information on Canadian earthquakes. Historical information, including location (*i.e.*, epicentres) and magnitude, for the North Appalachian Seismic Zone, within which the proposed Project is located, is available on-line at http://www.seismo.nrcan.gc.ca.

In New Brunswick, epicentres cluster in three regions, Passamaquoddy Bay region, Central Highlands (Miramichi) region, and Moncton region. Earthquakes have been more frequent in these regions and occasionally of a size to be potentially damaging (*i.e.*, larger than magnitude 5) such as the magnitude 5.7 earthquake in the Miramichi region in January 1982. Fortunately, because the immediate epicentral area was unpopulated, damage was very slight – a few hairline cracks but no structural damage in buildings up to 100 km away. The data indicates very few seismic events in the vicinity of the proposed Project area.

The proposed Project, and all related facilities, will be designed to the applicable standards for earthquakes in this area (Table 5.12.1). The intent of these design standards is to ensure the integrity of the facilities based on the level of risk for an earthquake in the area. Service could be interrupted due to earthquake damage in an extreme event. It is not likely that earthquakes will have a significant effect on the Project.

5.12.2.8 Soil Contamination

As previously discussed in Section 5.2.4.7, there are three abandoned dumpsites that are located within 500 m of the proposed RoW. Two of the sites are downgradient of the proposed RoW and the surface water and groundwater flow direction in the area of the third abandoned site would be expected to flow to the north, following topography towards the Lower Guisiguit Brook, approximately 140 m from the dump site. Additional mitigation measures during construction of the proposed TCH are not required.

Potentially contaminated sites, if encountered during Project construction, will be managed in accordance with the Guideline for Management of Contaminated Sites (NBDELG 2003c)). The site will be evaluated in a timely manner to determine whether there are off-site impacts or unacceptable on-site impacts and to minimize the effects on the Project construction schedule. Where environmental effects or risks are identified, NBDOT will:

- advise affected third parties, if appropriate;
- determine whether active remediation or ongoing site management is to be implemented; and
- submit a Record of Site Condition to NBDELG.

It is not likely that soil contamination will have a significant effect on the Project.

5.12.2.9 Fog

At times, portions of the Saint John River valley are prone to fog. The number of days with fog is reported as 41 per year, on average over the period 1971-2000. The highest number of events occurred in July, August, September and October (Environment Canada 2003). Most of the proposed Project alignment is at elevations above those typically affected by this phenomenon. Fog can, however, occur at any location along the proposed TCH under specific meteorological conditions. Under extreme conditions, operation of the proposed TCH may be suspended, but this is highly unlikely for this portion of the TCH. It is not likely that fog will have a significant effect on the Project.

5.12.2.10 Natural Forest Fires

There is potential for a natural forest fire to interrupt construction of the proposed Project. However, it is unlikely that fire could affect operation. New Brunswick has forest fire control programs in place to identify and control fires, minimizing the potential magnitude and extent of any forest fires and their environmental effects on the Project. Anthropogenic forest fires are considered accidents or unplanned events and are addressed elsewhere in relation to specific VECs. It is not likely that fire will have a significant effect on the Project.

5.12.3 Significance

Based on a consideration of the various mitigative strategies and designs applied, as described above, it is concluded that the effects of the environment on the Project are not significant.

5.13 Follow-up Program

5.13.1 Introduction

This section of the CSR outlines the need for and requirements of a Follow-up Program as outlined in the Guidelines (Appendix A) and CEAA (Section 16(2)(c)). "Follow-up Program" means a program for:

- verifying the accuracy of the environmental assessment of a project; and
- determining the effectiveness of any measures taken to mitigate the adverse environmental effects of the Project.

To that end, NBDOT is fully committed to fund and conduct a focused Follow-up Program to meet one or both of these objectives, as applicable. Where it is applicable to do so, the program will establish baseline information that is necessary to support the Follow-up Program to meet these objectives. Such baseline data could form the basis for compensation where unanticipated environmental effects are identified through follow-up. Any additional baseline data (*e.g.*, groundwater TSS in wells near blasting zones) will be offered to Environment Canada.

In determining the recommendations for follow-up for each VEC in Sections 5.1 to 5.11, NBDOT has considered a number of factors:

- the level of confidence in environmental effects predictions;
- previous experience with planned activities and knowledge of the effectiveness of mitigation strategies; and
- the susceptibility of the VEC to potential environmental effects.

The Follow-up Program focuses on those potential environmental effects with the greatest risk of occurring or the uncertainty in their prediction.

Section 5.13.3 outlines the proposed elements of Follow-up Programs for each VEC. The elements of the program are described, and as applicable, the location, frequency and duration of the follow-up are described. Generally speaking the Follow-up Program will be implemented by NBDOT. NBDOT may delegate this responsibility to its developers or consultants, as applicable. Where developers have obligations in this regard, they will be contractually required to undertake the follow-up. Regardless, NBDOT is ultimately responsible and accountable for undertaking the program.

At this point in time, NBDOT is outlining its preliminary Follow-up Program. It is anticipated that the Follow-up Program will be designed in consultation with the Responsible Authorities and finalized and approved prior to implementation. Greater detail would be developed at that time.

Where non-compliance with the Follow-up Program is identified, NBDOT will take the following action. If developers are at fault, they will be obliged contractually to remedy or rectify the situation. Where NBDOT is directly responsible, the non-compliance will be rectified.

It is proposed that an annual Follow-up Program report be provided for as long as follow-up activities are required. All environmental-related monitoring results (*e.g.,* pH of watercourses identified as potentially affected by sulfide bearing rock) will be provided to Environment Canada at quarterly intervals, or as it becomes available.

5.13.2 Mitigation Strategy

Section 3.0 of this CSR described the Project facilities and activities as designed and proposed. The proposed Project includes various design and environmental mitigation strategies that are intended to mitigate potential adverse environmental effects. The environmental effects analyses presented in Sections 5.1 through 5.11 present how these various mitigation measures and strategies will be implemented with respect to each potential environmental effect on each VEC. Section 5.12 describes how the effects of the environment on the Project will be mitigated.

Environmental protection measures have been developed by NBDOT as a result of legislative requirements and a desire to improve highway design and construction methods and procedures, and to minimize the interaction between the NBDOT activities and the environment. The EPP and EFG were developed in consultation with Environment Canada, DFO, Department of Fisheries and Aquaculture, NBDOE (now NBDELG) and NBDNRE (now NBDNR) to ensure that the mitigation contained therein are in compliance with regulatory requirements and that the potential environmental effects of NBDOT projects are managed and minimized so that significant environmental effects do not occur.

NBDOT will be responsible for managing the construction and operation of the proposed TCH and is committed to ensuring the Follow-up Program is developed and implemented through such means as construction contracts and appropriate training of NBDOT field staff. NBDOT is also responsible for preparation of environmental emergency response plans for the construction and operation phases of the Project. They are included in Section 8 of the EPP. NBDOT will ensure its developer(s) implement the mitigation measures and emergency procedures described in the EPP and EFG.

5.13.3 Proposed Follow-up Program

NBDOT will implement a Follow-up Program that combines the following elements:

- program objectives;
- establishment of baseline conditions;
- what, where, when, and how monitoring will take place;
- analysis and interpretation of results; and
- reporting.

The proposed preliminary Follow-up Program is described below for each VEC. This preliminary recommended Follow-up Program will be developed, finalized and approved in consultation with the Responsible Authorities, and other regulatory agencies as applicable. Protocols will be developed to assess the results of the Follow-up Programs. These results will be interpreted based on predictions contained within the CSR. If the follow-up program identifies unforeseen adverse environmental effects, then the existing mitigation measures will be adjusted or, if necessary, new mitigation or compensation measures will be developed.

5.13.3.1 Atmospheric Resources

Measurable environmental effects to air quality from dust and noise will likely be localized to the specific construction activities during construction and relatively localized during operation. In addition, there are currently several ambient monitors operated by NAPS / NBDELG in areas surrounding the proposed RoW. Provided the recommended mitigative actions are taken, additional monitoring of ambient air quality and noise is not warranted.

However, noise monitoring may be required to address any complaints from residents living near the highway. Where warranted, noise monitoring will be conducted at specific NSAs, in accordance with methodologies acceptable to NBDELG.

5.13.3.2 Groundwater

A groundwater Follow-up Program is recommended to establish baseline conditions prior to construction. Drilled wells within 500 m of blasting activity are included in this Follow-up Program. Monitoring will consist of an interview of the well owner, documentation of well construction specifics, collection of a water sample for chemical and bacteria analysis, and photographic documentation of the well location. Where several wells are present within the 500 m blast monitoring radius, selected representative proximity wells will be inspected, sampled, and closely monitored during the construction phase.

Also included in the groundwater Follow-up Program are dug wells located within 50 m of a major (> 5 m) overburden cut. These wells will be inspected (measuring depth, yield and water level in dug wells) by a licensed well inspector, and sampled for baseline water quality.

This Follow-up Program will be undertaken by the developer, on behalf of NBDOT. The developer will implement a contingency plan to provide temporary water during construction, and to repair or replace any wells found to be permanently damaged, in the event that wells are adversely affected by the Project. NBDOT will report the results of the Follow-up Program to NBDELG and Transport Canada.

Once the baseline is established, complaints or issues identified will be evaluated and compared to the baseline data.

5.13.3.3 Surface Water

The Project may result in residual environmental effects on surface water quality. In particular, total suspended solid (TSS) concentrations in watercourses may increase as a result of the mobilization of sediment from Project-related activities. An increase in TSS concentrations may elevate surface water temperature and increase the rate of sedimentation that may adversely alter fish habitat. In addition, the pH of surface water may be lowered (become more acidic) should water make contact with any sulfide bearing rock that may be exposed during Project-related activities.

The surface water monitoring program will consist of both compliance and effectiveness monitoring. During construction, compliance monitoring will ensure that all applicable environmental protection and permitting requirements for work within 30 m of a watercourse are followed, and that remedial action, if necessary, is successfully implemented. The surface water compliance monitoring will consist of the following core elements at all watercourses, as applicable:

- sampling of total suspended solids when precipitation events result in the visable overland flow of water;
- regular sampling of pH in watercourses where interaction with sulfide-bearing rock has been identified;
- inspection of all sediment and erosion control measures;
- inspection of hazardous materials storage areas (including possible sediment generating materials);
- inspection of watercourse crossing structures (including culverts) for verification of correct installation, and for subsequent signs of erosion or degradation (including beaver dams);
- development and maintenance of a log of erosion-prone areas;
- frequency of reporting to regulators; and
- exceedance thresholds and remedial actions.

The location and frequency of observations and the required sample size will be determined in consultation with NBDELG and DFO through their respective permitting and authorization processes.

Effectiveness monitoring for surface water is included in the description of effectiveness monitoring for Fish and Fish Habitat in Section 5.13.3.4.

5.13.3.4 Fish and Fish Habitat

The primary residual environmental effect of the Project on fish and fish habitat is the potential for the sedimentation of watercourses. The loss of fish habitat from installation of watercourse crossing structures will be mitigated by ensuring no net loss of fish habitat through habitat compensation. Watercourse crossing structures will be designed to allow for fish passage as required by DFO, where possible.

The fish and fish habitat monitoring will consist of both compliance and effectiveness monitoring. During construction, compliance monitoring will ensure that all applicable environmental protection and permitting requirements for work within 30 m of a watercourse are followed, and that remedial action, if necessary, is successfully implemented. Remedial action may involve fish rescue for de-watered sections of streams and/or near blasting areas. The fish and fish habitat compliance monitoring will be the same as that described in Section 5.13.3.3 for surface water monitoring.

Effectiveness monitoring for fish and fish habitat has the following four objectives:

- verify that mitigative strategies used during construction and operation have been effective;
- determine the total amount of HADD that occurred as a result of the Project;
- verify that habitat compensation, completed as part of the habitat bank, is operating effectively; and
- identify the need for, and carry-out, any additional habitat compensation.

The exact specifications of the fish and fish habitat and surface water monitoring program will be developed in consultation with DFO and NBDELG. The monitoring program will be subject to approval by DFO as part of the HADD authorization process and NBDELG as a part of the Watercourse and Wetland Alteration permitting process. This work will be undertaken in selected streams as determined through the authorization/permitting processes. The fish and fish habitat (and surface water) effectiveness monitoring will consist of the following core elements for comparison with pre-development baseline conditions:

- assessment of fish population and diversity (short term and long term);
- assessment of fish habitat;

- assessment of invertebrate population and diversity (short term); and
- a substrate and embeddedness study.

In addition, a fish passage study will also be conducted on a small number of watercourses to verify that design strategies for fish passage were effective.

The fish habitat assessment will use the NBDNR/DFO fish habitat assessment methodology (Hooper *et al.* 1995). The fish habitat assessment will also include measurements of pH and salinity in those watercourses identified, in consultation with DFO and NBDELG, as sensitive to these parameters.

5.13.3.5 Vegetation

NBDOT will undertake follow-up of rare plants that were observed within 50 m of the proposed RoW in the year following the completion of Construction and in the third year of operation. The follow-up will verify predictions made in the environmental assessment, and confirm the effectiveness of mitigation.

5.13.3.6 Wetlands

Additional monitoring is recommended beyond that which is stipulated in the EPP to ensure protection measures are used and are working. Wetlands within the Assessment Area will be monitored, within a short period after construction is completed, to visually assess wetland hydrology, introduction of invasive plant species, and used by recreational vehicles. The wetlands will be reassessed visually for the same parameters after a three-year period following completion of construction. NBDOT will negotiate a wetlands compensation plan that will be implemented as compensation for the project. Those negotiations will include the required follow-up that arises from that negotiation. Any follow-up identified in that process will become a part of the follow-up program as required under *CEAA*.

5.13.3.7 Wildlife

Monitoring of moose and deer in the vicinity of the proposed TCH is recommended in the short term to help fine tune the design of mitigation strategies (wildlife corridors and fencing). To aid in the design of wildlife corridors and fencing NBDNR and NBDOT will fly the alignment (Fall 2003) to understand the relationship between the topography and the proposed TCH to determine the need for structures and fencing. A follow-up aerial survey involving NBDNR personnel is recommended over the next winter to fine tune and confirm the high use areas that may warrant wildlife fencing, among other mitigation. NBDOT will continue to evaluate available technologies to keep moose off of highways and to provide information to motorists that will decrease the likelihood of collisions.

Other related follow-up is a recommendation for NBDOT to work with the CVFPMB to encourage the management of regenerating forest habitat near the Project footprint, so it is less attractive to moose and deer as browse. Existing management programs and money are already available to private woodlot owners, and managed by the CVFPMB. In addition, land that has already been cut, but will be within the RoW purchased by NBDOT should be managed using standard silvicultural techniques.

5.13.3.8 Land Use

No significant environmental effects were identified. However, monitoring may be required if potential environmental effects are identified (*e.g.*, noise-related complaints). This would likely entail traffic counting and noise monitoring as discussed further in Section 5.1.6 (Atmospheric Environment VEC).

A further consideration for monitoring and follow-up would be to confirm that the established recreational trails maintain continuity across the RoW.

5.13.3.9 Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons

In order to keep the lines of communication open between NBDOT and the Maliseet First Nation communities it is recommended that, in consultation with the six Maliseet Chiefs, the Maliseet Nation Liaison Committee be established and that NBDOT create and fill the position of the Aboriginal Coordinator. This effort can only accomplished if there is the desire and cooperation of the six Maliseet communities. While NBDOT will be the catalyst for this effort, the ability for it to function properly and provide meaningful information to the communities must come from within the communities and their Chiefs.

NBDOT is committed to ongoing monitoring and, where practical, mitigation of issues raised and potential adverse environmental effects as a result of the Project on the current use of land and resources for traditional purposes that are identified by the Aboriginal Community throughout the construction of the Project.

5.13.3.10 Archaeological and Heritage Resources

It is recommended that archaeological monitoring be conducted, by a qualified archaeologist, during initial ground breaking activities within 100 m of the watercourse banks on either side of the Lower Guisiguit River and the Little Presque Isle River (Hartland Interchange connector road) crossings. Monitoring at these locations is recommended in consideration of potential First Nation's concerns. The objective of the proposed monitoring is to prevent the loss of any potential additional information regarding archaeological and heritage resources at these locations.

If a suspected archaeological / heritage resources is encountered during construction, it is recommended that the procedures described in the EPP be followed, including the cessation of construction activities in the area of the discovery and contacting the provincial regulating agency, ASU, for direction on appropriate action.

NBDOT is responsible for ensuring that the recommended monitoring is undertaken and that the results of such monitoring are reported to Archaeological Services Unit, NBDELG, and Transport Canada.

5.13.3.11 Labour and Economy

No monitoring or follow-up is recommended. Should Project-related issues be identified in the Labour and Economy sector, NBDOT should follow-up on an issue by issue basis, where appropriate.