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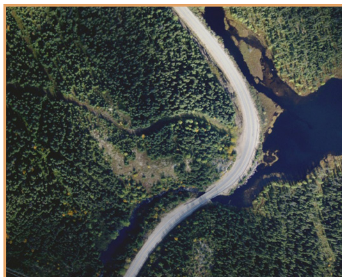

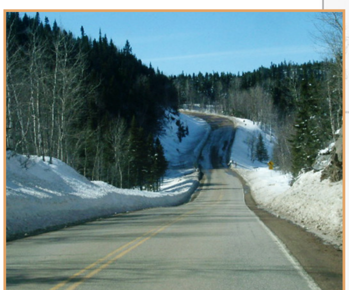

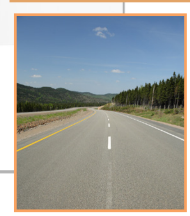

Transports Québec

Direction de la Côte-Nord

ROUTE 389 IMPROVEMENT PROGRAM BETWEEN FIRE LAKE AND FERMONT (KILOMETRE 478 TO 564)

IMPACT ASSESSMENT - SUMMARY

Version 00

MTQ File No: 6703-11-GA04
O/File: 55317-200

In Collaboration with:

INSPEC-SOL
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January 2016

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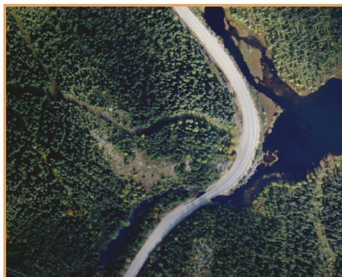
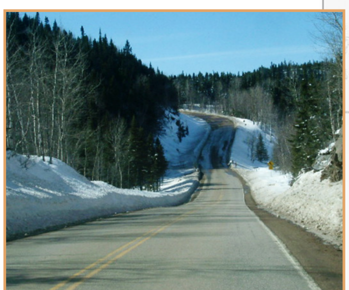



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1 Introduction

1.1 Project Presentation and Objectives

Route 389, which runs approximately 570 km to connect the cities of Baie-Comeau and Fermont, does not comply with current standards of the *ministère des Transports du Québec* (MTQ) (Quebec Transport Ministry). The *Programme d'amélioration de la route 389* (or Route 389 Improvement Program; hereinafter the Program) aims to make remedial steps essential to improving the safety and the comfort of users.

The main objectives of this Program, which fits in the context of the *Plan Nord*, is to improve the safety and traffic flow of Route 389, to facilitate travel towards Newfoundland and Labrador, as well as the development of the natural resources of this region. The Government of Quebec plans to achieve this major project over a period of about ten years.

The whole project plans for interventions over about 200 km and is divided into five separate projects:

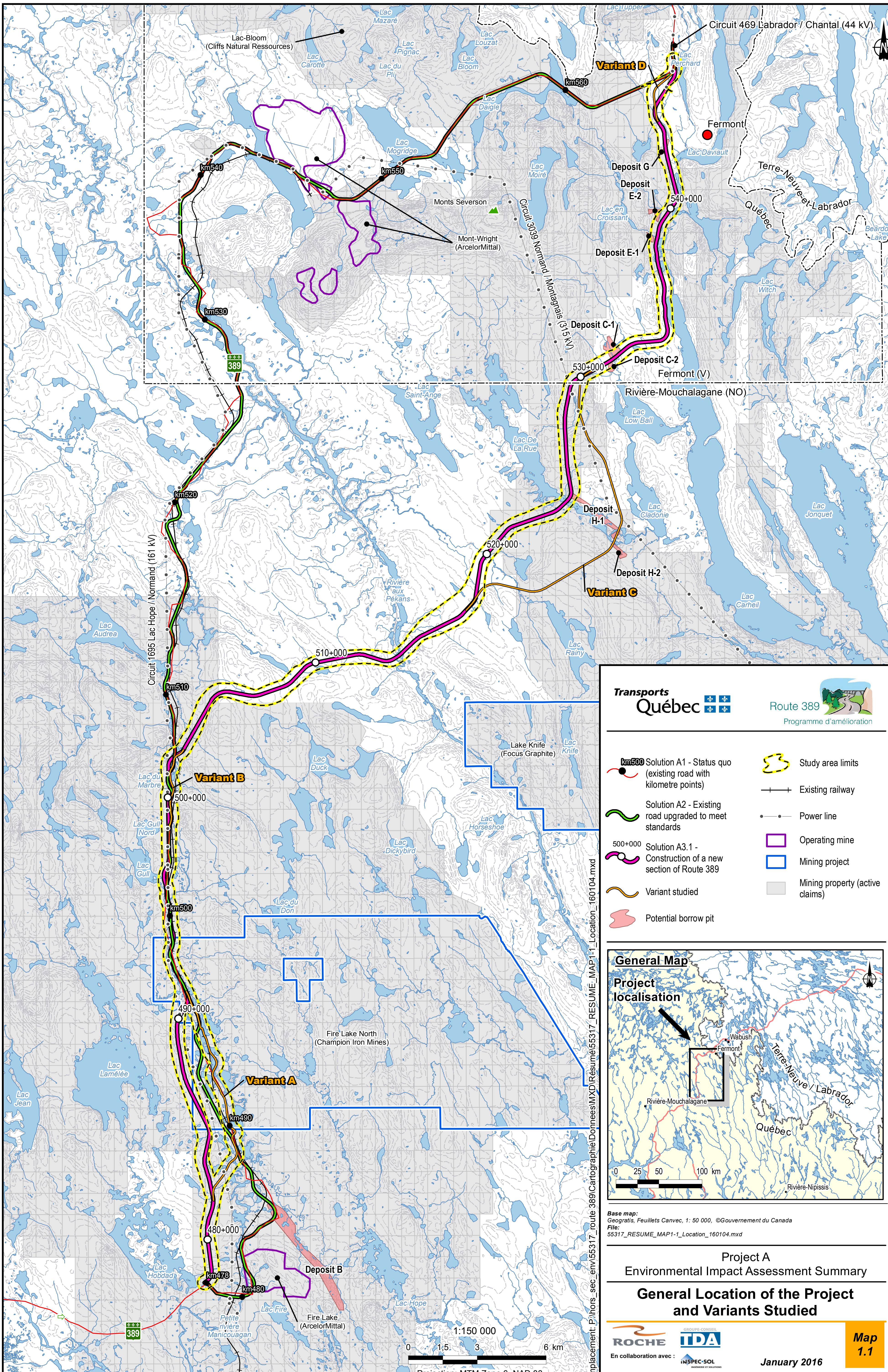
- Project A: major repairs and new road alignments (km 478 to 564, between the sectors of Fire Lake mine and the town of Fermont) (see Map 1.1). The end of the project is at km 566;
- Project B: major repairs and new road alignment (km 0 to 22, between Baie-Comeau and Manic-2);
- Project C: new road alignment (km 240 to 254, north of Manic-5);
- Project D: correction of curves that do not meet current standards (km 22 to 110, between Manic-2 and Manic-5);
- Project E: correction of curves that do not meet current standards (km 110 to 212, between Manic-3 and Manic-5).

Project A consists of building a new road linking Fire Lake and Fermont in compliance with current MTQ standards for a type D national road with a speed limit of 90 km/h. The projected Route 389 in the study area is about 70 km long and can be divided into three main segments (Map 1.1):

- Between km 478 and 490, the projected road branches off northward with an exclusive right-of-way to reconnect with the existing road alignment shortly before km 490;
- Between km 490 and 507, the projected road overlaps with the alignment of the existing road;
- Between km 507 and 566, the projected road branches off northeast with an exclusive right-of-way, then crosses the Pekans River and De La Rue Lake, and finally runs along an existing road connecting Fermont to Carheil Lake before joining the existing Route 389 at km 566.

The MTQ has mandated the Consortium Roche-TDA to carry out the environmental impact assessment of Project A under the *Canadian Environmental Assessment Act,* which aims to identify the optimal location of the future road and to determine its technical, socio-economic and environmental acceptability. This document is a summary of this study.

The project must also comply with three other Canadian federal laws, including the *Fisheries Act*, *the Explosives Act* and the *1994 Migratory Bird Convention Act*. In addition, it must comply with five provincial laws, including the *Environment Quality Act*, the *Sustainable Forest Development Act*, the *Act respecting the conservation and development of wildlife*, the *Act respecting threatened or vulnerable species*, and the *Natural Heritage Conservation Act*.



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Project A
Environmental Impact Assessment Summary

General Location of the Project and Variants Studied

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January 2016

Map 1.1

2 Project Rationale

Among the five projects of the Program, Project A is a priority due to the condition of the road and the fact that it directly serves the second most important agglomeration of the Program, the town of Fermont. In addition, between km 478 and 566, the current Route 389 counts many deficiencies. The poor condition of the road between km 478 and the Mont-Wright mine (km 547.75) (Map 1.1), is explained in part because Route 389 was built in 1978 without following any particular standard. This also illustrates the fact that the entire Route 389 was built to access resources of the back country by various stakeholders (Hydro-Quebec, forestry and mining companies).

2.1 Road Safety that has for Long been questioned

2.1.1 Substandard Geometry and Curves

The section of Route 389 aimed in Project A is classified as a national road. Its annual average daily traffic (AADT) being less than 500 vehicles per day, the road is considered of type D according to current MTQ standards. It is a surface gravel road, with the exception of the stretch between Fermont and Mont-Wright, which is paved. The speed limit displayed on the existing Route 389 is 70 km/h between Fire Lake and Mont-Wright mine, and 90 km/h between Fermont and the Mont-Wright mine.

Since the road was built without standards in 1978, several features do not match current MTQ criteria. Thus, the platform of the road includes non-defined and non-constant lane and shoulder widths. In addition, no slow lane or 'official' passing lane is present. Finally, several sections of the road have no ditches along them, while other sections have ditches that are not deep enough.

Also, of the 87 km of existing road analysed, 5% of it shows a slope greater than the prescribed maximum slope of 7%, and 20% shows a slope greater than the desirable slope for a national road, which is of 4%. Given the importance of heavy transport on this road, slopes that are too steep may present a significant risk factor.

The visibility, which is a function of vertical curves, is also problematic. Indeed, of the 1,173 vertical curves found in Project A, over 90% are non-compliant with visibility standards. As well, 94% of the 379 horizontal curves along the road have a radius or length that is substandard when considering that the design speed limit is equal to the displayed speed limit. It is noteworthy that compliance with the visibility distances required is an important aspect of road safety, allowing users to see, interpret and react to an event occurring on the road, such as the presence of an obstacle or a stopped vehicle.

Finally, aside from the paved section, there is virtually no roadside barrier on the existing road.

Taking into account all of these elements, the MTQ considers it necessary to take action in order to give the region a safe and quality access.

2.1.2 Numerous Railway Crossings and Overlap with the Railway Right-of-Way

A long part of Project A runs along a railway operated and owned by Arcelor Mittal Mines Canada Inc. (AMMC), which acts in this way as a "railway" company. The railway intercepts the existing Route 389 eleven times between km 478 and 566. The current axis of Route 389 had formerly served as a route of penetration for the construction of this railway, which explains the many crossing sites.

Because of the social status of this "railway" company, the railway is found under provincial jurisdiction. Thus, *Transports Québec* standards related to railway infrastructure must be applied to the development of the railway in the vicinity of Route 389.

Regarding railway crossings along the current road, minimally six of them must be reviewed and adjusted to meet current railway requirements. These criteria relate to the angle of intersection between the axis of the road and that of the railway or to the too steep slopes at the level of railway crossings. A reduction in the number of railway crossings through the reconstruction of some sections of Route 389 in a new right-of-way would also decrease the risk of collisions and improve traffic flow.

2.1.3 Important Consequences for the Safety of Users and Goods

The poor condition of the existing road and its substandard design is reflected in the number and causes of road accidents. Between January 1, 2006 and December 31, 2010, 76 accidents were reported, including two fatalities, 17 accidents with minor injuries and 57 accidents with property damage only. It is worth noting that this number could be underestimated considering that several run-off-road accidents and minor collisions are not recorded in accident report and are therefore not considered in the statistics.

An analysis of the main causes of accidents shows that the poor condition of the road and the inadequate road alignment explain 33% of accidents, while human factors (speed, careless driving, inattention or distraction) are involved in 40% of accidents.

The number and angle of railway crossings with the road, the dust that reduces visibility in areas that are not paved and vehicles crossing trucks or trucks crossing other trucks also increase the potential risk of accidents. Finally, according to the MTQ, comments and complaints from users of the existing Route 389 are most often related with the lack of grading, the uprising of dust affecting the visibility, as well as the lack of snow removal and de-icing.

2.2 The Mining Industry as an Economic Engine

The economic structure of the study area is clearly dominated by the primary sector including the industry of extraction of iron ore, which is very present on the territory. A total of 48.3% and of 36.0% of jobs are associated with the primary sector in Fermont and Labrador City, respectively. This is much higher than the Quebec average, which is less than 4%.

The Fermont region had two producers of iron ore, namely Arcelor Mittal and Cliffs Natural Resources (formerly Wabush Mines), which rank among the largest employers in the region. The first has been operating the Mont-Wright and Fire Lake mines since the 70s, while the second has been operating Bloom Lake mine since 2010 (the site is however currently not operated). Arcelor Mittal plans to expand its activities to significantly increase its production of iron ore, which also implies a significant increase in the number of jobs offered locally. The company has just accomplished the work to increase its production to 24 Mt.

In Western Labrador, an iron mine operated by IOC is also in operation close to Labrador City. Rio Tinto Iron Ore (formerly IOC) and Cliffs Natural Resources are active, although some activities are currently suspended due to the decline in the price of iron. Like their Quebec neighbours, Rio Tinto also plans to expand its activities without specifying when this could be done.

It is important to note also that several development projects and mineral exploration projects are underway in the region. Among them is Champion Iron Mines, which continued carrying out work for the feasibility study of its Fire Lake North iron mine project. Focus Graphite works on the development of a graphite mine close to Knife Lake located 35 km south of Fermont. In Western Labrador, the main project is the Kami iron mine developed by the Alderon Iron Ore Corp.

Finally, mining exploration continues in most parts of the territory surrounding Fermont and Route 389. Several companies, including especially those already active in the region, share hundreds of mining claims. Exploration work, especially focusing on iron but also on graphite, is currently carried out in the area of Lamêlée Lake (Fancamp Exploration Ltd. and Cliffs Natural Resources; iron) as well as west of the Knife Lake (Nevado Resources Corporation and Standard Graphite; graphite - iron).

Thus, although railway transportation is the cornerstone of these business sectors, road transportation remains an important mode of transportation supporting mining activities and it appears essential to maintain it with safe and sustainable infrastructure.

2.3 Desire of the Municipal and Community Sectors

In its current and reviewed development scheme, the regional county municipality (RCM) of Caniapiscau promotes the abandonment of the current alignment of Route 389 for the benefit of a new one. Indeed, the relocation of Route 389 in a new right-of-way has been the subject of several forums over the past decades on the part of elected officials, of businesses, worker unions and citizens of Fermont militating in favour of it. The project in question is therefore the object of a broad consensus.

2.4 Land Access for Tourism Activities

The construction of Route 389 in a new right-of-way would give access to areas of the territory where tourism activities are already taking place (resorts, hunting, fishing, snowmobile, quad, etc.) or in areas identified by the Caniapiscau RCM as having a vocation or a potential for recreation and tourism. In this way, Project A is seen as a tool for improving practice or the development of tourism activities in the Fermont region.

3 Description of the Environment

3.1 Physical Environment

3.1.1 Air Quality

3.1.1.1 Sources of Contaminants in the Study Area

According to the National Pollutant Release Inventory (NPRI), the study area does not have major industrial emitters. The only one in this inventory which is found in the area is the Arcelor Mittal mine, at Mont-Wright. However, the reference road alignment under study does not run along the area of the mine, so that emissions from it are not likely to affect the construction work area. Other mining projects underway (Fire Lake, Bloom Lake, Scully and Carol Lake) are sources of contaminant emissions, although they are insufficient to be included in the NPRI. In addition, some emissions could potentially come from future surrounding mines once they begin operating.

3.1.1.2 Greenhouse Gases

Canada's Greenhouse Gas (GHG) Inventory does not allow to accurately determine GHG emissions in a particular region. The latest report available from the *ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques* (MDDELCC, 2015) (or Ministry of sustainable development, the environment and the fight against climate change) indicates, however, that in 2012, global emissions of GHG in Quebec accounted for 78 Mt of CO_2 equivalent, while the road transportation sector alone accounted for 27.29 Mt of CO_2 equivalent. It is the latter sector that produces the most emissions. Emissions from road transportation have indeed increased by 32.4% between 1990 and 2012, while overall emissions have decreased by 8.0%.

3.1.2 Groundwater

According to the MDDELCC classification system, the aquifers potentially encountered in granular formations and rock in the study area would be of Class IIA (common source of drinking water) and class IIB (potential source of drinking water), respectively. No use of such groundwater sources is however expected on the short and medium terms. However, the granular deposits observed in the region are likely to serve as water supply sources, notably for mining or construction camps along Route 389. None of the other superficial deposits observed on the territory (peat and till) are aquifers of potential interest. Local communities in the study area, all located upstream of the site, are supplied with drinking water from surface water intakes (town of Fermont).

According to the DRASTIC method (Aller *et al.*, 1987) suggested by the MDDELCC to assess the vulnerability of groundwater, aquifer formations in the granular deposits (esker type, river terraces, washed out till) generally show a high vulnerability DRASTIC index. These deposits are very permeable and often devoid of overlying geologic units offering natural protection, which increases their vulnerability. In contrast, the aquifers found in rock that are observed in the study area are rather massive, although they may show fractured areas (faults) with greater fracturing near the surface (joints). These rock aquifer system conditions result in a lower DRASTIC index, except perhaps in rocky outcrop areas.

Only the potential sources of contamination from the construction and use of the road are a priori likely to contaminate groundwater. However, this risk seems limited, since the vast majority of the territory is occupied by low-permeability till deposits overlying rock aquifers. Thus, the hydrogeological conditions observed in the study area, the type of infrastructure involved and the fact that groundwater resources are not used as water supply sources near the road together suggest a low groundwater vulnerability over most of the territory under study.

3.1.3 Water Quality

In situ measurements of basic water quality descriptors have been taken at 20 stations distributed in the rivers where experimental fisheries were carried out and corresponding to the future watercourse crossing sites (Map 3.1 in pocket insert).

Results demonstrate that the water quality in the study area varies greatly from one station to the other. The water temperature varies from 6.30 to 21.60 °C, the pH from 6.70 to 7.65 and the conductivity from 0.91 to 57.8 µS/cm. The concentration and saturation of dissolved oxygen vary respectively between 8.1 and 11.5 mg/l and 77.0 and 99.9%, which meets the Quebec criteria for the protection of the life aquatic (MDDEFP, 2013c). However, 80% of measurements do not meet the Canadian guideline established for the protection of cold water biota for early life cycle stages (9.5 mg O_2l; CCME, 1999). The waters are generally very little turbid with 75% of the measurements below or equal to 1.92 NTU. These results suggest that, for the basic water quality parameters analyzed, the water quality in the study area is generally comparable to that of the Moisie River and the Fermont area.

3.2 Biological Environment

3.2.1 Vegetation

Overall, 67% of the territory covered by the study area is located in the eastern subdomain of the spruce-moss stand, while the other 33% is located in the spruce-lichen domain to the north. The study area is mainly composed of conifer stands dominated by black spruce, including 28.1% of spruce-lichen stands, 48.6% of spruce-moss stands, 5.4% of spruce-balsam fir stands and less than 1% of spruce-tamarack, white spruce and balsam fir stands. There is also 4.6% of wetlands and 5.8% of barren lands (burned areas, dry and anthropogenic barrens) and land in regeneration. A few stands of white birch also cover the steep slopes of some hillsides, which represent 0.9% of the study area. In total, forest stands cover 4,269 ha.

3.2.1.1 Wetlands

Within the study area, several small and medium-sized wetlands are present. The majority of them correspond to peatlands, ranging between 0.1 and 17.5 ha within the study area. Monospecific and quite dense alders and willows are also found in the vicinity of some streams. Wetlands occupy a total area of 234.8 ha. The majority of the area covered by peatlands in the study area is occupied by fens, which are the main type of peatland beyond the 50° latitude in Quebec (Payette and Rochefort, 2001).

Of the 30 wetlands sampled, five have a low ecological value and 25 have a medium ecological value. The main factors that increase the ecological value of wetlands in the study area are related to the fact that they are completely undisturbed. They have also, for the most part, a direct hydrological link with a stream, making them important ecosystems relative to water retention and filtration at the local scale. However, the small area of wetlands (5 ha on average) and their abundance, both at the local and regional scales, decrease their value from the point of view of their uniqueness and their relative rarity, especially given that species richness is low and that no threatened or vulnerable plant species has been listed. Thus, none of the wetlands sampled has a high ecological value in the actual regional context. For the five wetlands given a low ecological value, the factors responsible include fragmentation, a significant degree of anthropogenic disturbance and a small surface area.

The majority of wetlands in the study area carry out hydrological functions such as the regulation of flows and the protection of banks and from erosion. Some would also ensure aquifer recharge. As for biogeochemical functions, almost all identified wetlands play a role of export of nutrients and organic matter and carbon sequestration. The vast majority would also help to improve water quality. All wetlands would provide habitat functions including biological productivity and support for biodiversity (presence of potentially and confirmed rare species), while a third of them would carry out ecological functions (ecologically important environment). Finally, socio-economic functions of wetlands in the study area are marginal, considering the extent of the territory covered, the low population pool close to the study area and the remoteness of the territory.

3.2.1.2 Special Status Species

The unique special status vascular plant species reported by the *Centre de données sur le patrimoine naturel du Québec* (CDPNQ or Quebec natural heritage data centre) is the *Antennaria rosea subsp. confinis*. Indeed, large populations have been identified on the edge of Route 389 between km 500,280 and 500,650 during the field campaigns in summer 2013, as well as on rocks at the edge of a bog. The colonies identified are estimated at a total of more than 4,000 specimens. In addition, the large notchwort, a non-vascular bryophyte species, was also reported by the CDPNQ on the banks of the outlet of Gull Lake close to chainage mark 495+800, but no individuals of the species were observed in 2013.

3.2.1.3 Borrow Pits

The B, C, E, G and H deposits that are targeted for the project (Map 3.1 in pocket insert) are mainly composed of black spruce-lichen stands (67.2%), black spruce-moss stands (14.1%) or black spruce-balsam fir stands (0.1%). Anthropogenic areas represent 5.3% of overall deposits. Spruce-lichen stands cover between 19 and 92% of deposits and wetlands, between 0 and 20%. Wetlands identified within the deposits targeted for Project A are mainly bogs and fens covering 23.85 ha (6.6%) of the surface area of deposits, while shrubby swamps cover 5.89 ha (1.6%) of these.

As for the study area of the road, the main factors increasing the ecological value of these wetlands are related to the fact that they are completely undisturbed. However, none of the sampled wetlands show a high ecological value and no species at risk was identified during the 2014 surveys.

The main functions associated with the bogs studied include the export of nutrients and organic matter, carbon sequestration and wildlife habitat. According to the characteristics of each environment, some bogs can also serve functions including flow control, aquifer recharge and shoreline protection. Fens show greater hydrological functions than bogs.

3.2.1.4 Temporary Construction Road - De La Rue Lake

Considering the four options for the construction road in the area of the De La Rue Lake, the five wetlands sampled in 2014 all show a low ecological value, in particular because of their small size and the low diversity of habitats encountered. Again, fens show greater hydrological functions than bogs. However, fens, like bogs, are important for carbon sequestration and the export of nutrients and organic matter, in addition to being wildlife habitats for several species. Riparian swamps are recognized for their hydrological functions and habitat for wildlife.

3.2.2 Herpetofauna

The herpetofauna survey allowed to confirm the presence of only four species of amphibians in the study area, including three species of anurans (the America toad as well as the wood and north frogs) and one stream salamander species (northern two-lined salamander). Various biotic and abiotic factors can influence the quality of amphibian habitats such as the water regime, water acidification, water contaminants, noise, barriers to movement and diseases.

It should be noted that the northern spring peeper (*Pseudacris crucifer*) was not identified during the surveys, while its presence has been reported more west at similar or higher latitudes (Fortin, 2007; Fortin *et al.*, 2012) and recorded in the past along Route 389 at the height of the Manicouagan reservoir (50°50' North; Fortin *et al.,* 2012). Moreover, no special status species has been listed in the June 2013 surveys.

3.2.3 Ichthyofauna

The watercourses surveyed are divided into three large watersheds, namely that of the Petite Rivière Manicouagan, the Pékans River and Carheil Lake. In total, 29 watercourses present along the new road alignment were characterized in detail and subjected to experimental fisheries (Map 3.1 in pocket insert). Surveys show that most of the watercourses surveyed are of small size (less than 4 m wide). The major crossing sites are over the Petite Rivière Manicouagan, the Pékans River and De La Rue Lake (bankful width of 22 to 65 m).

Brook trout is an abundant species and it is present in most of the watercourses surveyed. White sucker and lake whitefish are also very abundant species in the territory. In addition, lake whitefish and northern pike have been caught more in lakes and large rivers than in small streams. Lake trout was caught only in the De La Rue Lake, but it may also be present in the Petite Rivière Manicouagan. It is worth noting that no special status species has been captured in the study area.

In each of the surveyed watersheds, the riffle type habitat is the most often encountered at crossing sites with a substrate composed of boulders, pebbles and gravel. This riffle type facies provides feeding, rearing and spawning habitats for several fish species, including brook trout. The second type of habitat frequently encountered is the channel type with a substrate composed of boulders and organic matter. The lack of aquatic vegetation in these streams reduces the spawning potential for the northern pike.

Concerning borrow pits, the B deposit includes two streams providing spawning and rearing habitats for brook trout (BE-B1 and BE-B4; Map 3.1 in pocket insert), but they are not crossed by the haul over roads. For the C deposit, apart from the streams already characterized for the road, a single watercourse offers habitats for brook trout spawning and rearing (BE-C1; Map 3.1 in pocket insert). For the H deposit, two watercourses provide feeding habitats for brook trout (BE-H2 and BE-H3; Map 3.1 in pocket insert). Finally, no stream is located within the boundaries of deposits E and G. For the temporary road of De La Rue Lake, the free passage of fish shall be provided in culverts of three of the streams crossed for option 1 (OPT1-2, OPT1-3 et OPT1-4; Map 3.1 in pocket insert) and in a single culvert for option 3 (OPT3-1; Map 3.1 in pocket insert). The free passage of fish does not have to be insured at the crossing site identified in option 4 due to the presence of diffuse and underground flow upstream. Finally, no crossing site was listed under option 2.

3.2.4 Bats

The potential for wintering and nursery habitats has been identified for the five species listed in Quebec and likely to be present in the study area, namely the little brown bat and the northern long-eared bat (cave dwelling species) as well as the eastern red bat, the silver-haired bat and the hoary bat. These species likely to be found in the study area have a special status either at the provincial (MDDEFP, 2013b) or federal level (COSEPAC, 2015). Overall, no natural structure offering a potential wintering place for cave dwelling species is known within the study area (Gauthier *et al.*, 1995). The forest stands present on either side of watercourses, however, offer important habitats for the other three species.

3.2.5 Micromammals

Five species of small insectivorous mammals and nine species of rodents are likely to be found in the study area (Deshmukh *et al.*, 2002). During the September 2013 surveys, only 59 small mammals were captured, for a low trapping success of 3,466 trap-nights (or 1.6 capture/100 trap-nights). Rather cold temperatures and rain during almost all of the survey could, among other things, explain the low capture rate.

Despite the low number of captures, eight species of micromammals have been identified, including four insectivorous species (masked shrew, pygmy shrew, American water shrew and Arctic shrew) and four rodents (Gapper's red-backed vole, meadow vole, rock vole and heather vole). The most often trapped species were the masked shrew (52% of catches) and the Gapper's red-backed vole (32%). The number of captures and the diversity of species were slightly greater in spruce-lichen and spruce-moss stands than in peatlands. However, it is risky to interpret these results given the low number of captures and the interstation variability.

The rock vole, a species likely to be designated threatened or vulnerable, was captured in a fen at 700 m from the proposed right-of-way (chainage mark 522+060). Despite the initially low potential to find this species in the study area because of its preferred habitat and its range, the capture of an individual confirms its presence in the study area. It is therefore likely to be present in other environments found in the study area, such as in coniferous or mixed forests.

3.2.6 Large Mammals

Large mammals present in the study area include the forest-dwelling ecotype caribou (hereinafter the woodland caribou), moose and black bears. The study area also overlaps with the historic range of the migratory ecotype woodland caribou (hereinafter the migratory caribou). The study area is located west of hunting zone 19 south (MDDEFP, 2013) where caribou sport hunting is prohibited, but it is permitted to hunt black bears and moose. The study area is also located in the furbearer management unit 60 where it is possible to trap black bears in the spring and fall.

3.2.6.1 Moose

Although no specific moose survey has been carried out in the context of this study or during the aerial survey conducted for the Canadian National Railway Company (CN) in March 2012, 26 track networks of moose were observed in the surveyed area (3,060 km^2). According to these results, the minimum density of moose in the large mammal study area would be of 0.08 moose/10 km^2 (versus 0.44 for the entire hunting zone 19 south; Gingras and Malouin, 1993). In addition to the survey method (2 km lines), the low abundance of moose observed is possibly due to the unproductive habitat type dominated by spruce-lichen stands (Gingras *et al.*,1989). The majority of track networks were observed south of chainage mark 512+040 and north of chainage mark 530+000 of the proposed road. Only one moose track network was observed 2 km away or less from the projected road alignment at chainage mark 501+463 and close the existing Route 389.

Between 2008 and 2012, eight moose were harvested in the study area near the road at km 488, 494, 498 and 507, as well as near de La Rue Lake near chainage mark 527+000. The *ministère des Forêts, de la Faune et des Parcs* (MFFP or Ministry of forests, wildlife and parks) reported two accidents involving moose between Fire Lake and Fermont at km 480 and 558 of the existing road (C. Ayotte, MFFP, pers. comm.).

3.2.6.2 Black Bear

No specific survey of black bears has been carried out. Signs of its presence (individuals, tracks, droppings) recorded during the survey for the CN suggest that the species uses the whole study area. Between 2008 and 2012, a black bear has been collected in the study area near the existing road at the level of the Fire Lake North project. The study area has some potential for black bears, like its wetlands, its spruce–lichen stands and its disturbed habitats (burned areas and dry barrens). The virtual absence of deciduous stands and low cervid density, however, limit the interest of this omnivorous species for the study area (Mosnier *et al.*, 2008).

3.2.6.3 Special Status Species

No special status species of large mammal or any regulated wildlife habitat have been identified by the CDPNQ. The woodland caribou is the only species with a particular status at the federal (threatened) and provincial level (vulnerable). Two caribou track networks were recorded during the survey for the CN. Among these, two groups of two woodland caribou were observed. These observations were made south of the Pékans River (chainage marks 483+700 and 494+000).

Telemetric monitoring has also begun with the MFFP in March 2015 using Argos collars on 12 woodland caribou of the petit lac Manicouagan herd. Among these, two individuals used the large mammal study area for the project. According to these preliminary data, the mostly used areas would be those of

Midway and Jonquet lakes. Finally, observations reported by the MFFP mention a group of 25 caribou observed south of Luck Lake in March 2014.

3.2.7 Small Mammals

As a whole, fur-bearing animals use different types of terrestrial and wetland habitats. In total, 18 species are likely to be found in the study area (Prescott and Richard, 2004 and Consortium Roche-Dessau, 1995) and all natural habitats affected by the construction work are suitable for one or several species. According to the March 2014 survey results, the most abundant species are the snowshoe hare, the tetraonidae and the red squirrel. The abundance of predators, such as the gray wolf, Canada lynx and red fox, is also high for the area. The less abundant species are the America mink and porcupine. Some species are mainly associated with wooded environments (e.g. American marten, red squirrel, snowshoe hare, Canada lynx, and American porcupine), open environments (e.g. woodchuck) and aquatic environments (e.g. Canada beaver, muskrat, river otter, and American mink), while others are rather ubiquitous (e.g. red fox, long-tailed weasel, ermine, gray wolf, and striped skunk) (Prescott and Richard, 1996; Feldhamer *et al.*, 2003).

The CDPNQ does not mention any report of small mammal with a special status in the study area. In addition, no regulated wildlife habitat other than fish habitat is present (MNR, 2013). However, the special status species belonging to this group and which are likely to be present in the study area are the wolverine and the least weasel. The probability to find a wolverine in the study area is considered negligible. However, the range of the least weasel overlaps with the study area (MDDEFP, 2013b) and its usual preys are present in the latter (mice and voles). This species could thus be found in the study area.

3.2.8 Avifauna

The avifauna surveys (May to July 2013) allowed identifying a large number of bird species in the study area. A total of seven species of waterfowl have been recorded, including six species of anatidae (Canada Goose, American Black Duck, Ring-necked Duck, Common Goldeneye, Red-breasted Merganser and Surf Scoter) and one species of gaviid (Common Loon). Nesting was confirmed only for the Canada Goose. In total, 18.5 indicated pairs of anatidae have been observed (density of 9.1 indicated pairs/25 km^2). The most abundant species in terms of indicated pairs is the Canada Goose, followed by the American Black Duck. These two species constitute 62% of the breeding population. Five indicated pairs of Common Loons have been identified in the study area (density of 2.5 indicated pairs/25 km^2). Other species of aquatic birds were also identified including the Herring Gull, the American Bittern, the Greater Yellowlegs, the Solitary and Spotted sandpipers and the Wilson's Snipe. Nesting was confirmed for the latter two species.

In addition, six species of raptors have been recorded, namely the Great Horned Owl, Osprey, Red-tailed Hawk, Bald Eagle, Sharp-shinned Hawk and Raven. Nesting of the Great Horned Owl and Sharp-shinned Hawk was confirmed in the study area. Osprey nesting has been confirmed at two sites located outside the study area; at 3 km from the reference road alignment and at 4.5 km from the road alignment in the case of the known nest at Daigle Lake.

Table 3.1 summarizes the number of terrestrial bird species listed in the study area for the different habitats surveyed. Scrublands are the habitats with the greatest density of pairs, followed by closed spruce stands. Herbaceous meadows would be the poorest biotope.

Table 3.1 Summary of Terrestrial Birds Nesting Pair Surveys by Biotope using Limited Radius Counts

Habitat	Survey Effort (number of listening stations)	Species richness (number of species)	Relative density (number of nesting pairs/20 min/ha)
Open spruce stands	40	24	4.20
Closed spruce stands	5	15	5.22
Peatlands	7	9	4.09
Scrublands	5	13	7.77
Herbaceous meadows	2	4	2.55
Deciduous-dominated stands	2	7	4.46
Burned areas	1	4	4.50

No species of waterfowl or other aquatic birds at risk were observed in the study area. For raptors, the list of species at risk whose range covers the study area includes the Golden Eagle, Bald Eagle, Peregrine Falcon (anatum subspecies) and Short-eared Owl. Only Bald Eagles were observed in the study area. The two birds, an adult and a two year old, flew over Daviault Lake. Finally, for terrestrial birds, the species at risk potentially present in the study area include the Common Nighthawk, Barn Swallow, Bank Swallow, Olive-sided Flycatcher and Rusty Blackbird. Three of these species were identified during the avifauna surveys, namely the Rusty Blackbird, the Olive-sided Flycatcher and the Bank Swallow. In addition to these species, an adult Common Nighthawk was observed over the Fire Lake North camp of Champion Minerals Inc. in June 2012, confirming the presence of the species in the area.

3.3 Human Environment

3.3.1 Land Use by the Innu

The study area completely falls within the Saguenay Beaver reserve established by the Government of Quebec in 1954. In the Sept-Iles division of this reserve, the Innu community of Uashatmak Mani-Utenam benefits special, yet non-exclusive, rights with regard to hunting and trapping of fur-bearing animals. The study area cuts across three traplines located in the traditional territory of the Gregory family (traplines 255, 256 and 243; Map 3.1 in pocket insert), whose holders are Innu of this community.

The users of these traplines have significantly changed their patterns of use of the territory over the past years (Consolidated Thomson, 2006). Traplines are currently used four to five times per year and for short stays (either in the fall, during the holiday period or in the spring, but rarely during the summer). These changes are particularly due to the ageing of key users, the different attitude of young ones relative to activities in the forest, as well as the remoteness of the area relative to the communities of Uashatmak Mani-Utenam. The traplines are used for fishing (lake trout, lake whitefish and northern pike) and hunting (ducks, Canadian goose, hare and moose).

There exists, however, little information on the recent use of the territory by the Innu. Some information was gathered from the 2004 environmental monitoring for the operating phase of the Sainte-Marguerite-3 hydropower development project (CDA, 2005). Results indicate that seasonal land use by the Innu was focused on traplines 255 and 243 along Route 389, from around Fire Lake mine to the Quebec - Newfoundland and Labrador border. Group interviews conducted in 2014 with the holders or main users of these traplines did not really allow gathering new information compared to what was already known. The informants interviewed, however, made it clear that, regardless of the areas already identified or mapped in other studies, the Innu users considered using the entire territory of their respective traplines, wherever there are coveted resources.

3.3.2 Land Use by Non-Natives

The built environment of the territory includes the town of Fermont, which was built in 1973-1974 for the purpose of extracting Mont-Wright's iron ore deposit by the Quebec Cartier Mining Company (now AMMC). The town now plans to expand northeast and northwest. Mining projects underway and those currently not operating or in development are listed in Section 2.2.

Used mainly for purposes of exploration and exploitation of mineral resources, public lands also host different recreational and tourism activities for resident populations and tourists, including the use of resorts, hunting and fishing, as well as tourism activities like snowmobile, quad, hiking, etc. Cottages and forest shelters, which are subject to a relatively sustained use, are scattered throughout the territory and some areas are used more significantly (surroundings of Carheil, Low Ball, Cladonie, De La Rue and Daigle lakes). The Caniapiscau RCM plans to promote the development of resorts on public lands for economic and recreational purposes.

The practice of snowmobiling is important in the Fermont region, both as a recreational activity and a mode of travel. A vast network of trails provides access to all of the surrounding territory. In total, the *Club Les Lagopèdes* operates a network of marked and maintained trails of more than 200 km. Fermont quaders use some of these trails for their activities, but they also have their own network of trails around the city. In 2015, the *Club VTT du Grand Nord* also undertook the construction of a new quad trail of about 6 km between Fermont and Carheil Lake. There are also seven hiking trails totalling some 30 km in the Monts Severson area located west of the town of Fermont. Rafting and canoeing are activities that are also commonly carried out in the region because of the quality of the landscape and the huge lakes and rivers that meander in the middle of magnificent valleys (MDDEP, 2005). The Pékans-Moisie canoeable waterway is actually one of the region's main attractions for canoers.

Finally, the project area includes public infrastructure and equipment, including Route 389, the AMMC railway and the railway dedicated to Bloom Lake mine facilities. In addition, there are at least four power lines, of which one is coming from the Montagnais station and supplies the Fermont region, as well as a Hydro-Quebec fibre optic network located along a portion of Route 389. The town of Fermont also includes a water intake, a drinking water supply plant, a wastewater treatment plant, aerated ponds and a snow deposit. Finally, a former landfill site was located southwest of the city core.

3.3.3 Archaeology

The archaeological potential was assessed on the basis of data relative to the location of known sites, historical data and criteria to assess the Native American archaeological potential (geography, geology, morphosedimentology, hydrography, vegetation, fauna and accessibility). In total, 77 areas with an archaeological potential distributed along the projected road have been identified in the study area. Among these areas, eight will be directly impacted by the project. They were all surveyed in summer 2015 and all trial trenching were found negative.

3.3.4 Sound Environment

The road traffic in the area is generally responsible for the LAeq sound level measured in an urban environment (54.5 dBA). In the Fermont area, the presence of children and human activities related to household maintenance (e.g. tractor for maintenance of the park) is responsible for the rise in noise level during the day. At night, the very quiet period, LAeq levels reach values between 25 and 30 dBA. Outside the Fermont urban area, noise exclusively comes from the natural environment (37.4 dBA) and results primarily from the wind in the trees, the rustling of bushes, birds, etc. On occasion, some human activities (motor boats) near cottages can contribute to increase the noise level.

3.3.5 Visual Environment

The visual basin under study is located in the northeastern boundary of the landscape unit of Plétipi Lake (Robitaille and Saucier, 1998). The region is characterized by a gentle topography of plains and hillsides and scattered with numerous lakes and watercourses, wetlands and rocky hills with rounded summits that rarely exceed 100 m in elevation. The land is predominantly forested. As a whole, the site offers a landscape dominated by softwood type vegetation where black spruce density varies from dense to open offering partial views on the rolling hills of either side of the reference road alignment. The hydrographic network of lakes offers large flat areas which open the view on the hills that surround them.

The landscape units chosen for the assessment of visual components are therefore barren softwood forests (BSF) and lakes (LKS). The assessment is based on criteria of visual accessibility, visual interest and value. The visual environmental value index was assessed at 2 for the BSF unit (low environmental value) and at 3 for the LKS unit (average environmental value). The latter result is explained by the importance attributed to human activities, such as hunting, trapping, and fishing as well as the areas occupied by resorts.

3.4 Consultation and Information Sessions

Consultation and information activities were conducted in the context of the Program. In compliance with this process as well as with its own environmental policy, the MTQ formally committed to inform and consult the various stakeholders concerned by the project. The MTQ communication plan translates into many forms and is continuously ongoing as the project progresses. It includes, among other things, the *Accès 389* newsletter and a Web page dedicated to the project. In addition, information and consultation sessions with authorities, environmental organizations, the general public and Native communities took place. Open houses were held with the populations of Baie-Comeau, Sept-Iles and Fermont, as well as with the Innu communities of Pessamit and Uashatmak Mani-Utenam. Exchanges with Native communities (Band Council of the Innu Nation of Matimekush Lac-John, Innu Council of Pessamit and Innu Council of Takuaikan Uashatmak Mani-Utenam) have been taking place since 2009 and a press review has been made for the 2009-2013 period.

These various communication activities, combined with activities specific to each project, helped paint a general picture of the concerns raised by the population, and this, as early as the design stage of the project. The main concerns raised include:

- A timeline for construction work that is too long as well as inadequate budgets;
- The need to improve road safety and maintenance;
- Continuous communications to inform stakeholders of the progress of the project and the importance to consult Native communities;
- Procedures for awarding public contracts to contractors as well as job creation and the potential economic spinoffs to Native communities;
- The social and environmental impacts of the project (e.g. on the human environment, the migration of woodland caribou and the protection of the territory) for Native communities and the eventual presence of threatened species, the protection of watercourses and access to cottages for non-Natives.

4 Analysis of Alternative Solutions and Variants

4.1 Analysis of Alternative Solutions

Section 2 on the project rationale allowed to thoroughly assess the state of the situation and the reasons justifying the intentions of the MTQ regarding Route 389. In the light of the portrait that has been made, the sought solutions must first of all meet the safety, maintenance, environmental conservation and socio-economic objectives of the region, while respecting the financial imperatives of the MTQ. Finally, the solutions considered must comply with the guidelines of the Program.

Three potential solutions have been considered (Map 1.1).

Solution A1 consists of keeping Route 389 in its current state. Only the work relating to the maintenance of the road and the gradual replacement of culverts are planned. This solution can be divided into three segments, from south to north:

- Segment 1 (km 478 to 480 - Fire Lake mine area): road paved;
- Segment 2 (km 480 to 547.75 - between Fire Lake and Mont-Wright): about 67 km of highly deficient gravel road;
- Segment 3 (km 547.75 to 566 - between Mont-Wright and Fermont area): about 18 km of paved road which shows lesser deficiencies.

Solution A2 consists of correcting and improving the current alignment and profile of the road (segments 1 to 3 such as described above) so that the road is compliant with the standards of a type D national road with a displayed speed limit of 90 km/h, yet including some areas restricted to 70 km/h for technical and economic reasons. This solution suggests a proposed road that would be 82 km long, which is 5 km less compared to the existing road. Interventions are divided as follows:

- Segment 1: rehabilitation of the existing paved segment according to current standards;
- Segment 2: upgrading of the road to meet the standards, which involves a nearly complete reconstruction of the existing road, including the replacement of culverts, the improvement of the drainage and the construction of a newly paved road structure;
- Segment 3: rehabilitation of the existing paved segment according to current standards and the correction of substandard curves.

Solution A3.1 consists of building a new road connecting Fire Lake to Fermont, in addition to performing a major upgrade of part of the existing road to meet current standards. The new total length of the projected road would be of 69.9 km. This solution would result in the complete abandonment of the existing road between Fire Lake and Mont-Wright mines. Based on current MTQ standards and the technical and environmental constraints, this solution uses some sections of the existing road before deviating along the new road alignment. In this case, interventions are divided into three new segments as follows, from south to north:

- Segment 1: Between chainage marks 478 and 491, the projected Route 389 branches off northward with an exclusive right-of-way to join the existing route around the km 497. The length of segment 1 is about 13 km;
- Segment 2: Between chainage marks 491 and 502, the projected Route 389 basically uses the existing road corridor. The length of segment 2 is about 11 km;

- Segment 3: Between chainage marks 502 and 546, the projected Route 389 branches off to the northeast with an exclusive right-of-way, it crosses the Pékans River and De La Rue Lake, it bypasses Low Ball Lake to the north, then runs along an existing road connecting Carheil Lake to Fermont, before bypassing Fermont to the west and finally joining the existing Route 389. A new road is planned to connect Route 389 with Fermont through the existing Duchesneau Street. The length of segment 3 is about 45 km.

The comparative analysis of the three potential solutions was based on operational objectives which are divided mainly into three categories, namely safety, traffic flow, accessibility and maintenance, the natural and human environment and economic aspects. The analysis shows that Solution A3.1 best meets all these operational objectives. Table 4.1 summarizes the performance of each solution for each criteria group.

Table 4.1 Summary of the Performance of Solutions relative to the Analysis Criteria

Analysis criteria	Solution A1- Status quo	Solution A2 - Upgrading of the existing Route 389	Solution A3.1 - Construction of a new segment of Route 389
Safety, traffic flow, accessibility and maintenance (45%)			
Technical criteria (35%)	11.0%	30.0%	30.6%
Traffic conditions (10%)	4.2%	8.8%	9.4%
Subtotal (45%)	15.2%	38.8%	40.0%
Rank	3rd	2rd	1st
Natural and human environment (30%)			
Biophysical criteria (8%)	4.0%	3.6%	5.4%
Terrestrial environment (7%)	3.8%	4.0%	4.8%
Socio-economic aspects (15%)	4.8%	5.4%	14.4%
Subtotal (30%)	12.6%	13.0%	24.6%
Rank	3rd	2rd	1st
Economic aspects (25%)			
Costs (20%)	13.6%	9.2%	11.6%
Other (5%)	5.0%	1.4%	2.6%
Subtotal (25%)	18.6%	10.6%	14.2%
Rank	1st	3rd	2rd
Total (100%)	**46.4%**	**62.4%**	**78.8%**
Final rank	**3rd**	**2rd**	**1st**

Although Solution A1 is the one which performed best at the economic level because of the lack of construction work, this is not sufficient to justify recommending this solution. Indeed, maintenance costs involve substantial investments, particularly for the repair of structures at watercourse crossing sites. Finally, road safety deficiencies almost justify alone the rejection of this solution.

4.2 Optimization of the Selected Solution

4.2.1 Variants selected for a Comprehensive Analysis

The MTQ designated Solution A3.1 as the "preferred scenario" or "Scenario 0". This scenario has been used as the basis of comparison for four road alignment 'variants' which were analyzed and which constitute variations in plan and profile of Scenario 0 (see Map 1.1):

- Variant A: chainage mark 481+700 to 491+300;
- Variant B: chainage mark 498+600 to 502+620;
- Variant C: chainage mark 517+320 to 530+650;
- Variant D: chainage mark 543+610 to 546+945 (where construction work ends).

To determine the variant to be selected for the project, the general performance of each variant was compared with Scenario 0. Hence, each variant has been assessed on the basis of technical, environmental and economic criteria.

In sum, the MTQ has agreed to continue the project without adopting any of these variants. The selected and optimized scenario allows to reduce the total length of the road and allows for an improved harmonization of the road alignment with contour lines. Scenario 0 allows eliminating several kilometers of guardrails. In addition, six steel-wood structures are subtracted from the initial number of necessary structures. This scenario also enables the removal of several railway crossings, including automated gates, in addition to eliminating more than 3 km of encroachment in the Arcelor Mittal railway right-of-way. It also allows eliminating curves near steel-wood bridges. The reduced number of watercourse crossing structures enables in fact to decrease the encroachment in fish habitat and the embankment in water bodies.

Hence, Scenario 0 globally results in significant gains at the level of road safety (readability and anticipation, etc.), road maintenance and traffic management during construction work, as well as from an environmental standpoint.

5 Project Description

Following the comparative analysis of variants, the optimal road alignment (Scenario 0) has a total length of 68.9 km (Map 1.1). Although Scenario 0 was developed assuming a design speed limit of 90 km/h, some horizontal or vertical curves could not be standardized for such a speed limit, particularly due to technical (proximity of a railway or power line, presence of railway crossings and lake or stream crossing sites, etc.) or economic constraints.

5.1 Technical Specifications

Route 389 is classified as a national road and it will be completely paved. The main design criteria considered for the development of the proposed road alignment and profile include, among other things, a speed limit of 90 km/h, desired and absolute maximum slopes of 4 and 7%, respectively, and lane and shoulder widths of 3.3 and 2 m, respectively. The width of the right-of-way to be cleared will vary according to the profile of the terrain and road, but should generally be in the range of 30 to 35 m.

5.2 Vehicle Types, Potential Users and Traffic Flow

The new alignment of Route 389 will facilitate travel towards Newfoundland and Labrador as well as the access to the development of natural resources. The main users of the road are trucks supplying the town of Fermont and nearby mining projects. This regional road is also used for the mobilization of workers and residents. The initial annual average daily traffic (AADT) expected is of 373 in 2022 (year of commissioning of the project) with a mean annual increase of 1%.

5.3 Location of Temporary Camps

Two temporary camps with an accommodation capacity of 75 to 100 people each are planned during construction work. Their location will be determined by the contractor and in consultation with the MTQ. The camps will require a drinking water supply source that will likely come from a lake adjacent to the camp sites. An appropriate treatment system will be installed. As well, a wastewater treatment system will also be set up in compliance with the applicable regulation. Camp sites will be restored to their original condition at the end of the work.

5.4 Auxiliary Trackage, Railways and Safety Standards

Slow lanes (total of about 13 km) will be necessary and localized where a reduction in speed of at least 15 km/h is calculated. The location of these slow lanes will be determined with preliminary plans and specifications. Side widening lanes for safety stop will also be developed about every 10 km, alternating in north and south direction, to ensure the safety of users when crossing non-standard vehicles. A total of eight such lanes of 100 m each are planned.

A single railway crossing is planned between the railway and the road alignment (chainage mark 502+530), which will be constructed to meet MTQ standards.

5.5 Waste Management

The waste generated by the construction of the road will be transported to the closest landfill site where it will be properly managed (remote landfill site). Disposal areas (location TBD) for excavated and non-reusable materials will be required. Reuse on the slopes of the road to be smoothed will be encouraged.

5.6 Road Construction

Deforestation generally corresponds to the width of the right-of-way. However, additional bands are planned for discharge ditches and in some curves for better visibility. In addition, five borrow pits, which may constitute sources of materials, have been identified (Map 3.1 in pocket insert). The use and restoration of borrow pits will be in compliance with the *Regulation respecting standards of forest management for forests in the domain of the State* (RSFM). In total, the approximate surface area of deforestation is 265.95 ha for the permanent road and approximately 221.18 ha for borrow pits and their access roads.

Since the project area is located beyond the limit of mature forest, a certain amount of woody debris could be transported to predetermined sites and made available after construction, together with the tallymen if they wish to recover them.

Wetlands (peatlands) will either be excavated or filled according to their thickness and their characteristics. Balancing culverts will be installed to ensure good drainage. Blasting will be required in some places, but blasting locations are not known for the time being.

Disposal areas will be developed for borrow pit material excavated that cannot be used for the construction of the road. Topsoil will be set aside to be reused on the slopes of the road and to cover disposal areas to be revegetated (mechanic or hydroseeding).

The installation of culverts will be done under dry conditions either by diverting the watercourse using a temporary diversion channel, by pumping the water or by using cofferdams depending on the size of the watercourse. Temporary protection structures against erosion and sedimentation ponds will be set up where appropriate during construction.

5.7 Drainage

Route 389 being of rural nature, the management of runoff from the pavement is ensured through side ditches and discharge ditches, as well as culverts and bridges, while making sure to respect the natural stream flow and surface runoff.

The proposed structures will comply with MTQ standards as well as with those of the MDDELCC, the MFFP and the Department of fisheries and Oceans (DFO).

5.7.1 Culverts

In total, 17 streams require the installation of culverts with an opening smaller or greater than 4.5 m (Map 3.1 in pocket insert). The new culverts will be made of reinforced concrete or high density polyethylene (HDPE) for unstable soil areas. Culverts with a concrete rigid frame, but without a reinforced concrete raft foundation are planned where reinforced concrete culverts are insufficient.

5.7.2 Bridges

Currently, 11 bridges are planned (Map 3.1 in pocket insert), of which nine are of steel-wood type and two of steel-concrete type (Pékans River and De La Rue Lake crossing sites). At this stage of the project, the hydraulic and specific geotechnical studies for the structures have not yet been carried out. The geometry of the structures as well as estimates and recommendations are subject to revision after the completion of additional land and bathymetric surveys. Bridges will be 11.4 m wide and an overload of 20% is planned. The bridge design was made considering a 1 in 50 year flood event. Where the flood plain was not excessively larger compared to the bankful width, the DFO's Operational Statement "Clear-Span Bridge" has been respected.

5.7.3 Ditches

Side ditches ensure runoff management along the new pavement. They have a width of 1 m, a minimal depth of 500 mm below the line of infrastructure and a minimum slope of 0.5%.

5.7.4 Road Maintenance

Given that the road will be completely paved, little summer maintenance will be necessary. Any failure in the pavement will be repaired if necessary. Culverts will be inspected to ensure that the flow is maintained and the structural state of bridges will be inspected on a regular basis. Winter maintenance will consist of adding abrasives, such as sand, in the grooves created following the passage of a surface grinding machine. No salt will be used.

5.7.5 Traffic Management during Construction Works

Traffic on Route 389 shall be ensured during the construction work. The traffic management was analyzed for the three segments of the road. For the construction of segment 1, only work at the ends of this segment are in conflict with traffic on the existing Route 389. Thus, during the work to connect the new segment with the existing road, traffic will be ensured by alternating traffic coming from each way or by temporarily expanding the platform of the existing road pavement.

The proposed road alignment for segment 2 overlaps with the existing road corridor on almost all of this segment. To avoid imposing on users alternating traffic over a length of several kilometres, the work will be carried out by sections with a maximum length of 3 km, for example, in order to better control the total length of obstacles and to limit the waiting time for users. In addition, alternating traffic will be managed by flaggers during working hours and by traffic lights at night.

Segment 3 requires no traffic management measures in particular on the majority of its length. However, between chainage marks 535+300 and 542+100, the projected Route 389 uses the corridor of an existing gravel road leading to Carheil Lake. A few houses and gravel pits/quarries are present along this road. Traffic in this area must be ensured by alternating traffic or by the construction of temporary detour roads. As suggested for segment 2, it might be best to limit the length of road sections under work to reduce the waiting time for users.

Traffic on graveled roads will be ensured during and after construction work. Traffic will be ensured at the connection between the existing Route 389 and boulevard Jean-Claude Ménard, at the northern boundary of the project, by temporarily expanding the pavement or by ensuring alternating traffic.

Recreational trails are present between De La Rue Lake and the northern limit of the work area. A discussion with concerned organizations is planned to identify conflicts between these trails and the proposed work, and to see if their access must be ensured.

5.7.6 Project Timetable and Cost

The total estimated cost for the construction of the new road is about $150 million, including 20% contingency. The most expensive structures are the pavement, road structures, and culverts. The extra cost for the construction of slow lanes, totaling approximately 12 km in length, is preliminarily estimated at $4 million.

A deforestation contract and another one for the construction of the pavement will be awarded by the MTQ to complete this project. The deforestation work will take place from November 2018 to April 2019. The construction of the road will begin in May 2019 and will take place over a period of four years.

5.7.7 Road Restoration

The road section between km 490 and 507 will be dismantled. Culverts or bridges will be removed and watercourses restored to their natural state and revegetated. The road backfill will be scarified to facilitate its revegetation. The junction points between the current and future road will be closed to avoid vehicles travelling the old route inadvertently.

For now, it is planned to keep the existing Route 389 between km 478 and 490 as well as between km 507 and Fermont, passing through the mine site of Arcelor Mittal. There are ongoing discussions between the MTQ and the different users of the road with respect to the future maintenance of these road sections.

6 Impact Analysis and Mitigation Measures

6.1 Methodology

The impacts of the project were assessed based on their type (positive or negative impact on environmental components) and significance. It is worth noting that, such as prescribed by the Canadian Law, this section discusses negative impacts only. Positive impacts are discussed in Chapter 12. The potential negative impacts were first identified and their significance was then assessed for the construction and operating phases, and this, based on objective knowledge and measurable variables, such as the intensity (low, moderate or high), the extent (site-specific, local or regional) and the duration (short, moderate or long).

The sources of impacts during construction are essentially related to the presence of a worksite and to general construction activities, including deforestation and grubbing, earthwork, grading and digging of ditches, watercourse crossing sites and watercourse rehabilitation, road subbase and surfacing, the use of borrow pits and the dismantling of the existing section of Route 389 between km 490 and 507. The sources of impacts during the operating phase are rather related to the presence and use of the road as well as its maintenance and repair.

Once the significance of the impacts is established, mitigation and compensation measures to minimize or compensate for the negative impacts were identified. Residual impacts, those that remain following the proposed mitigation measures, can then be measured (see Section 6.3).

During the construction work, several very effective techniques widely used in the world will be used to minimize the impacts of the work, such as to limit erosion and control sediment transport. These techniques are listed in the general plans and specifications, the environmental specifications, the *cahier des charges et devis généraux* (CCDG), as well as in road construction standards. In addition, an environmental representative will be continuously present on the worksite to ensure the implementation of all appropriate environmental protection measures.

6.2 Physical Environment

6.2.1 Air Quality

The impact of the construction work on air quality is essentially linked to the emission of atmospheric contaminants (e.g. PM_{10}, $PM_{2.5}$, NO_x, CO, and SO_2), dust and polycyclic aromatic hydrocarbons (PAHs) related to worksite preparation and the use of vehicles and machinery necessary for the work (e.g. traffic, machinery, deforestation, blasting).

To minimize these impacts, the environmental requirements of the CCDG - *Construction and réparation* (MTQ, 2014) will be respected. To limit dust emissions, the watering of exposed surfaces or a dust suppressant will be used during dry periods. Granular materials stored on the site and containing fine particles will be covered with tarps and trucks carrying such materials will be equipped with retractable tarps. The location of crushing and sieving equipment and of the concrete plant will be selected to minimize atmospheric emissions outside. In addition, emission control systems of vehicles and equipment will be operational and respond to existing standards. Attention will also be paid to avoid running engines unnecessarily in order to reduce the disturbance of the environment with exhaust gases, smoke, and dust.

During the operating phase, atmospheric contaminants and dust will also be released, in addition to the resuspension of dust deposited on the pavement and abrasives used in winter. However, due to the low level of emissions related to the use and maintenance of the road, no mitigation measure is planned during the operating period.

6.2.2 Soils

During the construction period, the main impacts on soils result from the risk of contamination due to spills or leaks during construction work, as well as the risk of erosion of bare soil and sediment transport to watercourses. Removal of the vegetation cover for the use of borrow pits may also reduce the absorption and retention of surface water as well as causing erosion. Dust could also be transported outside of these operating sites.

To prevent soil contamination, mitigation measures will be implemented relative to the maintenance and repair of vehicles and machinery, reservoirs of petroleum and chemical products, as well as an emergency response plan in case of spills and the use log boom if necessary. In addition, effective mitigation measures will be implemented to limit erosion and sediment transport during activities related to cutting, filling and slope areas, restoration, scrap materials, temporary access roads and the use of borrow pits, for example.

During the operating phase, the presence and use of the road will represent permanent sources of impact on soils, such as changing the natural drainage, the banks, the substrate and morphology of watercourses at crossing sites, the waterproofing of a large surface area, the concentration of runoff toward the drainage system and the erosion of slopes. The use and maintenance of the road may also cause contamination and erosion of soils, as well as sediment transport.

Upgrading of the road to meet current standards, the regulations on the transportation of dangerous goods, the heavy transport safety standards and the implementation of the "Responsible management" program of the Canadian Chemical Producers Association will reduce the risks of contamination. In terms of erosion and sediment transport, specific mitigation measures to ensure slope stability, as well as for the maintenance of ditches and to reduce sediment transport (e.g. filter berms, catchment or sedimentation basins) will be implemented.

6.2.3 Surface Water

The presence of a worksite, general construction activities and the use of borrow pits have the potential to negatively affect the quality of surface waters in the study area and may disturb watercourses during construction work in the aquatic environment. In addition, potential impacts include increased turbidity and suspended solid (SS) concentrations, as well as the contamination by fecal coliforms, nutrients and other contaminants related to wastewater and domestic waste.

In order to prevent contamination of the aquatic environment, domestic wastewaters will be treated at a wastewater treatment plant that meets regulatory requirements (e.g. the *Regulation respecting the application of section 32 of the Environment Quality Act*) and applicable standards. Domestic waste and part of the construction material waste will be managed on-site. Non-hazardous residual waste will be buried in a remote landfill site that will respect the guidelines and design criteria of the *Regulation respecting the landfilling and incineration of residual materials*. Residual hazardous waste that cannot be eliminated at the landfill site will be managed in compliance with the *Regulation respecting hazardous materials*.

Environmental standards and requirements of the document *Normes – Ouvrages routiers* (MTQ, 2015) and of the CCDG (MTQ, 2014) related to erosion and the release of contaminants into the natural environment will be applied. Additional measures relative to construction work near watercourses and the aquatic environment, the prevention of contamination by petroleum hydrocarbons and borrow pits will be applied.

During the operating phase, the main impacts include increased runoff, the risk of oil spills and the contamination of surface waters, as well as the risk of disturbance of the natural environment. Road surface waterproofing will cause runoff to go directly toward drainage ditches, which could change the flow regime of some watercourses hydraulically downstream from the road. Runoff is the main route of entry of road contaminants into the aquatic environment. The design of a drainage ditch system suitable for local land conditions will minimize these impacts.

In addition, during snow melt and spring rains, the abrasives applied in winter will be transported towards ditches and eventually to the aquatic environment downstream of the road. Heavy metals in the exhaust of vehicles can also reach the aquatic environment. Concerning the risks of accidents and oil spills, the MTQ has an emergency response plan for these types of situation (see Chapter 8).

Regular road structure inspections will be carried out and any problem will be promptly corrected. Culverts shall be inspected to verify their state and to make sure that the flow is not obstructed or that there are no signs of erosion downstream. The criteria to monitor during the inspection and maintenance of bridges and culverts are derived from the *Lignes directrices pour la protection environnementale du milieu aquatique* (MTQ, 1992) (or the guidelines for the environmental protection of the aquatic environment). The maintenance of ditches will be done using the *Méthode du tiers inférieur* (or lower third method) (MTQ, 2001), which allows to limit erosion problems and excessive sedimentation of ditches, to improve water quality and to reduce the maintenance cost of ditches (Clément, 2004).

6.2.4 Groundwater

Under construction, the impacts on groundwater include the risk of contamination due to the presence of camps and worksite facilities and construction activities, as well as the drawdown of the water table due to the use of borrow pits.

The presence of the two temporary camps, the use of machinery and facilities provided for their maintenance, as well as reservoirs for fuels, oils, chemical products of all kinds and residual hazardous waste are all at risk of contaminating groundwater in the event, for example, of an accidental spill. If a groundwater catchment structure is used for the water supply, point source contamination of groundwater could compromise the supply of drinking water to the camps. To protect groundwater by preventing the discharge of contaminants into the environment, relevant mitigation measures taken from the *Normes – Ouvrages routiers* (MTQ, 2015) and CCDG (MTQ, 2014) documents, as well as the applicable regulations will be implemented. In addition, measures aimed at the maintenance of machinery, the restriction of traffic, the management and disposal of residual hazardous waste in compliance with the legislation in force will also be implemented. Finally, the emergency response plan for contaminant spills will be applied, where appropriate, to limit contamination of surface soils and prevent migration of contaminants to the superficial groundwater table (see Chapter 8).

The use of borrow pits may also be a source of impact on groundwater if the use of materials located below the groundwater level is required. In this case, the pumping of water will cause a local drawdown of the water table. However, borrow pits will be operated in compliance with the RSFM and, when possible, the use of borrow pits at a depth below the upper level of the groundwater table will be avoided.

During the operating phase, the presence of the road will permanently change the drainage of the area, resulting in a decrease of the effective infiltration of rainwater into soils and, therefore, decreased recharge to groundwater. This may cause a lowering of the water table under the roadway and roadside. However, nothing indicates that groundwater on the edge of the road and in the study area are currently used as a resource. No mitigation measures is therefore planned for this potential impact. Furthermore, the transportation of dangerous goods on the road is also at risk of contaminating groundwater in the event that a major spill is not quickly controlled. The MTQ has an emergency response plan to intervene adequately in such circumstances (see Chapter 8).

6.3 Biological Environment

6.3.1 Land Vegetation

Construction activities such as deforestation and the use of borrow pits will result in habitat losses that will reach up to 487.13 ha of forest stands (221.18 ha of encroachment for the road and 265.95 ha for borrow pits). The vast majority of the impacted areas, more than 90%, is occupied by black spruce-moss and lichen stands. To the extent possible, worksite facilities will be developed in previously disturbed areas or on bare land to minimize these impacts. However, if no such areas are available, minimal deforestation will be done. At the end of the work, these facilities will be dismantled and the site rehabilitated.

Given that, at the regional level, the main forest stands to be deforested are abundant and common within the study area, the losses incurred will have no significant impact on the specific richness of plant communities, both at the local and regional levels. In addition, no exceptional forest ecosystem or forest ecosystem of specific interest for conservation is affected by the project.

Common mitigation measures include seeding of bare soils, revitalization of borrow pits, revegetation of temporary worksites, as well as keeping a riparian buffer strip such as required by the RSFM. Other measures apply to machinery, the reworking of soils, deforestation, the stabilization of soils during the redevelopment of disturbed areas, the boundaries of work areas and the risk of forest fires.

Once built, the road will create a dispersal corridor that could potentially contribute to the introduction of some invasive species (e.g. exotic species colonizing the road's right-of-way and ditches, birch and poplars colonizing areas recently cleared and thinned, willows and mountain serviceberry advantaged by the maintenance of the right-of-way). These changes would be limited, however, to a migration northward of the limit of distribution of some species already present in the bioclimatic domain of spruce-moss stands and, therefore, to the emergence of a few new non-abundant species rather than a complete monospecific invasion of a site. No specific mitigation measures is therefore considered necessary during the operating period.

6.3.2 Wetlands

Several mitigation measures were implemented as soon as the design phase of the project to avoid and minimize the potential impacts of the project on wetlands. Nevertheless, 30 wetlands are affected by it, including 26 bogs and 4 shrubby swamps. Total losses are estimated at 8.5 ha, or 3.6% of the total area of the road right-of-way. However, wetlands present in potential borrow pits (11% of these or 29.7 ha) will not be affected.

The measures that will be implemented during the construction phase involve the stripping, excavation, filling and grading of work areas to keep the natural topography and prevent erosion, the disposal of woody debris and natural waste materials, the boundaries of work areas, the choice of location of temporary facilities, encroachment, the risks of forest fires and the renaturalization of banks. Other measures are also implemented relative to the flow conditions and drainage of wetlands impacted by putting in place a series of balancing culverts or a road structure sufficiently permeable to allow the movement of the water table (permeable embankment).

Thus, hydrological and biogeochemical functions of wetlands of the region will not be modified and their ecological functions will be little affected. The loss of wetlands due to the construction of the road will especially affect peatlands and will result in a reduction of their terrestrial and aquatic habitat functions. The construction of the road will not affect the other functions and the value of wetlands in the study area, i.e. their social, cultural, aesthetic and recreational values. In addition to the usual mitigation measures (e.g. prohibit the movement of the machinery outside the main road alignment, avoid modifying the natural drainage and use appropriate techniques for erosion control during construction), no specific measures are planned to mitigate these impacts.

During the operating phase, the presence of a road corridor could promote the introduction of exotic plant species in wetlands affected by the project, thereby affecting primarily their ecological functions. Yet, no specific mitigation measures are considered necessary here.

The compensation project proposed for the loss of wetlands aims to develop a conservation plan for wetlands across the Pékans River watershed. Given the blatant lack of knowledge of the area, this plan will meet several objectives which aim to enable the use and management of wetlands in a sustainable way (Government of Canada, 1991). It will allow to list and locate wetlands, characterize the different types of wetlands, assess functions and the ecological value associated with them and provide a unique basis of knowledge and information on the wetlands of this watershed. This project will therefore contribute to complete the state of knowledge on wetlands of the Côte-Nord administrative region presented by *Canards Illimités Canada* in 2009.

6.3.3 Special Status Plant Species

The survival of several specimens of *Antennaria rosea subsp. confinis* is compromised by the construction of the road, but not by the use of borrow pits. The alignment of the new road is located 90 m from the largest colony of the species, while it crosses into the center the second largest colony located at chainage mark 500+820. This species is very sensitive to trampling, moderately sensitive to the alteration of drainage (CDPNQ, 2008) and not very sensitive to the opening of the canopy.

For individuals located outside the road right-of-way, the mitigation measures will include to report the presence of specimens and to prohibit any traffic or activity around them, to avoid the alteration of the soil surface layer nearby, to avoid water accumulations (ruts, etc.) and to carry out work nearby when snow cover provides protection to this species. Moreover, a perimeter will be delineated around the habitat of the species as a minimum protection against microclimatic alterations caused by an edge effect. For individuals found within the right-of-way, the specimens will be relocated under the supervision of a competent botanist in similar habitats conducive to their growth. Seeds may also be harvested for conservation purposes. Transplanted colonies will be monitored over a period of at least three years.

There is no evidence to believe that the operation and maintenance of the road can have negative effects on this species. The presence of a new road corridor could even encourage the spread of the species in the right-of-way adjacent to the existing population. Therefore, no mitigation measure seems necessary.

6.3.4 Herpetofauna

Under construction, deforestation, filling and cutting work, the installation of culverts and the development of borrow pits will cause habitat losses for four species of herpetofauna in the study area. Total permanent losses are estimated at 221 ha for the road right-of-way and 266 ha for borrow pits. These losses will mainly be observed in black spruce-lichen (268 ha) and black spruce-moss stands (170 ha) for the road and borrow pits, respectively. The installation of culverts and the construction of bridges at 28 crossing sites will disturb the habitats used by some species.

The noise caused by construction activities is likely to scare individuals in the vicinity of the worksite and interfere with their reproduction (Sun & Narins, 2005; Bee & Swanson, 2007). Road traffic can also cause mortality to these species (Mazerolle, 2004; Fahring & Rytwinski, 2009). In addition, the installation of culverts will cause punctual and temporary increases in turbidity and SS concentrations, which can in turn harm amphibian eggs and the gills of amphibian larvae (Semlitsch, 2000), as well as degrading aquatic habitats. All these impacts will not, however, threaten the survival of amphibian populations across the study area due to the abundance of habitats of interest on the outskirts of the affected areas. The four species confirmed in the study area are also widely distributed in Quebec.

The selected mitigation measures are intended to rapidly stabilize, revegetate and replant temporarily disturbed areas, to install sediment barriers, to keep the required riparian buffer strips adjacent to water bodies, to limit the reworking of soils, to minimize trampling and compaction of vegetation and soil and to locate access roads outside riparian areas and wetlands. The RSFM guidelines for deforestation on the edge of aquatic environments and the governmental guidelines for culverts will also be applied.

Impacts during the operating phase are similar to those in construction (barrier effect, mortality, noise and risk of contamination by dust and transport of contaminants by runoff). Mitigation measures that will be implemented are to mitigate atmospheric emissions (dust) at the source and to limit the use of abrasives near culverts (leaching in watercourses).

6.3.5 Ichthyofauna

The presence of worksites as well as construction activities will inevitably lead to some impacts on fish and their habitat, including an increase in the SS concentration related to permanent structures, obstacles caused by temporary structures, disturbance during spawning, hatching of eggs and rearing periods and the permanent loss of 3,500 m^2 of habitat.

According to Bash *et al.* (2001), extended exposure to a large amount of SS would have physiological and behavioral effects on fish as well as on their habitat. Downstream of the watercourse crossing sites, a potential increase in the water temperature of small streams could be observed due to the deforestation of banks and warmer and more turbid runoff inputs to streams. Other impacts include the settling of solid material on rock or gravel substrates used for the reproduction of fish, the risks of oil spills or leaks and the possible development of periphyton and algae in small streams due to the potentially more significant inputs of organic matter and phosphorus.

Mitigation measures and good practices proposed to reduce impacts on fish habitat are essentially the same as those discussed in the section on water quality to limit the amount of fine particulate matter in runoff and watercourses. Specific mitigation measures will also be applied to protect the habitat of the main fish species of interest during the spawning, hatching of eggs and rearing periods. As much as possible, no work in the aquatic environment, including temporary diversion canals, will be performed during the fish upstream migration and spawning periods.

Certain steps in the construction of bridges and installation of culverts will result in the temporary loss of fish habitat, including the setting up of cofferdams for the development of abutments of bridges and the temporary diversion of watercourses for the installation of culverts. On the other hand, permanent fish habitat losses entailed by the construction of the road are mainly associated with the new culverts and backfilling on the edge of the road. In order to minimize the encroachment of the fish habitat and to ensure the free movement of fish at crossing sites, culverts will be installed in compliance with the requirements of the *Tome III des Normes IV Ouvrages d'art du MTQ* (2014). As well, the design of the various structures will comply with the DFO guidelines, good practices, recommendations, and operational statement (2012, 2010, 2007a, and 2007b, respectively).

Two avenues are being considered for the proposed fish habitat compensation program: the removal of culverts found on the portions of Route 389 to be dismantled and the development of spawning habitats for brook trout. Where the proposed road is located in the same place as that of the existing road, culverts will be dismantled and replaced with properly designed culverts. Otherwise, the culverts will be dismantled and the bed of the watercourse will be restored to recreate initial flow and substrate conditions as much as possible. These culverts will allow brook trout to reach new areas upstream of the road that are suitable for reproduction, rearing and feeding. A total of 12 compensation sites would serve to develop spawning grounds for brook trout (riffle sections with gravel upstream and downstream or gravel boxes) over a total surface area of 2,200 m^2 (Map 3.1 in pocket insert). Since the development of spawning grounds will increase productivity for this species of interest, this will largely compensate for the loss of lower quality habitats.

During the operating phase, most of the road infrastructure should cause little additional impact on fish habitat. Potential impacts arise from changes in water quality due to sediment inputs, to the increase in water temperature, as well as the drainage of the road and the transportation of various pollutants to the aquatic environment (e.g. hydrocarbon residues). The deviation of drainage ditches toward stable vegetation areas located more than 20 m from the natural high water mark (NHWM) will reduce inputs to the surrounding aquatic environment. Other water quality changes arising from the use of abrasives (sand) and the maintenance of drainage ditches are anticipated. The intensity of changes in water quality will be low due, among other things, to the use sand as an abrasive. During the maintenance of the road and its drainage ditches, mitigation measures proposed by the DFO (2010) will be applied.

Greater access to the territory could cause an additional pressure on species targeted by sport fishing between chainage marks 502 and 536. Fishermen will however concentrate near crossing sites and will have to comply with applicable provincial regulations.

6.3.6 Bats

Under construction, deforestation and the use of borrow pits will decrease the amount of habitats available over a surface area of 452.6 ha of forest stands as well as of 8.5 ha of wetlands. Since forest stands and wetlands will remain abundant in the area, the amount of summer habitats as well as feeding areas will likely remain sufficient. Also, no natural structure providing a privileged habitat has been identified in the project study area (Gauthier *et al.,* 1995). The surface area of habitats destroyed by construction activities does not represent a restricting element for these species.

Activities involving deforestation, blasting and transportation of equipment have the potential to disturb individuals who are close to the worksite, notably due to the noise, road traffic or the destruction of habitats. Bats are generally sensitive to disturbances. However, no significant colony was identified in the study area. The deforestation restriction period aiming to protect nesting forest birds (April 25 to August 13) will also protect bats during the calving and feeding of the young periods (June to August). In addition, the construction work will be carried out during the day, thus the various bat species present should not change their feeding behaviour, since they are mainly active at night.

The deforestation work and earthworks, as well as the use of explosives may destroy cracks or caves and trees used by the various bat species. The young non-flying bats and hibernating adults are likely to be killed at the time of the destruction of these habitats. Nevertheless, the impact of these activities on the mortality of individuals is considered low, since deforestation work will be carried out outside of the calving and feeding of the young periods (June to August). The traffic of vehicles on the access roads is also likely to cause mortality, but this impact is expected to be non-significant given the low flow of traffic during the construction phase. Measures to minimize deforestation and impacts on vegetation and soils, to promote revegetation and reforestation, as well as the application of the RSFM guidelines will help limit the impacts on bats.

During the operating phase, modified "dry barren" type habitats in the slopes of the new road segments may be favorable to the movement of bat species for which borders can represent a habitat of interest. Otherwise, the noise generated by vehicles may cause bats to avoid the road area, but the low traffic flow anticipated as well as the small width of the right-of-way will not create a barrier impermeable to the movement of these bat species. Finally, a number of collisions with vehicles can be expected, but no specific mitigation measures are considered necessary for this group of species during the operating phase.

6.3.7 Mammals

6.3.7.1 Micromammals

As for bats, the main impacts of the project on micromammals during the construction period include the loss of terrestrial and wetland habitats, the modification and disturbance of habitats, and an increase in the risk of mortality. All plant communities found in the study area represent a potential habitat for micromammals. Deforestation and construction activities will result in the permanent loss of 206.8 ha of terrestrial habitats and 8.5 ha of wetlands used by micromammals. The use of borrow pits will entail the loss of 247.6 ha of forest stands if all of the pits are used.

Habitat modifications will impact species that especially use forest environments such as the Gapper's red-backed vole, the deer mouse and the woodland jumping mouse that will have to move towards adjacent forest environments. For the rock vole, a species likely to be designated threatened or vulnerable, the main threat would be logging, which can have an impact on the loss of habitat and the isolation of populations (Duhamel & Tremblay, 2013). It is important to note, however, that the peatland where an individual was captured will not be affected by deforestation activities and construction work.

A second species likely to be designated threatened or vulnerable and likely to be observed in the study area is the southern bog lemming. However, studies are needed to determine its status and to identify threats to this species. The latter uses sphagnum and ericaceous peatlands, grassy marshes and mixed forests surrounding peatlands (Desrosiers *et al.*, 2002). Deforestation and other construction activities will cause the loss of 8.5 ha of peatlands and swamps, which are preferential habitats for the southern bog lemming.

As for bats, measures to minimize impacts on vegetation and soils, to promote revegetation and reforestation, as well as the application of RSFM guidelines will limit the impact of the project on micromammals.

Once the road is in operation, modified "dry barren" type habitats and borrow pits will provide favorable habitats for some micromammal species, but less for others. In addition, given the general integrity of surrounding habitats, road traffic projections and the width of the right-of-way, the proposed road will be permeable to the movement of micromammals. Finally, the road will increase the collision and mortality risks. However, since micromammals tend to avoid roads or to get across them quickly and since they have a high reproductive rate, no specific mitigation measures are considered necessary.

6.3.7.2 Large Mammals

During construction, the main impacts expected on large mammals include the loss of terrestrial and wetland habitats, disturbance, the risk of collision and an increased hunting pressure. Deforestation and construction activities will cause a permanent loss of terrestrial habitat for moose, black bears, woodland caribou and migratory caribou. Depending on the species, these habitat losses are of the order of 202 to 221 ha for the Route 389 right-of-way and 247 to 266 ha for borrow pits. Mitigation measures to reduce habitat losses by restricting traffic and avoiding certain sensitive environments will be applied.

The noise caused by construction activities has the potential to disturb large mammals close to the worksites. The temporary functional habitat loss could affect the feeding, breeding and rearing behavior of large mammals, especially in winter when movements are more difficult. Black bears could be disturbed during the hibernation period, but given the low density of bears in the study area and the relatively narrow right-of-way of Route 389, very few bears should be affected. In addition, migratory caribou is unlikely to use the study area during the construction phase. However, the woodland caribou is a species sensitive to disturbance and will probably avoid the work area during the construction period. Calving (in spring) would also be a critical period of the annual life cycle of the species during which caribou are most sensitive to disturbance (Li *et al.*, 2012). These temporary impacts shall however cease at the end of construction work.

Some increase in the hunting pressure on moose may be induced by construction workers. For black bears, the hunting pressure should not increase given in part to the low rate of capture in the region (Lamontagne *et al.*, 2006; Lefort and Massé, 2015). As for woodland caribou, sport hunting has been prohibited in hunting zone 19 south since 2001.

For black bears, the camps and the landfill site may attract some individuals and threaten the safety of workers, which could result in the displacement or the slaughter of unwanted animals. The management of these sites should thus be done according to the standards in force and an information campaign to make workers aware should be carried out in order to mitigate this impact.

During the operating phase, a loss of functional habitat for black bears and moose is expected since the road will provide a habitat less suitable for these species and since individuals may avoid the area due to noise or to avoid users of the road. However, the road should not be a barrier to movement and, given the low density of these species in the study area and the low traffic flow anticipated, this impact will be limited. In addition, the number of collisions with these species may increase on the new road, resulting in an increase their mortality rate. However, the improvement of the visibility should help reduce this risk. For cost-benefit reasons (Huijser *et al.*, 2009) and given the low proportion of accidents involving large mammals, there is no reason to consider major mitigation measures at this level. However, some simple measures (e.g. road signs) will be implemented along the road.

For the woodland caribou, a special status species, the main impacts include habitat modification and fragmentation, road avoidance behavior, increased predation and harvesting for food, ritual or social purposes, as well as poaching. It is worth noting that the study area of the project is located in the northern portion of the area where the *Plan de rétablissement du caribou forestier au Québec* (Équipe de rétablissement du caribou forestier, 2013) (or the *Quebec Woodland Caribou Recovery Plan;* Woodland Caribou Recovery Team, 2013) is applied. In this area, the forest environment is free from logging and large-scale disturbances include mainly forest fires. Linear disturbances are limited to the access roads for mining projects, power lines, the existing Route 389, as well as railways. Nevertheless, given the proximity of the town of Fermont, the existing Route 389 and the many mining projects in the area, this factor is important to consider. Impacts on woodland caribou populations will be especially observed along the 45 km of new road (segment 3). Mitigation measures to control moose and black bear harvesting and to reduce the risk of poaching will be applied. Several measures are listed in the *Plan de rétablissement du caribou forestier au Québec* and the MTQ could contribute to the implementation of these measures in cooperation with the MFFP.

6.3.7.3 Small Mammals

Deforestation and other construction activities will result in the permanent loss of 205 ha of forest stands, 8.5 ha of wetlands and 1.8 ha of dry barrens. If the totality of borrow pits are used, an additional 247.6 ha of forest stands will be cleared. At the level of the right-of-way, the new "dry barren" type vegetation on each side of the road will be favorable to ubiquitous species and species using open environments.

As for other mammals, construction activities will disturb small mammals. The effects will be felt especially on species with small ranges. The efforts made by the herbivores (e.g. American porcupine, woodchuck, and snowshoe hare) to move to a safe environment could alter their physical condition or increase their vulnerability to predation. These temporary impacts shall however cease at the end of the construction work. Construction activities and traffic will also increase the risk of mortality, primarily for species associated with trees (e.g. red squirrel, northern flying squirrel, eastern chipmunk, American porcupine, American marten), as well as the young of the majority of species that are confined to nests or burrows for several weeks before moving independently. Waste management sites, workers feeding animals and the smell of food will attract some animals (e.g. grey wolf and red fox), resulting in the displacement or the slaughter of these animals.

All these impacts will not, however, threaten the survival of populations of fur-bearing animals across the study area, due to the abundance of habitats of interest on the outskirts of affected areas and the high reproduction rate of the majority of species. All species reported in the study area are also widely distributed in Quebec. However, a series of mitigation measures are planned to reduce mortality, disturbance, and habitat loss by restricting traffic to specific corridors and by avoiding certain sensitive environments. Other measures will be applied to reduce the number of unwanted animals.

For small mammals, the presence and use of the road in the operating phase are likely to change the quality of the habitat in segments 1 and 3 of the projected road as well as to increase the risk of mortality associated with collisions in segment 3 mainly. In terms of habitat fragmentation and road avoidance behavior, the proposed road should not be a barrier to the movement of small mammals, but rather act as a filter limiting somewhat movement from one side of the road to the other. Finally, the presence of a new 45 km stretch of road will increase accessibility and thus harvesting for food, ceremonial or social purposes, as well as poaching. Local populations of species that are of interest for trappers of the furbearer management unit 60, namely the American marten, Canada beaver and red fox, may therefore decline. Specific measures to reduce the number of deaths associated with road collisions and poaching, as well as measures to reduce the effect of this semi-permeable barrier will be applied.

6.3.8 Avifauna

In general, the three groups of birds studied, namely waterfowls and other aquatic birds, raptors and terrestrial birds, will suffer relatively similar impacts in the construction phase. These mainly include the destruction of nests, habitat loss, disturbance and fragmentation or the disturbance of birds and nests.

The number of nests destroyed by deforestation, earthwork, and grading necessary for the construction of the road and the use of borrow pits will depend, for example, on the overlap between the period where the trees and shrubs will be cut and the reproduction period of the different species present. It is worth noting that the project is located in the nesting area D5 for which the general nesting period of migratory bird is from April 25 to August 13 (Environment Canada, 2014a). It should also be noted that the *1994 Migratory Bird Convention Act* and the *Migratory Birds Regulations* prohibit disturbing or destroying nests of migratory birds.

As for other animals, the noise caused by construction activities will disturb the bird species present in the area. The sensitivity of birds to disturbance varies from one species to another as well as between individuals. Thus, in addition to birds nesting on the outskirts of worksites, some sensitive species using habitats further away will be disturbed by construction activities.

The construction work will affect 1.09 ha of water bodies, 28 watercourses, as well as 26 peatlands and four shrubby swamps of various sizes (total of 8.5 ha). In addition, the deforestation of the road right-of-way and borrow pits will destroy 206.2 and 292.6 ha of forest stands, respectively, which represents the loss of nesting habitats for birds. To the extent possible, worksite facilities will be set up in areas already disturbed in order to limit impacts. Otherwise, deforestation will be kept to a minimum. Deforestation will thus have a very low impact on the different habitats used by birds. At the end of the work, worksite facilities will be dismantled and the sites rehabilitated.

In total, the reproduction habitat (for nesting and rearing of young) of 6.5 indicated pairs of anatidae will be affected by the construction of the road, which represent a third of the nesting population observed in the study area. The low number of waterfowl nesting pairs potentially affected by the project should not impact the overall status of these bird populations. In addition to anatidae, some shorebird species could be affected by the loss of habitats. At these densities, wetland and forest habitat losses caused by the construction of the road could affect nearly three nesting pairs of Wilson's Snipe, nearly three nesting pairs of Spotted Sandpiper and one nesting pair of Solitary Sandpiper. In addition, at least four pairs of Greater Yellowlegs could lose part of their reproduction habitat.

For borrow pits, it is estimated that at least three pairs of Wilson's Snipe and three pairs of Spotted Sandpiper might be affected. The Solitary Sandpiper and the Greater Yellowlegs should not, however, be affected by the use of borrow pits, because the wetlands in these areas will be preserved. For terrestrial birds, the loss of nesting habitats will affect a total of 2,009 nesting pairs, of which 941 will be affected by the construction of the road and 1,068 by the use of borrow pits. In addition to these impacts, new food sources, such as food abandoned by workers as well as landfill sites, may attract opportunistic terrestrial birds like the common raven, the American crow and the Canada jay.

Mitigation measures for the avifauna essentially aim to limit disturbance and habitat loss, and this, by restricting traffic to specific corridors and by avoiding certain sensitive environments. If a nest containing eggs or chicks of a raptor species or of a species at risk during the construction work and the extraction of aggregates, the measures recommended by Environment Canada (2014b) will be applied.

Once the road is built, the potential impacts are mainly related to mortality and the disturbance of birds and nests. The road's right-of-way will be an open habitat that could be used for hunting for example. The avifauna found on road sides will have an increased risk of collision with vehicles. Birds nesting in habitats bordering Route 389 will continue to be disturbed by the noise of road traffic in the operating period. Depending on the intensity of the disturbance and the sensitivity of species to it, the stress caused by road traffic could ultimately lead to the abandonment of the nest and the displacement of pairs to other areas. However, given the low expected traffic flow and the speed limit of 90 km/h, the risk of collision and the disturbance due to noise is considered to be of rather low intensity. There exists few mitigation measures to limit these types of impact.

As for the maintenance of the road, mowing of the right-of-way and ditches will be carried out between August 13 and April 25, as recommended by Environment Canada (2014a), in order to avoid the possible nesting period, and thus, the destruction of nests.

6.3.8.1 Species at Risk

The Rusty Blackbird, the Olive-sided Flycatcher, the Bank Swallow and the Common Nighthawk are the four special status species identified in the study area. According to the observations of Rusty Blackbird, the new road right-of-way will run across two peatlands used by the species. Thus, it is considered that at least two nesting pairs will lose part of their nesting habitat due to the construction of the road. On the other hand, 26 other peatlands and four shrubby swamps, for a total of 8.5 ha, will also be affected by the construction of the road. It is therefore possible that additional pairs of the species may find their nesting habitat affected by the project. Since it is considered that wintering and migration habitats are the limiting factors for the species, it is likely that nesting pairs affected by construction activities will find new reproduction habitats relatively easily.

Two pairs of Olive-sided Flycatchers will lose part of their reproduction habitat due to the construction of the road. A maximum of one other couple could use the study area. It is also estimated that one to two couples could see their nesting habitat affected by the use of borrow pits. It is suspected that the loss or the deterioration of its wintering habitat is the main limiting factor for this species, thus couples affected by the construction of the road should easily find new suitable reproduction habitats.

It is not expected that the construction of the road will have an impact on Bank Swallow colonies. However, if the availability of vertical slopes is limited in the region, it is possible that the use of borrow pits will lead to the creation of nesting habitats favourable to this species. Management measures will be implemented if individuals were to settle in borrow pits.

It is estimated that a maximum of one couple of Common Nighthawk will be affected by the construction of the road and that at least one couple will be affected by the use of borrow pits. According to the information available on this species, the Common Nighthawk pairs potentially affected by the project should, on the other hand, easily find new suitable reproduction habitat.

6.4 Human Environment

6.4.1 Land Use by the Innu

Certain activities associated with the construction phase are likely to have an impact on land use by the Innu of Uashatmak Mani-Utenam for the three traplines affected by the proposed road (traplines 243, 255 and 256; Map 3.1 in pocket insert). Indeed, the presence of temporary camps, the different work necessary for the development of the infrastructure, the use of borrow pits and the presence of workers may affect land use due to the associated nuisance (noise, dust, vibrations, traffic, etc.). Thus, it is expected that the use of snowmobile and quad trails, as well as the use of gravelled roads will be affected the traffic of heavy machinery and construction vehicles. It is also possible that work activities will lead to the temporary closure of portions of these trails and roads. Regarding the opening of the territory, the Innu concerns include the loss and the disturbance of a significant number of animals and plants (potential impact on the hunting success), the deforestation and the destruction of habitats for animal and plant communities, the decrease in water quality, the fractionation of the territory and the net decrease in the surface area of the territory used by the Innu.

Mitigation measures relative to the communication of information, information to workers on hunting and fishing rules, the involvement of the Innu community in deforestation, road signaling and monitoring activities will be implemented to limit the impacts anticipated during the construction period.

The presence, use and maintenance of the road are also likely to have an impact on land use. In addition to the impacts mentioned for the construction phase, the opening of Route 389 will facilitate access to the territory for non-Natives, which could in turn affect land use by Native people since the road will overlap two traplines in the area (traplines 243 and 256). The Innu concerns include the opening of the territory to other mining, recreational and resort activities, the fractionation of the territory, the increase in the presence and activities of non-Native people in the region (hunting, fishing) and potential allochthonous misbehavior, the alteration of waterways, the cultural and historical heritage of the Uashannuat (cultural sites and burial places) and relations between Native and non-Native communities, mainly with regards to the accessibility and development of natural resources.

To minimize impacts during the operating phase, a communication program for users directly concerned and the community will be implemented and participation of the Innu community for road maintenance will be encouraged.

6.4.2 Land Use by Non-Natives

The development of the road infrastructure, the presence of workers and the use of borrow pit H will disturb the recreational and resort activities in the area. In total, eleven resort leases, two forest shelter leases, and two accommodations with no lease will be affected. In addition, the roads giving access to cottages located outside the study area could be impacted by construction work. The new road right-of-way and borrow pit H will also encroach on portions of snowmobile and quad trails as well as gravel roads, thus affecting their use during the construction period. The construction work are also likely to disrupt traffic along the existing Route 389, especially near Fermont, due to heavy machinery and an increase in workers commuting daily to work.

Since the project will result in habitat losses for moose, the accessibility of the resource or the chance of seeing a moose will be reduced in the work area and around it. Work activities will disturb the tranquillity of places visited by non-Natives and could scare away wildlife. The impact on hunting will only affect a relatively small number of hunters who will be forced to move to other places. Furthermore, the hunting pressure on moose could increase due to workers. In addition, white water rafting and canoeing are common activities in the region (Pékans River, Moisie River and Carheil Lake). Construction activities will make these water bodies temporarily less suitable for such activities (due to noise and vibrations) or inaccessible in some places (for safety reasons).

In order to limit the inconveniences related to the construction of the road, mitigation measures will be implemented to ensure good communication and meetings with workers and local communities, adequate signaling, good deforestation practices, compensations for resort centers and the safety of users.

During the operating phase, some increase in traffic is expected on Route 389. Users could also be tempted to ride faster, thereby increasing the potential risk of road accidents. Intersections between Route 389 and secondary gravelled roads or recreational trails (snowmobile, quad) will be areas with higher risks of accidents. Also, a better knowledge of the territory and an easier access to it could bring new fishermen and hunters in the area. This could make cohabitation difficult and even result in some conflicts with current land users, as well as increased pressure on wildlife resources of the territory. The only mitigation measure planned for this phase is proper road signaling where the road intersects with secondary roads, recreational trails and accesses to cottages.

6.4.3 Archaeology

Construction activities will directly affect five of the 42 areas with an archaeological potential identified along the selected road alignment and potentially three other areas found within the borrow pit areas. In order to limit the impacts of the project on the archaeological heritage of the region, an archaeological survey was conducted in summer 2015 within these eight areas. The survey did not allow to find new archaeological sites. It is worth noting that any chance discovery will be treated in compliance with the *Natural Heritage Conservation Act*. In the event of a significant discovery, it may be necessary to review the road alignment.

6.4.4 Sound Environment

The sound environment modelling results demonstrate that no exceedance of threshold values is anticipated for any of the construction activities at the most sensitive assessment point located in Fermont, except obviously for blasting activities. Overall, the construction phase will generate noise levels that can cause additional disturbance in homes along the road. Therefore, mitigation measures will be implemented during blasting and drilling activities and equipment generating noise will be selected accordingly. As well, time periods for noisy work and speed limits will also help limit these impacts.

During the operating phase, the modelling results indicate that, for all the selected assessment points, the anticipated noise impacts related to traffic on the new stretch of road are all low or equal to zero. No additional mitigation measure is therefore recommended.

6.4.5 Visual Environment

The presence of worksites during the construction phase will change the existing landscape and the visual field of observers. Indeed, in addition to being a visual nuisance, access roads, construction trailers, storage areas for materials, and machinery necessary for construction work will all contribute to alter the existing landscape. Also, depending on the location of worksites, these changes could be seen by a number of stationary (users of temporary camps for resort leases issued by the MNR) and mobile observers (users of waterways in summer and snowmobile trails in winter). It is also possible that users of the *Sentier vers le Grand Nord*, which crosses the northern area of the landscape units, see construction work while using this unmarked snowmobile trail.

The construction of structures to be developed will bring changes to two existing landscape units (BSF and LKS) and to the visual fields that can be seen by mobile and stationary observers. The presence of the new road infrastructure will have a strong impact on the landscape and it will be seen from both landscape units.

Deforestation activities are the only activities that will modify the existing forest landscape. They will result in a slight loss of riparian vegetation for the LKS unit. Deforestation will also contribute to increase the visibility of some portions of the new infrastructure for users of the landscape units. Deforestation will open views on the LKS unit from the BSF unit. These openings of interest will mainly be found at the crossing site of the Pékans River and De La Rue Lake, as well as along the northwestern part of Carheil Lake.

During the operating phase, stationary and mobile users will have a direct or indirect view on the new road depending on their location. This impact will be mitigated, when possible, by planning for open panoramic views on lakes and rivers while developing plans and specifications.

6.5 Assessment of Residual Impacts

In the end, all residual impacts (impacts remaining after the implementation of mitigation measures) are considered non-significant. Indeed, the design of the project itself has been optimized so that the sources of impact have been reduced as much as possible. However, some impacts are predictable on certain components. During the construction phase, impacts on the physical environment are mainly related to erosion due to various activities, such as stripping, cutting and filling work and the construction of bridges and installation of culverts. Terrestrial vegetation and wetland losses are also anticipated, as well as impacts on the fauna associated with these environments. In addition, the construction work will result in impacts on the activities of Native and non-Native people in the area.

During the operating phase, the maintenance of the road will result in different impacts on the physical and biological environments. For example, impacts will include the input of sand and gravel as well as an increase in SS concentrations in aquatic environments due to the repair of some structures. Finally, the very presence of the road could have some impacts on wildlife, including avoidance of the road.

7 Effects of the Environment on the Project

The effects that the project may have on the environment are mainly associated with extreme natural events, the presence of contaminated soils or damage to the infrastructure located near the road.

Among the natural events, extreme precipitation events can cause heavy flooding, which may have a negative impact at the level of the road structures or infrastructure. The latter can even be weakened if the flooding persists. Such a situation is very rare and is often caused by an improper drainage system. The abundance of wetlands and the upgrading of the road should help to avoid such a situation.

The increase in precipitation in the form of rain or snow associated with climate changes may cause changes in the environment which, in turn, are likely to affect the new road infrastructure. To take into account climate changes, the MTQ increases by 18% design flows of bridges and culverts.

The MTQ has an emergency response plan specific for major forest fires. The latter require important and concerted logistic efforts on the part of different stakeholders, including the *Société de protection des Forêts contre le feu* (SOPFEU). The MTQ general emergency response plan is detailed in Chapter 8 of this document. It should be noted that such situations are relatively rare. In addition, the new road alignment should not change the way the MTQ manages forest fires.

Regarding the risk of major earthquakes, their probability of occurrence is almost zero because the road is located in an area where no significant earthquake took place according to the available data, and in one of the most stable regions in Quebec or even in Canada (NRC, 2013). Thus, the risk that an earthquake causes damage to the road or its structures is considered virtually zero.

Finally, some sites located in the zone of influence of the future Route 389 are at risk of contamination. These sites correspond mainly to the railway backfills, some borrow pits and a snow deposit. In the event that Phase II of the environmental site assessment, which is planned before the beginning of the construction work, shows that soils are contaminated, a management plan will be implemented during the construction period to ensure that contaminated soils are treated according to the regulation in force. However, very few infrastructure of anthropic origin are found along the road. Hence, the risks associated with infrastructure or equipment failure that could affect the road are very low. Moreover, in the event of a contamination from the Fire Lake and Fire Lake North mining sites, which lie close to the road alignment, emergency response plans and measures must be implemented by these mining companies in order to manage such a situation safely. Finally, the transportation of dangerous goods on Route 389 may also constitute a risk of contamination in the event of an accidental spill. The MTQ's emergency response plan covers these risks.

8 Failures and Accidents and Emergency Response Plan

8.1 Failures and Accidents

The activities related to the construction of Route 389 may be affected by failures and accidents requiring emergency response plans to manage these problematic situations. Indeed, four types of failures or accidents are likely to occur during construction work, such as equipment and machinery failure, workers getting injured, accidental spills of hazardous materials or risks of fires. These risks of failures and accidents can, however, be mitigated by implementing some measures before and during construction work. These include the proper maintenance of equipment and machinery and the application of the Safety Code for the construction industry. The MTQ has emergency response plans allowing to ensure the management of accidental events which could have a negative impact on the environment. The MTQ indeed has a National Civil Protection Plan (NCPP) since 2003.

During road operation, some technical failures as well as work injuries could occur during maintenance and repair activities. The same measures implemented under construction will be applied.

8.2 Emergency Response Plan

The MTQ must provide assistance to users of the road and ensure the management of minor or major emergency events that can have a significant impact on transportation networks. As head of the 'Transport' mission, the MTQ has responsibilities in terms of public safety according to its NCPP.

To respond adequately to its mission and its responsibilities, the MTQ sets up a public safety organization to support decision making and coordination of actions to be implemented in the case of emergency events. The four dimensions of public safety are taken into account, namely prevention, preparedness, response and recovery. This ministerial organization of public safety has three coordination mechanisms: local coordination of emergency response measures, regional coordination of public safety and the ministerial coordination of public safety (MCPS). The MTQ staff supports these coordination mechanisms (MTQ, 2011).

The MTQ has a tool for managing emergency situations, namely the *Plan ministériel de mesures d'urgence et de sécurité civile* (PMMUSC or Departmental Emergency and Public Safety Plan), which takes into account the NCPP. The PMMUSC is one of the measures selected by the MTQ to mitigate or eliminate various natural and anthropogenic risks related to public safety and that can have an impact on the infrastructure, which is under the responsibility of the MTQ and is intended for users of the road (MTQ, 2011). The emergency plan is developed in compliance with the principles and conditions of the PMMUSC. The MTQ has also developed a *Plan régional des mesures d'urgence et de sécurité civile* (PRMUSC or Regional Emergency Response and Public Safety Plan) for the *Direction de la Côte-Nord*. The latter is regularly updated and is better adapted for the region in question. Two types of measures can therefore be deployed to address an emergency situation involving the MTQ: emergency response measures and public safety measures. An emergency response plan for the construction period and another one for the road operation period are planned in order to respond to emergency situations likely to occur for each of these two periods.

9 Cumulative Effects

Five valued environmental components (VECs) were selected for the assessment of cumulative effects. The time limits selected are from 1974 to 2042, which are the years corresponding to when the Mont-Wright mine began operating and the town of Fermont was founded and up to 20 years following the commissioning of the new road. Table 9.1 summarizes the selected VECs, the spatial limits considered and the selected indicators.

The past, ongoing and future projects and development activities considered within the spatial and time limits include mining and hydroelectric projects, power lines, road transport infrastructure, protected areas and wildlife reserves. Native and non-Native community activities located near the site were also considered.

Table 9.1 Scope of the Cumulative Effects Assessment

VEC	Spatial limit	Indicators
Woodland caribou	40 km around the proposed road alignment	Rate of disturbance of the caribou range (% of the area)
Fish habitat	The Petite Rivière Manicouagan, Pékans River and Carheil Lake watersheds	Loss of habitat (in ha)
Wetlands	Third level of the ecological reference framework (mounds of petit lac Manicouagan and Vallard Lake)	Surface area of wetlands, loss of wetlands
Tourism activities	Expanded area of the town of Fermont	Resort leases, tourism
Land use by the Innu	Traplines affected by the project	Historic use, testimonies, surface area affected by the project

9.1 Assessment of Cumulative Effects

9.1.1 Woodland Caribou

The analysis allowed determining that the existing and projected disturbance rate for the study area (22.4% versus 25.6%, respectively) are below the minimum recommended by Environment Canada (2011), which is 65% of undisturbed habitat. The disturbance rate of the project is also lower than the value recommended for the woodland caribou, which is of 35% (woodland caribou recovery team, 2013).

The Program will result in the loss of approximately 48.1 km² of woodland caribou habitat. Despite the fact that this area is considered good-quality habitat, it represents only 0.5% of the territory within the spatial limits considered. Individuals who are currently using these habitats may move on the outskirts in similar habitats.

In addition to habitat loss, the project will increase the disturbance of caribou on a portion of the territory and this species is very sensitive to human activities. However, this impact will be felt only over a small area. Also, the project will increase habitat fragmentation by creating a semi-permeable barrier for woodland caribou (Dyer *et al.*, 2002). However, the amount of undisturbed habitat within the study area demonstrates that existing and future projects do not appear to jeopardize the future of woodland caribou in the area.

9.1.2 Fish Habitat

The construction of the road will result in approximately 3,500 m^2 of lost habitat for brook trout, but this area will be offset by the implementation of a fish habitat compensation program aiming to develop 2,200 m^2 of habitat to increase the productivity of the area. In addition, considering that fish will circulate freely under bridges and through culverts and considering the measures used to protect fish habitat and recreate conditions similar to the natural environment after the completion of the work, the impact of the construction of Route 389 is considered as non-significant.

Other projects that may affect fish habitats are present in the Petite Rivière Manicouagan, the Pékans River and Carheil Lake watersheds. However, the free passage of fish will be ensure through hydraulic structures and the surface area of fish habitat affected by the construction of Route 389 are relatively small and will be compensated for. Hence, the implementation of the project will not further affect fish and their habitat.

9.1.3 Wetlands

All projects (mining, forest, road) to be developed in the study area will result in the loss or degradation of a portion of wetlands and aquatic environments. Disturbed areas can therefore serve as indicators to measure cumulative effects. Also, the number of projects carried out per sub-watershed may also be an indicator of cumulative effects.

Cumulative effects for wetlands are assessed at the scale of level III of the ecological reference framework which overlaps with the regions of petit lac Manicougan (D0706) and Vallard Lake mounds (D0703) for a total of 15,000 km^2. The analytical report on the situation of wetlands in Quebec (Pellerin and Poulin, 2013) indicates that wetlands represent about 10% of the petit lac Manicougan mounds region and 16% of the Vallard Lake mounds region. The new road alignment is mainly inside the petit lac Manicouagan mounds, but for the remainder of this section, it is considered that, at the level of the territory covered for cumulative effects, wetlands represent an average of 13% of these natural environments.

Mining operations are the main activities of the region which have justified the construction of settlements in place as well as the existing road network. The existing mining developments (Mont-Wright, Wabush, Bloom Lake and Fire Lake mines) and those projected, which total approximately 286 km^2 of disturbed habitats, are responsible for the majority of natural habitat losses in the study area.

At the scale of the study area defined for assessing cumulative effects, a total of 3,971.3 ha of wetlands will potentially be destroyed or less than 40 km^2. This represents 2.2% of the wetlands theoretically present in the study area. Thus, across the study area targeted, the significance of the impact of the construction of Route 389 is regarded as non-significant. It is important to note, however, that the loss of wetlands related to the Program will be offset by the implementation of a compensation program (Chapter 6).

9.1.4 Tourism Activities

The main events that have had a major impact on tourism activities of the region in the past are the commissioning and the expansion of iron mines (Wabush, Mont-Wright, Fire Lake and Bloom Lake). These mines have had negative effects (loss of territory for the practice of tourism and change in living habits), but also positive ones (massive arrival of mine workers engaging in tourism activities). Cultural activities being limited by the remoteness of the territory, residents of the area have privileged resort activities and many have obtained a resort lease or lease for forest shelters. The development of the region resulted in a moderate tourism traffic in the area.

In principle, the different projects developed (mining projects and the Route 389 project) should not significantly affect tourism activities, because these projects mainly cause local disturbances (e.g. relocation of cottages or part of snowmobile trails). On the other hand, Route 389 will lead to the opening of the territory and increase its accessibility, which could lead to an increase in tourism activities through an increase in the number of resort leases granted, as well as the improvement and diversification of the tourism offer.

The projected biodiversity reserves (mainly the Moisie River in the area) will generally have positive cumulative effects insofar as they increase the number of services offered in the area. Activities that will be carried out on these territories will be primarily recreational, since the uses and rights in force (fishing, hunting, vacationing, Native activities, outfitters, etc.) will be maintained.

Nevertheless, it is important to note that tourism activities are and will be strongly influenced by mining activities. Indeed, the region has undergone several changes in population over the past 30 years, which therefore affects the number of resort leases issued and tourist numbers in the area. Despite the uncertainty around the mining industry in the area, which makes the assessment of cumulative effects difficult, the Program should not really contribute to cumulative effects on tourism activities, but could instead change the way these activities are developed on the territory.

9.1.5 Land Use by the Innu

Due to the uncertainty around the mining industry, it is difficult to estimate cumulative effects on land use by the Innu jointly with other past, present and future projects. All in all, it is considered that the Program will not prevent land use by the Innu, but will instead change it in a positive and negative way.

The three traplines used by the Innu that are affected by the project have extensive areas (Map 3.1 in pocket insert). In the past, the main events that have had a major impact on the use of these territories are the mining projects that have developed over the years, as well as the railway connecting the Mont-Wright mine with port facilities of Port-Cartier and the development of the town of Fermont. Large areas have been modified and disturbed, making it impossible for the Innu to use these areas. Hunting, fishing, trapping, gathering and cultural sites could have been destroyed. Experience has shown that for mining projects in general, the effects are usually felt on a very limited number of traplines and the surface area affected by each project is restricted. The railway has split the territory while allowing the Innu to access it by another means of transportation. These traplines may be more affected in upcoming years by current and future projects. In all cases, disturbances to hunting, fishing and trapping activities that may be associated with the footprint of mining facilities or disturbances associated with their operation are local only.

Furthermore, the creation of jobs within the Innu community of Uashatmak Mani-Utenam for the needs of this road project and other projects in the area, could have short term effects on the use of the territory and the traditional way of life of the Innu. Thus, instead of leaving for long periods of time in the forest in order to meet the food needs of their families or for fun, some Innu will carry out these activities during the weekends or only for recreational purposes. In addition, thanks to the higher salaries in remote areas, community members will have more money to buy equipment and vehicles required for hunting, fishing and trapping activities, yet much less time to carry out these activities.

New accesses to the territory should promote and improve land use by the Innu, for example, by facilitating displacements towards new areas, between the Innu community and traplines or hunting, fishing and trapping grounds.

In addition, several leases for resorts or forest shelters were granted in the area to non-Native people. These leases are concentrated near Fermont and so mainly in the northern part of trapline 256. The effects of each of these leases are limited, but the potential addition of new leases in this part of the territory may modify land use by the Innu in the area.

Finally, conservation projects, such as aquatic reserves or projected biodiversity reserves (Gensart Lake and Moisie River), also overlap with these traplines. The impacts of such reserves are, however, generally positive, as long as traditional activities are preserved on these territories.

10 Renewable Resource Capacity

In compliance with the CEAA requirements, the environmental assessment must also take into account the capacity of renewable resources to meet the needs of this project without compromising those of future generations[1]. The environmental assessment should therefore describe how the project could affect the sustainable use of renewable resources[2]. The renewable resources likely to be significantly affected by this project include water resources, wetlands and forest, fish and fishing as well as wildlife and its use (hunting, trapping).

The assessment of the impacts of the project on these different resources demonstrates that, considering all of the proposed mitigation measures, no significant adverse effect is expected on the capacity of water resources, wetlands and forests to meet present and future needs. In addition, the project is located beyond the limits of commercial forests. However, the project could have effects on fish and terrestrial wildlife through habitat loss, fractionation of the territory as well as fishing, hunting and trapping activities.

Indeed, the main impact of the construction of the road is related to fish habitat losses, which are due to the embankment on some bodies of water and the encroachment on the bed of watercourses during the construction of bridges or the installation of culverts. Moreover, the opening on the territory and its greater accessibility could increase the fishing pressure and allow for the use of lakes that were before inaccessible. Taking into account the mitigation measures and the fish habitat compensation program, the impact on this resource is again considered non-significant (see Chapter 6).

Furthermore, the project will result in the direct loss of terrestrial wildlife habitats. Also, the presence of the road will create an area perceived as a low quality habitat, causing the functional loss of habitats of variable sizes depending on the species. The opening of the territory and its greater accessibility could increase the hunting pressure on moose in the area. However, the impact on this resource is low and considered non-significant (see Chapter 6).

Overall, the project would not significantly impair the ability of current and future generations to access safe water, to benefit from wetlands and forests and to collect wildlife species. The project would therefore not compromise the sustainability of ecosystems to meet the needs and aspirations of present and future generations.

1 Resource that renews itself through biogeochemical and physical cycles.

2 Use of biological diversity components in a way and at a rhythm that does not compromise populations in the long run in the Central Uplands and Valley Lowlands ecoregions, hence ensuring their potential to meet the needs and aspirations of current and future generations.

11 Surveillance and Monitoring Program

11.1 Environmental Surveillance Program

The environmental surveillance program for the worksite is planned as soon as plans and specifications are developed during the preparation phase of the project. For this purpose, a specification entitled "Protection of the environment" is included in the contract with the contractor. All mitigation measures to minimize the impact of the project on the environment, as well as the special requirements of governmental authorities, will be included in the plans and specifications. In addition, the MTQ CCDG, which automatically applies to all MTQ projects, contains environmental requirements with which contractors must comply.

The MTQ supervisor or his representative will be present at all times on the worksite and will verify, assisted by environmental specialists of the ministry, that contractors and subcontractors know the points to respect and comply with them effectively.

11.1.1 Specific Measures of Route 389 Worksite

This study assesses that the most important impacts on soil erosion and fish habitat will be felt during construction work. Monitoring of these two components is therefore essential on the worksite of Route 389. Mitigation measures included in the specification entitled "Protection of the environment" should represent the best practices of the industry in this area. In addition to the mitigation measures prescribed in this impact assessment, the MTQ will act proactively by adding all other necessary measures that could not be defined here or by further specifying measures based on the reality of the worksite and the issues specific to the planned activities.

Environmental surveillance of protection measures that the contractor will implement will have to focus on the protection of soil against erosion (particularly near watercourses), the protection of fish habitats (especially at water crossing sites and during the construction of related structures), measures to prevent contaminant leaks and the management of contaminated soils, revegetation work, as well as the effectiveness of corrective measures and the speed with which the latter are implemented.

The results of this surveillance will allow the MTQ to ensure compliance with the measures listed in the impact assessment, but also to document the effectiveness of these measures in a northern and remote environment. This will allow the MTQ to draw lessons for the future and to target sites that are deemed sensitive during maintenance in the operating phase.

11.2 Monitoring Program

The objective of the monitoring program is to follow the evolution of certain components of the environment affected by the project. It allows verifying the accuracy of the impacts anticipated and assessed, especially those for which uncertainties remained in the impact assessment, as well as the effectiveness of certain mitigation measures.

In this particular case, some components will be monitored, including the renaturalization of portions of abandoned road, the fish habitat compensation program, the monitoring of raptors nests or nests of terrestrial bird species at risk that are discovered incidentally, chance observations of woodland caribou and the monitoring of transplanted special status plant species.

12 Benefits of the Project

12.1 Economic and Social Benefits

12.1.1 Social Benefits

The safety and traffic flow of Route 389 will be greatly enhanced through this project. This road will allow better access for residents and for the development of natural resources. It will be used for the transportation of goods, to serve future tourist and mining sites, as well as for the transportation of workers. The road will also be used by tourists, especially in summer, wishing to visit Fermont or Labrador.

Furthermore, the opening of Route 389 (segment 3) will facilitate access to the territory for trapline users and all of the family user groups. Some users could even increase their use of the territory. The road is also an improvement in terms of safety for people travelling on the territory.

Better accessibility will facilitate sport fishing activities in lakes near the road and new resort areas could be developed with fast and safe access. The new section of Route 389 could also promote and facilitate the development of the territory from a recreational and tourism perspective as well as for natural resource development. A better access to the territory has many advantages in terms of mineral resource exploration and mining. Several logistical challenges could be resolved relative to the mobilization/demobilization of workers and the installation of camps and their supply in perishable goods, materials, fuel and equipment, while ensuring the safety of workers in case of unforseeables. Furthermore, this implies a significant reduction of the costs incurred for companies. Finally, relative to mining operations, the presence of a road infrastructure allows to ship outputs, including ore.

12.1.2 Economic Spinoffs

The construction, use and maintenance of the road will have an impact on the regional economy of the North Shore. The anticipated direct impacts concern mainly the creation or consolidation of jobs for local and regional companies (mostly for the construction sector), the purchase of local and regional goods and services, the generation of tax revenues through wages and business incomes, as well as the opening of a portion of the territory for economic development purposes.

The project to improve Route 389 represents a total investment of $438 million until 2021, which will generate economic spinoffs for Native people as well as for regional workers and companies. Most of this budget will be spent in Quebec, via direct (e.g. construction, deforestation, facilities, civil and electrical work) and indirect (e.g. engineering) expenditures. Project A alone represents an investment of about $150 million that will have direct and indirect local economic spinoffs.

About 150 jobs (full time equivalents) will be created for all of the construction phase (4 years). The creation or consolidation of jobs will affect the services or employers including the general contractor of the project and its subcontractors, accommodation and restorations services, temporary worksite facility suppliers, the purchase of materials, engineering and surveying work, worksite surveillance and specialized workers. In addition to the economic spinoffs directly related to the creation of jobs, wages will incur an increase in local expenditures, mainly in Fermont, but also in Wabush and Labrador City. Shops, accommodation and restoration services, as well as other business services, are likely to take advantage of the arrival of new workers.

By facilitating access to family land, it is possible that some Innu will increase their expenditures related to traditional hunting and fishing activities. Families could then save on the cost of food thanks to a larger quantity of wild meat and fish.

Other benefits related to the Project have also been taken into account in the study, including the time saved by users of the road and lower vehicle operating costs due to reduced travel distances, the reduction of the frequency and severity of accidents, and the improvement of the comfort of users due to the paved surface.

12.2 Benefits of the Environmental Assessment

The environmental assessment process of the Project allowed to take into consideration the concerns of Native and non-Native people, as well as those of local and regional organizations. Thus, the Project has evolved making sure to integrate technical, economic, environmental and social constraints. The project therefore respects the three pillars of sustainable development, namely the economic development, the protection of the environment, and social equity. The environmental assessment has enabled to visualize the whole project in its receiving environment and to select the variant of lesser impact.

Indeed, the road was designed to avoid encroachment in sensitive areas as much as possible and in a way to reduce fish habitat losses associated with the various watercourse crossing sites.

The environmental assessment also contributed to the development of a surveillance and monitoring program (Chapter 11) to ensure the protection of the physical, biological and human environment in both the construction and operating phases. The latter integrates the various mitigation measures proposed with the project.

13 Conclusion

Overall, the new road alignment of Project A for Route 389 is a must for the safety of its users and the development of this remote region. Indeed, it will improve road safety and traffic flow, it will facilitate travel towards Newfoundland and Labrador, as well as promoting the access to the development of natural resources. In addition, this environmental and social impact assessment allows concluding that, in general, the project will not have significant residual impacts. Mitigation measures as well as the surveillance program and emergency response plans will allow minimizing the risks associated with the construction and operation of this road.

The project will also result in substantial social and economic benefits. The presence of the road will facilitate access to the territory and will also be safer for its users. The development of certain parts of the territory and of tourist and mining activities could be facilitated or even accelerated by the presence of the road.

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Fermont area
HQTE post
Industrial development project
Snow deposit
Deposit G
Waste water treatment plant
Old landfill site
Fermont
1:40 000
Deposit E-2
Deposit E-1
Deposit C-1
Deposit C-2
Deposit H-1
Deposit H-2
Deposit B
237
243
255
256
257
1:80 000
Projection : MTM Zone 6, NAD 83
Transports Québec
Route 389
Programme d'amélioration
Transportation
Existing road with kilometre post
Reference road alignment with chainage marks
Power line (Hydro-Quebec)
Snowmobile trail (FCMQ)
ATV trail (FQCQ)
Potential borrow pit
Environment
River
Lake
Wetland
Moisie River projected aquatic reserve
Element of the human environment
Trapline limits
Water crossing sites and fish habitat
Compensation site
Intermittent watercourse
Permanent watercourse
Permanent watercourse (free passage of fish to be ensured)
Base map:
Geogratis, Feuillets Canvec, 1: 50 000, ©Gouvernement du Canada
Source:
MRN, Gestim, fichier du 6 juin 2013; BDGA, 2013
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Project A - Environmental Impact Assessment Summary
Selected Project
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En collaboration avec :
INSPEC-SOL
January 2016
Map 3.1
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