

Social, Economic and Environmental Impact Assessment for the Chapais and Chibougamau Region

Construction of a Logging Road for Oversized Trucks

Submitted by Barrette-Chapais Ltd.

July 2009



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1. Introduction

The *Paix des braves* agreement stipulates that members of the forestry industry having entered into Timber Supply and Forest Management Agreements (TSFMA) must provide access to the territory covered by such agreement, which represents almost 10% of Quebec's forestry capacity. This must be done in accordance with sustainable development principles, including respecting Cree traditions and ensuring their participation in regional development.

Accordingly, Barrette-Chapais Itée, a forestry company, wishes to build a 96 km road for oversized vehicles that will allow it to reach the North-West part of the territory covered by its TSFMA. This road will connect the existing road from the Chibougamau river ramp to the northern edge of forest management unit 02665, following most of the way the old road that was built during the construction of power transmission line L7081-7082, which passes through the Albanel station. The new logging road has a predicted service life of at least 15 years.

Given its location, this project is also covered by the James Bay and Northern Quebec Agreement (chapter 22), and an environmental assessment is required for preapproval by the *ministère du Développement durable, de l'Environnement et des Parcs (MDDEP)*, in accordance with subsection h of Appendix A of Chapter II of Quebec's Environment Quality Act. This assessment takes into account various factors cited in the guidelines received from the MDDEP, which were prepared by the evaluating committee (EVCOM).

This territory will therefore become accessible to all vacationers, hunters and fishers from Quebec and elsewhere, including three nearby Cree communities. Indeed, the three Cree communities are directly affected by this project due to its expected impact on seven trapping areas. These are the Mistissini, the Oujé-Bougoumou and the Waswanipi communities. Public consultation is therefore an integral part of this assessment, which takes into account all the concerns expressed by various stakeholders during meetings. Furthermore, the approach taken by Barrette-Chapais directly implements the vision outlined in the *Paix des Braves* agreement; it aims to promote and facilitate participation of the James Bay Cree in forestry development projects on their territory, through partnerships, jobs and contracts. The latter will be expanded in the section on impact mitigation.

This impact assessment will address all the expected environmental impacts of the two corridors proposed for the construction of this road; it will emphasize socio-economic impacts and impacts on woodland caribou herds, since no other special status floristic or animal species are listed in either the overall assessment area or the local assessment area, according to the *Centre de données sur le patrimoine naturelle du Québec (CDPNQ)*. Changes to the boundaries of the future Assinica Cree Heritage Park have resulted in a few changes to the road corridor. One of the main concerns relates to a listed caribou herd located East of Lake Ruth, at the South-Western point of the future park, thus combining two significant issues that must be taken into consideration.

The social and environmental constraints that are raised have indeed been studied since the very beginning of the project's inception, with a view to mitigating potential negative impacts. This has resulted in a notable improvement in project outcomes, thanks also to the application, at each stage of its execution, of mitigating measures that reduce the anticipated negative impacts. Mitigating measures will be discussed in Chapter 6; the

following chapter will cover the monitoring and follow-up program that will be implemented in order to deal with areas of uncertainty.

This report was first written in French, and then translated into English. In case of conflict between these two versions, the French version shall take precedence.

An electronic copy of the environmental assessment has been supplied to the MDDEP. It is also available for consultation by contacting the proponent of the project. All the information contained in the environmental assessment remains the property of the project proponent. Any reproduction of the document, the maps or any other information contained in this environmental assessment must first be authorized by the project proponent.

2. Identification of the project proponent

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3. Summary

Barrette-Chapais ltée, a forestry company, is submitting its project for the construction of a 96 km logging road to an environmental impact assessment in order to fulfill the legal obligations arising from applicable regulations and agreements signed between the federal and provincial governments and the Cree communities affected by the project.

The two proposed road corridors aim to improve an old road dating back to the construction of the power transmission line (L7081-7082) that passes through Albanel; both proposed corridors follow the old road on 23% of the distance to reach forestry management unit (FMU) #02665. The overlap between the new road corridor and the old one aims to reduce potential negative impacts, since a road already exists on a portion of the corridor.

The project will take place in the realm of the spruce-moss stand, a bioclimatic zone characterized by the dominance of coniferous trees, mostly black spruce and balsam fir. Part of the territory covered by the assessment is included in the Assinica wildlife sanctuary; taking the future Assinica Cree heritage park into consideration constitutes one of the main issues raised by this project, given that it is not only a protected area, but it also is home to a woodland caribou herd sufficiently close to be included in the local assessment area.

Opening this new territory will make it accessible to the entire population of Quebec, in particular the residents of the Chapais-Chibougamau region, for uses other than forestry. The construction of roads entails a loss of habitat equivalent to their area, but also enables a faster and more economical access to resources. Such benefits have been perceived by the local population affected by the project, including the Cree communities that were consulted during the public consultations; all were favourable to the project, though some expressed concerns, mostly regarding the opening of the territory.

In fact, three Cree communities (Mistissini, Oujé-Bougoumou and Waswanipi) are affected by the project, due to the fact that seven trapping areas will be opened. Various issues have been identified and will be taken into consideration during the construction of the road, in order to mitigate the expected negative impacts. The main issues relate to the fact that, depending on the final choice of the road corridor, a woodland caribou herd will be disturbed or a trapping area will become accessible, when it should rather be protected according to a tallyman of the Waswanipi community. However, notable improvements in project outcomes can be foreseen through the application, at each stage of the project's execution, of mitigating measures that reduce the anticipated negative impacts. Highlights include the construction of bridges in accordance with applicable legislation, including the Regulation respecting standards of forest management for forests in the domain of the State (RSFM), and the evaluation of the possibility of limiting traffic on the road to the fall and winter, in order to avoid disturbing the caribou, especially during gestation and calving. In addition, in case of uncertainty, an adaptable environmental monitoring and follow-up program will be implemented, and the work site will be under the constant supervision of a person appointed for that purpose in that area. All these measures will specifically aim to reduce the risk of hydrocarbon spills and the risk of introducing sediments into waterways and lakes. All personnel working on site will receive training with regards to the mitigation measures to be adopted.

Following project approval, further consultations are planned involving the seven tallymen affected by the project, in order to fine tune the alignment of the road within their family hunting territories, while maintaining a 1 km buffer zone along the road. This stage preceding road construction demonstrates the respect Barrette-Chapais Ltée has towards the Cree communities affected by this project. In addition, special attention will be given to ensuring that these communities may contribute economically to the project and participate directly in the construction of the road.

Barren wetlands represent 19% of the area studied. Such hydrogeological conditions require the construction of several culverts; both corridors studied have been chosen due to the impossibility of crossing a major lake. It is therefore necessary to go around this lake, either westward (main corridor) or eastward (alternate corridor, entailing an incursion into the future Assinica park). The alternate corridor might end up being preferable given that, even though it would entail disturbing a woodland caribou herd, the caribou would still enjoy the rest of the Assinica Park, since the road would only cut off a 30 km² area. The other main consideration pertains to a trapping area of the Waswanipi community (#W12). In this case also, the alternate corridor would reduce impacts, since access to the said area would not be via the road, but rather via a waterway, contrary to the main corridor which crosses directly the area in question. Another factor favouring the alternate corridor is the fact that the latter requires the installation of two bridges rather than three, which represents an estimated savings of \$150,000 in construction costs, not taking into account maintenance costs, which are always higher for a bridge than for a logging road.

In the event that no road corridor is approved by the MDDEP, harvesting of forest resources on forest management unit #02665 will be extremely doubtful. Indeed, even though this territory is accessible via the North, Barrette-Chapais Ltée may decide not to extend the existing road, since this option would increase timber transportation costs by \$25 million over 15 years of operation. The potential economic impact, related to the hiring of qualified personnel among the Cree during the various stages of the project, would also be jeopardized.

4. Project rationale

In order to ensure its long term supply and to fulfill its commitment to the provincial government in accordance with the supply contracts that were awarded to the company, Barrette-Chapais Itée must make new logging territories accessible. The new logging road would effectively give access to a significant area in forest management unit 02665. In terms of timber volume, this represents 2,844 M m³, which translates into estimated stumpage fees totalling more than 7.8 M\$. If the timber that will be harvested in order to clear the road's right of way is added to this figure, the total impact is of the order of \$7.9 million. Extending the main existing road (L7081-7082, Albanel Station –Abitibi Station) would require a significant and expensive detour, and supply costs would increase proportionally to the extra distance that trucks would then have to travel. Construction of the new road aims to allow the fastest possible access to the North-Western part of forest management unit 02665. Over 15 years, construction of the proposed road (extension of the L-209 North road) would entail savings of \$25 million compared to passing through the North. Map 4.1 shows the corridor that trucks would have to follow if the new road project is not carried out.

The total construction cost of the project is approximately \$12.5 million, plus estimated annual maintenance costs of \$65,000, giving an overall cost of \$975,000 over 15 years. From an economic point of view, the benefits will significantly outweigh the costs associated with the project. Thus, the construction of the road entails real benefits.

The construction of the road will also allow faster and easier access to seven Cree trapping areas. Even though the opening up of the territory remains a concern for these Cree communities, the benefit of easier access to their trapping areas, except for area W12, was generally perceived as being more positive than negative by tallymen and other stakeholders that were met during the public consultations.

A modification of the original road corridor takes into account the borders of the future Assinica Cree Heritage Park. Modified several times in order to take into account new information that was received with regards to the park's border, the proposed road corridor bypasses the park on the South, then continues towards the North on the West side of the park. The main option for the road corridor does not make any incursion into the Assinica Park, while the alternate corridor overlaps the park on a 6 km stretch East of Lake Ruth. Everywhere else, care was taken to respect the borders of the future park. The bypass East of Lake Ruth included in the alternate corridor brings the road into a territory occupied by a herd of woodland caribou. Map 4.2 shows all the corridors that were studied and rejected for the above mentioned reasons. In all cases, the company took into account the concerns raised by the various Cree communities consulted, together with the information received concerning the future Assinica Park.

Both proposed road corridors (main and alternate) overlap, over more than 22 km, the old road built by Hydro-Québec during the construction of the power transmission line that passes through the Albanel and Abitibi stations. This approach aims to minimise environmental impacts due to the construction and operation of the planned logging road. Furthermore, this corridor follows more closely suggestions made by the Cree communities during public consultations. In reality, the first corridor considered followed only sporadically the power line road and entailed therefore greater impacts on the environment in addition to exposing 12 trapping areas rather than 7. The need to limit the number of affected trapping areas is indeed one of the social parameters that need to be taken into account, along with the need to respect the boundaries of the future

Insert map 4.1

Insert Map 4.2

Assinica Park, among other considerations. Nevertheless, the alternate corridor is being put forward, even though it departs from this rule over a distance of 6 km. In light of the impact assessment and the proposed mitigation measures, this corridor offers other benefits that outweigh the disadvantages identified with respect to the park boundaries and the woodland caribou habitat. The caribou will of course be affected by the increase in road traffic, but it is believed that the herd will eventually move to another part of the future Assinica park. Several other economic, social and environmental considerations have also been taken into account in order to establish the best possible road corridor. These decision criteria are explained in detail in Chapter 3 which contains the project description. All project impacts are detailed in Chapter 5. Mitigation measures proposed in order to reduce the significance of impacts are discussed in Chapter 6. The positive aspects of the alternate corridor include one less bridge to build, as well as a more limited access to trapping area #W12, despite the disturbance this corridor would entail for the woodland caribou.

Although it has not been possible to obtain a list of Cree contractors, from an economic standpoint, the possibility of hiring qualified Cree personnel will be evaluated. If Cree businesses are interested in participating in this project, Barrette-Chapais ltée remains open to studying this possibility. In this context, there exists a possibility of economic spin-offs for local Cree communities (i.e. the Mistissini, Oujé-Bougoumou and Waswanipi communities).

In light of the pre-consultations with tallymen and of the consultations with the MDDEP regarding the future Assinica Park, either the main road corridor or the alternate corridor remain the most desirable options. Indeed, the northern bypass is not economically feasible, while the straightest possible corridor gives rise to many social or environmental drawbacks. Thus, choosing to bypass the boundaries of the future Assinica Park and to follow the old power transmission line is, in our opinion, the option that respects most closely the principles of sustainable development followed in Quebec.

5. Project description

The logging road construction project launched by Barrette-Chapais Itée, a forestry company, aims to reach the north-western section of forestry management unit 02665 by passing through forestry management unit 02663. The road will thus start at the Chibougamau River and head in a north-westerly direction towards the power transmission line. The road will then follow the power transmission line over a distance of 30 km. The road will have to go around Lake Ruth, either through the East or through the West, depending on the road that is chosen. At the level of Lake Capiehagimau, the road veers towards the North-West on a distance of 33 km, and ends before the river located 5 km North of Lake Morin. The main and alternate corridors pass through trapping areas #M47A, O52, O53, W10, W10A, W12 and W22. This logging road's corridor is mainly located on category I land; it ends on category II land in Waswanipi (north-western tip of the road).

The reasons that guided the definition of the main and the alternate corridors are explained in the following paragraphs, followed by a detailed discussion of the overall infrastructure that will be built.

5.1. Corridor definition and description

The definition of the (main and alternate) corridors is based on economic, technical, social and environmental criteria.

Economic criteria:

- The corridor must reach the felling area through the shortest distance possible. This criterion is essential to the economic feasibility of the project.
- Road construction must avoid physical constraints that increase construction costs and are also likely to increase maintenance costs.

Technical criteria:

- The corridor must avoid major watercourses in order to minimize civil engineering challenges associated with water crossing structures;
- The corridor must follow in as much as possible the locations of unconsolidated deposits that facilitate the installation of such structures in order to minimize construction and maintenance costs;
- The corridor must avoid peat bogs in order to minimize construction and maintenance costs;
- The corridor must avoid locations with topographic features greater than 9% in order to respect transportation and road safety requirements;
- The corridor must be as straight as possible in order to minimize distances and increase road safety.

Social criteria:

- The corridor must avoid as many trapping areas as possible;
- The corridor must avoid trapping areas already serviced by major access roads, as described in the *Paix des braves* agreement;
- The corridor must avoid sensitive areas as defined by trapping area managers (e.g. : faunal or special landmarks);
- The corridor must avoid Aboriginal archaeological sites;
- The corridor must avoid passing over territory claimed by the Cree Nation for the creation of the Assinica Park.

Environmental criteria:

- The corridor must avoid water crossings in as much as possible, in order to minimize impacts on water quality due to the road's construction;
- The corridor must avoid large peat bogs in order to avoid reducing the area of this ecosystem;
- The corridor must avoid locations of special status faunal or floristic species (e. g.: woodland caribou);
- The corridor must avoid fragmenting the territory of the future Assinica Park.

The criteria used to define the road's corridor do not all have the same weight. In fact, the corridor was in largely defined based on the comments made by various trappers affected by the road's construction. Some of these comments were collected during public consultations, while others were collected beforehand and date back to the Cree contribution to the preparation of the 2008-2013 General Forest Management Plans. The definition of the corridor was also determined by the future Assinica Park and by technical or road safety considerations.

5.2. Logging road description

The length of the planned logging road will slightly less than 97 km if it follows the main corridor (Assinica Park) and just over 96 km if it follows the alternate corridor (Lake Ruth). This logging road will be non standard. This means that tree-length logs will be transported using trucks that are not allowed on the provincial road network. Such trucks carry a load of more than 100 tons.

The road will therefore have to be able to withstand such loads, and will have to be built according to specifications specific to this type of road.

The logging road will have the following features:

- Width of the right of way: 35 metres
- Width of the road surface: 10 metres
- Annual utilisation period: 6-8 weeks
- Transportation activity 5 days per week
- Transportation will take place 24 hours a day.

- Minimum radius: 250 metres
- Maximum favourable gradient: 9%
- Maximum adverse gradient: 6%
- Maximum speed: 70 km/hr
- Minimum visibility: 110 metres
- Three truck crossings every two kilometres
- Signposts indicating road features and obstacles (e.g.: curve, intersection, bridge, speed limit, distance...)

Construction of the road will entail deforestation on a width of 35 metres, i.e. the width of the right of way. A certain volume of timber will therefore be extracted from the right of way. It is estimated that 300 m³ of timber per kilometre will thus be extracted, giving a total volume of timber of 11,317 m³ for the road. Deforestation will be performed according to standard practices in Quebec's forests, i.e. using a tree feller, a skidder and a delimber.

5.3. Studied and rejected corridors

Several corridors were studied before the corridors were finally defined. For instance, the first sketch of the corridor followed a straight north-westerly line starting at the Chibougamau River, but this corridor was quickly rejected due to the location of the future Assinica Park.

A second corridor was then studied. This time, the road corridor passed south of the known future boundaries of the Assinica Park. This is the corridor that was submitted to the MDDEP in December 2008. This corridor was also rejected following discussions with Messrs. Jean-François Lamarre and Jean Gagnon of the *Direction du patrimoine écologique et des parcs* of the MDDEP who argued that the current outline of Assinica Park had been modified to include a southern section through which the proposed road corridor would pass. This area is known to contain a large population of woodland caribou. Accordingly, Barrette-Chapais Itée modified the corridor once more, in order to reach to final definition for the main corridor.

5.4. Main corridor

As described in the introduction to this chapter, the main corridor will start near the Chibougamau River and continue in a north-westerly direction until it reaches the power transmission line. This road segment bypasses the southern boundaries of the future Assinica Park.

Where the road reaches the power transmission line, a bridge will have to be built. The road then heads north following the power line until it reaches the disputed area, i.e. the surroundings of Lake Ruth.

The main corridor thus passes West of Lake Ruth, near Lake Caupichigau, before returning to the power line corridor and heading north again. Lake Ruth is too large to envision having the road cross over it. The crossing of the watercourse joining Lake Ruth to Lake Caupichigau requires the construction of a bridge.

A second detour is required near Lake Omo due to the special topography at this location.

Passed this obstacle, the road resumes following the Hydro-Quebec power transmission line until Lake Capiebagimau, where it veers towards the northwest in order to reach the territory this project seeks to open up. One last bridge will have to be built at the very end of the road.

Barette-Chapais Itée favours this corridor since it minimizes impacts on the woodland caribou populations and avoids any incursion within the boundaries of the future Assinica Park. These points will be discussed in Chapter 5 under "Description of the impacts".

5.5. Alternate corridor

During the first attempt to define the corridor, the Waswanipi Cree community raised various objections. The manager of trapping area #W12 indicated that it would be hard to accept if the road passed near Lake Caupichigau. He indicated that should the road pass along the lake shore, this would increase significantly its use by the non-native population, which would cause a large decrease in the piscifauna.

In light of this, an alternate corridor is being proposed. The alternate corridor is in large part identical to the main corridor. However, as mentioned in the preceding paragraph, the road would go around Lake Ruth on the east.

Even though the alternate corridor would avoid the construction of a bridge, it would also entail crossing into the known boundaries of the future Assinica Park and passing through an area identified as woodland caribou habitat.

The alternate corridor is likely to reduce construction costs by several thousand dollars, since the construction of one bridge would be avoided. However, the Waswanipi Cree community has reservations about this corridor.

The two proposed corridors have elicited objections. The Waswanipi Cree community is opposed to the passage of the road west of Lake Ruth. On the other hand, the Oujé-Bougoumou Cree community and the MDDEP – *Direction du Patrimoine Écologique et des Parcs* object to the road passing through the known boundaries of the future Assinica Park. It is therefore currently impossible to make a choice.

5.6. Borrow pits

Careful study of the region has allowed the identification of several potential locations of borrow material (see map 5.1). Basically, material will be borrowed wherever eskers and reworked glaciofluvial drifts are to be found. Currently, the location, size and quality of the borrow pits are not precisely known; these parameters will be determined continuously during road construction.

Insert map 5.1

Once the sandpits are abandoned, they shall be restored in accordance with section 21 of the Regulation respecting standards of forest management for forests in the domain of the State (RSFM). The following requirements shall be observed, among others:

- Every person working or opening a sand pit while constructing, improving or maintaining a road shall completely clear the required part of the site before using it, remove and pile up the organic matter for later reuse not closer than within 20 m of a lake, a watercourse or a fish habitat and extract the non-consolidated substances in the part that is the most distant from any lakeshore or the bank of any watercourse.
- The person shall divert runoff towards a vegetation area located at least 20 m from any lake or watercourse, as measured from the natural high-water mark.
- After the sand pit is abandoned, the person shall reduce its slopes, clear the surface of the site of debris, waste, machine parts and other litter and then respread the organic matter that has been piled up.
- Where the sand pit is located south of the 52nd parallel, the person shall, within 2 years after it is abandoned, ensure that the area is regenerated with commercial species and that the distribution coefficient of such regeneration, established in accordance with section 90, is at least equal to the coefficient existing before the cutting of the species over that area.
- The person shall also ensure that the coefficient is maintained 8 years after the area has been abandoned.

5.7. Blasting

Construction of the road will require no blasting.

5.8. Infrastructure

The project will require the installation of several infrastructure elements. Some will consist in temporary infrastructure, such as a forest camp to house workers, while others will be permanent, such as bridges and culverts at watercourse crossings. The following paragraphs describe the infrastructure elements that will need to be installed in the course of the construction of the Barrette-Chapais Itée logging road.

5.8.1. Temporary forest camp

A temporary forest camp will be required in order to house workers affected to the construction of the logging road. This camp will be able to receive up to 40 workers. The camp will operate from May to November during the entire construction period, which will last approximately 2 years.

The forest camp will be located on the old Hydro-Québec campsite, located along a road and near a small lake approximately 2km east of Lake Omo. Map 5.2 shows the location of the temporary forest camp.

INSERT map 5.2

This camp will be equipped with a kitchen that will prepare all the workers' meals. Wastewater will be treated using a septic tank and a gravity drain field. This installation will require an authorization in accordance with section 32 of the Environment Quality Act (Q-2).

With regards to waste, it will be disposed of in a « remote landfill » as described in the *Regulation respecting the landfilling and incineration of residual materials* (Q-2, R 6.02). No authorization is required for this infrastructure, as specified in section 146 of the same regulation. A simple notice to the MDDEP or to the local municipality is sufficient.

Petroleum equipment will be installed at the camp. This equipment will be high risk equipment used to store gasoline and diesel fuel. These storage tanks will be installed in accordance with the Building Code and the Safety Code of the Building Act. This equipment will conform to Chapter VIII of the Building Code (B-1.1, r.0.01.01) and Chapter VI of the Safety Code (B-1.1, r.0.01.01.1).

A generator will be installed in order to supply the forest camp. This generator will have a nominal power of 135 kilowatts and will operate 24 hours a day.

In addition, propane tanks will be installed in the camp in order to supply the kitchen. These two tanks will have a propane capacity of 400 lbs. each and will be installed in accordance with standards applicable to this category of tank.

A drinking water intake will be installed. Holes will thus be bored down to the water table, in order to ensure the drinking water supply of the camp. The well will be setup in accordance with the standards specified in the *Groundwater Catchment Regulation* (Q-2, r.1.3).

When the camp ceases to be used, the campsite will be restored as described in section 42 of the *Regulation respecting standards of forest management for forests in the domain of the State* (F-4.1, r.7). This section sets out the following requirements:

- A holder of a management permit who sets up a forest camp area shall remove and pile up organic matter for later reuse not closer than within 20 m of any lake, watercourse or fish habitat.
- When the forest camp area is abandoned, the permit holder shall clean it of all materials, infrastructures and waste and then respread the organic matter that has been piled up.
- Where the forest camp area is located south of the 52nd parallel, the permit holder shall, within 2 years after it is abandoned, ensure that the area is regenerated with commercial species and that the distribution coefficient of such regeneration, established in accordance with section 90, is at least equal to the coefficient existing before the cutting of the species over that area.
- The permit holder shall also ensure that the coefficient is maintained 8 years after the area is abandoned.

5.8.2. Bridges and culverts

In total, the construction of the logging road will require the installation of 33 culverts and bridges, depending on the various corridors examined. Table 5.1 shows the specifications of the watercourse crossings for the two proposed road corridors. This data is based on

the flow studies carried out with the **ArcView** version 3.3 and **Ponceau 7.4** applications developed by *Le groupe Système Forêt inc.* The raw data originated from the *MRNF – Direction Territoire*. Map 5.3 gives an overview of the flow studies. Flow calculations are carried out in accordance with Schedule 3 of the *Regulation respecting standards of forest management for forests in the domain of the State (RSFM)* in the case of drainage basins less than 6,000 hectares (ha). For drainage basins greater than 6,000 ha, calculations follow the method indicate in Schedule 4 of the same regulation.

The culvert dimensions put forward by Barrette-Chapais Itée are subject to change. The final dimensions will be confirmed when construction work begins. However, flow studies are usually consistent with field conditions.

The water crossing structures proposed by Barrette-Chapais Itée consist of two types of structures. In most cases, they take the form of culverts made of corrugated steel pipes with locked seams. Such structures are commonly used for the construction of roads in remote areas, such as logging or mining roads. On rare occasions, watercourses are too large and require a more complex structure, such as a bridge. The frame of such bridges is made of steel, while their deck is made of wood. Appendix 5.1 contains typical specifications for the construction of such a steel and wood bridge.

Culverts will be installed in accordance with the standards specified in the *RSFM*. Particular care will be taken to ensure conformity with sections 16 to 40 of the Regulation in order to avoid restricting the flow of the watercourses or the free movement of fish.

The provisions of the Regulation include the following:

- The diameter or span of the pipe of such culvert shall be at least 30 cm. The end of the culvert shall extend at least 30 cm beyond the base of the fill supporting the road and the fill in that location shall be stabilized at the same time.
- Every person constructing or improving a road that crosses a watercourse shall preserve the ground cover and the stumps within 20 m of the watercourse, outside the roadway, the shoulders and the slopes of the road's embankment, as measured from the natural high-water mark.
- Every person constructing or improving a road that crosses a watercourse or a fish habitat shall construct a bridge or install 1 or more culverts, ensuring the free passage of water and fish.
- The construction of bridges or the installation of culverts shall not reduce the width of the watercourse by more than 20%, as measured from the natural high-water mark. In the case of culverts, the width ensuring the free flow of water shall correspond to their diameter or their span.
- The construction of bridges or the installation of culverts shall not be allowed to cause erosion in the watercourse.
- Every person installing a culvert with a bottom in a watercourse or a fish habitat shall ensure that the culvert is installed following the slope of the bed of the watercourse and that the inner wall of its base is located below the natural bed of the watercourse at a depth equivalent to 10% of the culvert's height, except in locations where the conditions of the soil make it impossible to install it at such a depth.

INSERT MAP 5.3

- Every person installing a culvert with a bottom in a fish habitat shall ensure that the slope of the bed of the fish habitat is less than 1% if the length of the bridging does not exceed 25 m and is less than 0.5% if the length exceeds 25 m.
- Where a person installs culverts parallel to one another, he shall space the culverts at least 1 m apart. It is prohibited to enlarge a watercourse.
- Every person installing a culvert in a watercourse or a fish habitat shall ensure that the bed of the watercourse is stabilized at the intake and at the outlet of the culvert and that the passage of fish is not obstructed.
- Every person constructing or improving a bridge to cross a watercourse or a fish habitat shall ensure, at the time of the work, that diversion structures, such as channels, dikes and caissons, do not obstruct the passage of fish or reduce the width of the watercourse by more than 2/3, as measured from the natural high-water mark. At the end of the work, he shall remove the dikes and fill in any channels that were used to divert the watercourse and are no longer in use.
- Work in a fish habitat for the installation of a structural plate culvert or for the construction or improvement of a bridge shall not be carried out during the upstream migration of fish.

Table 5.1: Summary of the technical data from the flow studies at each of the watercourse crossings on the main and the alternate corridors.

Crossing #	Basin area (ha)	10-year interval peak flow (m ³ /s)	Tube diameter output per culvert 7.4 (mm)		Number and diameter of structures proposed by Barrette-Chapais Itée (mm)
			Single structure	Double structure	
2009-01	98.923	0.39	800	600	1 * 800
2009-02	1,369.883	1.46	1400	1000	1 * 1400
2009-03	129.086	0.45	800	600	1 * 800
2009-04	508.340	0.95	1200	900	1 * 1200
2009-05	54.834	0.35	800	600	1 * 800
2009-06 ¹	36,780.177	30.35	4300	3300	Bridge
2009-07	1,904.556	1.64	1400	1200	1 * 1400
2009-08	159.909	0.27	700	500	1 * 800
2009-09B	990.452	1.20	1200	900	1 * 1200
2009-10B	16,793.909	21.42	3990	3000	Bridge
2009-11B	291.891	1.49	1400	1000	1 * 1400
2009-12B	201.031	0.30	700	600	1 * 800
2009-13B	639.369	0.68	1000	800	1 * 1000
2009-09A	143.905	0.41	800	600	1 * 800
2009-10A	895.663	1.05	1200	900	1 * 1200
2009-11A ¹	11,378.798	15.93	3300	2700	2 * 2700
2009-12A	141.294	0.24	700	500	1 * 800
2009-13A	86.297	0.22	600	450	1 * 800
2009-14	1,893.097	4.13	2000	1500	1 * 2000
2009-15	67.586	1.40	1400	1000	1 * 1400
2009-17	284.537	1.59	1400	1000	1 * 1400
2009-18 ¹	11,665.188	15.79	3300	2700	1 * 3300
2009-19	2,588.386	3.98	2000	1500	1 * 2000
2009-20	845.404	1.27	1200	900	1 * 1200
2009-21	332.253	0.58	900	700	1 * 1000
2009-22	110.558	0.47	900	600	1 * 1000
2009-24	332.064	0.40	800	600	1 * 800
2009-25	259.789	0.31	700	600	1 * 800
2009-26 ¹	11,502.389	19.16	3600	2700	2 * 2800
2009-27	1,231.414	0.99	1200	900	1 * 1200
2009-28	6,960.735	7.45	2700	2000	1 * 2700
2009-29	141.133	0.24	700	500	1 * 800
2009-30	756.083	3.47	1800	1400	1 * 1800
2009-31	90.078	0.91	1200	800	1 * 1200
2009-32	493.856	1.29	1400	900	1 * 1400
2009-33	776.167	1.64	1400	1200	1 * 1400
2009-34	25,601.354	27.06	4300	3300	Bridge
2009-35	636.695	0.82	1200	800	1 * 1200

¹ 20-year interval daily peak flow (Q1,20)

A: This letter refers to the alternate road corridor.

B: This letter refers to the main road corridor.

5.9. Schedule

The road construction schedule is contingent on the project being authorized by the MDDEP. Road construction will begin immediately after the authorization is issued.

Based on the assumption that such authorization is issued before the end of 2009, the road construction will likely begin towards the end of October. Before any work begins, it will be necessary to carry out a ground reconnaissance and to mark the road. Installation of temporary facilities, e.g. forest camp, will follow, along with the final definition of the location of borrow pits.

Table 5.2 gives an overview of the various stages of the work and of the time allotted for each stage. This table is supplied for information purposes only, since one or more stages may be delayed or take longer than planned. There are many possible contingencies which cannot be foreseen at the present time.

Table 5.2: Stages and schedule for the construction of the Barrette-Chapais Itée logging road.

Stage	Month/Year															
	10/09	11/09	12/09	01/10	02/10	03/10	04/10	05/10	06/10	07/10	08/10	09/10	10/10	11/10	12/10	01/11
Road marking	█															
Location of the borrow pits	█															
Deforestation		█														
Bridge construction								█								
Culvert installation			█													
Road earthworks			█													
Road gravelling				█												
Road operation																█

5.10. Construction costs

Road construction costs are estimated at \$120,000 per kilometre of road built. However, it is necessary to add to this the bridge building costs, roughly estimated at between \$200,000 and \$350,000 depending on the size of the watercourse that needs to be crossed. In addition, the cost for the installation and the demobilization of the temporary camp is estimated at around \$200,000. The costs associated with mitigation measures, monitoring and project follow-up must also be taken into account. Mitigation measures and the monitoring and follow-up program will be discussed in Chapters 5 and 6 of this assessment.

Table 5.3 shows the detailed costs and the total cost of the project. Obviously, such costs are strictly approximate. Many contingencies could increase the cost of the project.

Table 5.3: Detailed construction costs of the Barrette-Chapais ltée logging road.

Stage	Cost of each road corridor	
	Main corridor (96.8 km)	Alternate corridor (96.4 km)
Road construction		
- 96 km @ \$120,000/km (in \$millions)	\$11,568 M	\$11,616 M
Bridge construction		
- Construction of bridge # 1	\$350,000	\$350,000
- Construction of bridge # 2	\$250,000	Not applicable
- Construction of bridge # 3	\$200,000	\$200,000
Mitigation measures	\$80,000	\$80,000
Monitoring and Follow-up Program	\$50,000	\$50,000
Total (in \$millions)	\$12,498 M	\$12,296 M

6. Public and private consultations

Public and private consultations have been carried out during the preparation and drafting of the project's impact assessment.

The Waswanipi and Oujé-Bougoumou Cree communities were consulted. In addition, the non-native population of Chapais and Chibougamau was also consulted.

With respect to private consultations, two meetings were held with representatives of the *MDDEP – Direction du Patrimoine écologique et des Parcs*, in order to obtain their opinion with regards to the project.

The following paragraphs describe these consultations and the recommendations and/or comments collected during such consultations.

6.1. Pre-consultations of tallymen

At the very beginning of project planning, consultations were carried out among tallymen, in collaboration with the *MRNF – Direction des Affaires régionales du Nord-du-Québec*, in order to present the logging road construction project to them and discover what items might form the basis for a consensus.

Following consultation of the tallymen, several road corridors were drawn with a view to minimizing the inconveniences caused by the project. The most important point that emerged from these meetings was the necessity to avoid interconnections between family hunting grounds. The Company responded positively to several requests formulated by the tallymen. On the basis of this information, several road corridors were therefore drawn and presented to the tallymen. Map 4.2 shows the various corridors that were studied and rejected after these consultations.

6.2. Public consultations

6.2.1. Chapais and Chibougamau

The population of Chapais and Chibougamau was invited to attend a presentation on the project held on April 27, 2009. The meeting's objective was to inform the local population and to allow it to make comments regarding the road's construction.

Approximately twenty people attended the meeting, including representatives of the Chamber of Commerce, of the Chapais Mayor's Office and regular users of the forest (hunting, fishing and mining).

Several comments were made during this information meeting which was held at night. It appeared that the non-native population saw this project in a very positive light. The following comments were made, among others:

- Opening of a territory that is little visited due to the absence of an acceptable and serviceable road;
- Easier access to a territory that could be the subject of mineral exploration;

- The new road could form an additional tourist attraction and thus attract tourists from Montreal and the rest of Quebec;
- The construction of this new road could allow a safer access to the territory (road safety);
- Stabilization and retention of jobs that are important for the region at the Barrette-Chapais sawmill;

It therefore appears, from this public consultation of the non-native population, that it will enjoy an easier access to the territory which was abandoned as a result of the degradation of the road that runs under Hydro-Québec's power transmission line.

6.2.2. Consultation of the Waswanipi Cree community

The Waswanipi Cree community was consulted on June 15, 2009. The entire community was invited to participate in this consultation. Invitations were jointly coordinated with the Band Council and Allan Saganash (Convenor of the Waswanipi Joint Working Group). Approximately twenty people attended this meeting, including all the tallymen affected by the project, who were accompanied by members of the community and representatives of the Waswanipi Band Council.

Many comments were made during this information session, some of which were positive, while others were negative. Some comments were also very constructive and were included among the mitigation measures presented in following chapters of this assessment. The following comments were formulated, among others:

- The construction of the road will have a negative impact since it will open up new territories to the non-native population;
- The construction of the road could end up facilitating access to the trapping grounds of the Waswanipi community;
- The road should remain open at all times in order to ensure permanent access to the trapping grounds;
- The main road corridor, i.e. the corridor that passes west of Lake Ruth, should be avoided at all cost in order to ensure trapping area #W12 remains inaccessible;
- A private consultation should be held with tallymen once the project is approved by government authorities in order to define precisely the location of the road corridor within the local assessment area (1 km buffer zone);
- The presence of woodland caribou east of Lake Ruth does not justify the construction of the road west of the said lake;
- Waste from the temporary forest camp should be transported to a remote landfill instead of being buried according to the trench method;
- Should a need arise for beaver trapping services when the road is operational, trapping contracts should be offered to tallymen affected by the project;
- Near Aboriginal camps, dust control liquids should be applied for road safety reasons;

- The Waswanipi Cree community wishes to participate in the road construction work.

6.2.3. Consultation of the Oujé-Bougoumou Cree community

The Oujé-Bougoumou Cree community was consulted on June 17, 2009. This consultation involved mainly the Band Council, at the invitation of Mr. Norman Wapachee (Traditional Pursuits Director). About ten people attended this meeting, but no tallymen were present.

During the presentation, it was mentioned that there were differences of opinion regarding the proposed road corridors. Once more, special mention was made of the presence of woodland caribou east of Lake Ruth. This is a major issue for both the Oujé-Bougoumou and the Waswanipi Cree communities. It was also mentioned during the meeting that several road corridors had been studied, and that the corridor that followed the power transmission line entailed the least impacts on family hunting territories, since it contained an existing road. Furthermore, Waswanipi participants were told that a private meeting with the tallymen was necessary, in order to define the precise location of the road corridor within the local assessment area. This approach will also be proposed to the tallymen from the Oujé-Bougoumou and Mistissini Cree communities who are affected by the project. Finally, it was explained that the Company favours the main road corridor, west of Lake Ruth, since it minimizes impacts such as disturbing the woodland caribou and fragmenting their territory.

Various comments were formulated during this meeting. Overall, these comments were very constructive. However, no clear position was formulated regarding the choice of the road corridor. The territories inhabited by the woodland caribou remains a major concern for the Oujé-Bougoumou Band Council. The effects of disturbances on this species are unpredictable. Towards the end of the meeting, Mr. Wapachee mentioned that it was very interesting that the Company was taking the time to inform the community and gather its comments. Mr. Wapachee also indicated that he would organize a private meeting with tallymen and that he would formulate a clearer position regarding the two proposed road corridors.

Other comments were also made during this meeting, as summarized below:

- The Oujé-Bougoumou Cree community wishes to participate in the road construction work;
- They would like trucking operations to stop for goose hunting during two weeks in spring (*Goose Break*);
- Road construction could have permanent effects on the woodland caribou population;
- Routing the road east of Lake Ruth will not ensure that Lake Caupichigau remains inaccessible since there is an easily navigable waterway connecting Lake Ruth to Lake Caupichigau;
- The road will open up the territory to the non-native population;
- It is feared that the construction of the road will increase the number of applications to rent land for vacation purposes;
- The road corridor which borders the future Assinica Park should be moved further west.

6.2.4. Consultation of the Mistissini Cree community

No meeting took place. An offer to present the project was made, but no reply was received. Once the project is authorized, concerned tallymen will be contacted directly, and we will hold private consultations with them in order to define precisely the location of the road corridor within the local assessment areas that overlap their trapping grounds.

6.3. Private consultations

As previously mentioned, private consultations were held with representatives of the *MDDEP – Direction du Patrimoine écologique et des Parcs*. Thus, two meetings were held with Messrs. Jean-François Lamarre and Jean Gagnon, in order to explain the project to them and obtain their comments.

These meetings allowed us to learn more precisely the location of the boundaries of the future Assinica Park. Following the first meeting, a new road corridor was drawn in order to avoid the southern boundary of Assinica Park.

A second meeting was required in order to inform them that one tallyman objected to the passage of the road west of Lake Ruth on the grounds that this would open up the territory giving access to Lake Caupichigau. Due to the objections of this tallyman, it was mentioned that the Company was considering a road corridor that passes east of Lake Ruth and therefore encroaches into the boundaries of the future Assinica Park on a distance of 6.8 km.

Messrs. Lamarre and Gagnon were not very receptive to this idea. They mentioned that woodland caribou has little tolerance for human presence, especially if such presence consisted of timber transportation, with the associated truck noise, high traffic frequency and accompanying road dust. However, they indicated that they understood the tallyman's argument. Nonetheless, they were of the opinion that the impacts on the woodland caribou were greater than those caused by the opening up of Lake Caupichigau for the purposes of fishing.

6.4. Recommendations arising from public and private consultations

From these public and private consultations, it appears that the non-native population, in general, views the project in a positive light. The project is likely to ensure, in part, the retention of jobs at Barrette-Chapais Itée, and it could increase the tourism potential in the region.

On the other hand, the Waswanipi and Oujé-Bougoumou communities perceive this to be a negative aspect of the project. Conversely, the construction of the road will promote access to family hunting grounds, both for the Waswanipi and the Oujé-Bougoumou communities, which is in conflict with access to the territory by non-natives.

Furthermore, the two communities have expressed a significant interest in participating in the construction of the road.

Finally, both communities are not in agreement over the issue of bypassing Lake Ruth on the east. The two communities have differing views on the impacts of both the main and the alternate road corridors.

In summary, many constructive comments were made during these information meetings, several of which are included among the mitigation measures. The following are a few examples:

- Transportation of waster towards a remote sanitary landfill;
- Application of dust control liquid near Aboriginal camps;
- Use of tallymen should the need to trap beavers arise;
- Once the project is authorized, tallymen will be consulted in order to define precisely the location of the road corridor within the local assessment area;
- Particular care shall be given to ensuring that Aboriginal communities may participate in the road construction work.

7. Description of the environment

Upon issuance of the MDDEP directive regarding this project, two assessment areas were defined based on the various factors that had to be taken into consideration and the expected significance of their impacts.

The two areas are named: "overall assessment area" and "local assessment area".

The overall assessment area refers to the whole territory affected by the construction project. This area was defined arbitrarily on the basis of the various trapping grounds affected by the project. This assessment area aims to facilitate the analysis of the project's overall environmental impacts on the territory in question. Nonetheless, this assessment area does not attempt to describe all of the impacts in Northern Quebec. This area, however, is sufficiently large to provide an accurate description of the situation, both before and after construction of the logging road proposed by Barrette-Chapais ltée. Map 7.1 illustrates the overall assessment area. This territory is delimited by trapping areas #M47A, O52, O53, W10, W10A, W12 and W22.

In order to study the potential local impacts, a second assessment area, i.e. the local assessment area, was drawn. As its name indicates, this area aims to define the environment and impacts focusing on local and point scales. The notions of global, local and point scale are further discussed in the section on impacts contained in Chapter 5. Thus, the local assessment area has been defined as a buffer zone spanning 500 metres on either side of the road axis. Within the local assessment area, information has been collected regarding vegetation cover and special ecosystems, special status floristic or faunal species and water crossings. Map 7.2 illustrates the local assessment area.

7.1. Overall assessment area

In general, the overall assessment area covers an area of 5,156 km². This territory comprises seven trapping areas. Four trapping areas are located on the territory of the Waswanipi Cree community, two are located on the territory of the Oujé-Bougoumou Cree community and one is located on the territory of the Mistissini Cree community. Table 7.1 shows the general ecological characteristics of the assessment area.

INSERT MAP 7.1

INSERT 7.2

Table 7.1: Ecological characteristics of the overall assessment area for the Barrette-Chapais Itée logging road project.

Ecological characteristics	Area (ha)	Percentage of the assessment area
Forest cover		
Softwood stands	249,778	48.4
Mixed stands	38,940	7.6
Hardwood stands	3,339	0.65
Forestry planting	2,486	0.48
Total windfall	256	0.05
Burn	28,216	5.5
Recently logged area (15 years ago or less)	14,506	2.8
Other considerations		
Water	51,732	10.0
Barren wetland (peat bog)	101,651	19.7
Barren dryland (rock)	16,562	3.2
Operating or abandoned gravel pit	35	0.01
Power transmission line	3,151	0.6
Total area	515,639	99.0

Table 7.1 indicates that 65.5% of the territory consists of a forest ecosystem dominated by softwood stands. Of this percentage, 3.28% of the territory has been logged or was the site of a forest plantation program. A significant part of this percentage is due to the recovery of burned timber. More than 5% of the assessment area is also made of unrecovered burns. It should be noted that after the overall assessment was made, a major fire took place on June 19 of last year. At the time of drafting of this document, the fire covered an area of 9,100 hectares, which is entirely located within the overall assessment area. Consequently, this report does not take into account information regarding such fire.

Water bodies represent 10% of the overall assessment area. Humid environments also cover a significant portion of the territory. Almost 20% of the territory is covered by peat bogs. Barren drylands (rock outcrops) represent slightly more than 3% of the territory. Finally, permanent or temporary infrastructure due to human presence constitutes 0.61% of the overall assessment area. This does not include class 2 or 3 logging roads or winter roads.

In all, there are 545 linear kilometres of logging roads within the overall assessment area, which also includes the access road that was built when Hydro-Québec installed its power transmission line. Table 7.2 summarizes the statistics regarding existing logging roads within the assessment area.

Table 7.2: Statistics regarding existing roads in the overall assessment area for the Barrette-Chapais Itée logging road construction project.

Logging road class	Distance within the assessment area (in linear kilometres)
Class 1	13.4
Class 2	41.8
Class 3	191.5
Class 4	61.3
Winter road	139
Non-logging road (Hydro-Québec)	98.4
Total	545.4

Class 1 roads are roads that are used for the transportation of timber, from the cutting area to the provincial road network. Class 2 roads defined as roads that approach cutting areas, starting from a class 1 road. Finally, class 3 and 4 roads are access roads that lead to the cutting areas. A winter road is a road that is only used in winter, since it is not graded and its surface is entirely made of snow and ice. Once snow has melted, all that remains of a winter road is the bare cleared land.

If logging is taken into account in the calculation, more than 96% of the overall assessment area shows little or no human presence. Human influence is only visible along the corridor of Hydro-Québec's power transmission line, as well as in the southern and the northern parts of the assessment area, where major fires have taken place and where the timber has been recovered.

To illustrate the state of the overall assessment area with respect to fragmentation of family hunting grounds, table 7.3 shows the characteristics of each hunting area crossed by Barrette-Chapais Itée's planned logging road.

Table 7.3: Overall view of the trapping areas crossed by the Barrette-Chapais Itée logging road construction project.

Trapping area ID #	Family hunting ground user	Area (ha)	Road distance within the trapping area (in linear kilometres)	
			Main corridor	Alternate corridor
M47a	Charlie John Coon	30,361	15.8	15.8
O52	David Bosum Sr.	81,321	12.6	9.1
O53	Charlie Bosum	94,425	12.0	12.0
W10	Joseph Neeposh	87,582	28.0	28.0
W10a	Johnny Trapper	116,214	5.6	11.1
W12	Simeon Mianscum	56,927	14.0	12.3
W22	Willy Wapachee	48,808	8.7	8.7

Table 7.3 indicates that the trapping areas of the Waswanipi cover 60% of the assessment area, while the Oujé-Bougoumou's trapping areas represent 34% and those of the Mistissini community cover slightly less than 6% of the assessment area. Three trapping areas are affected by the two

alternatives, i.e. either the main corridor or the alternate corridor. These are trapping areas #O52, W10a and W12.

The trapping area used by Mr. Neeposh (#W10) will be the most affected in terms of the length of road crossing on his territory, followed by trapping area #M47a (Mr. Coon). Depending on which of the proposed corridor is selected, family hunting grounds #O52, W10a and W12 will be affected differently (5.6 - 14 km).

7.2. Local assessment area

The local assessment area covers an area that varies between 9,700 ha and 9,750 ha depending on whether the main or the alternate corridor is selected. As previously mentioned, the local assessment area has been defined as a buffer zone spanning 500 metres on either side of the road axis. As in Table 7.1, Table 7.4. shows the general characteristics of each corridor.

Table 7.4: Ecological characteristics of the local assessment area for the Barrette-Chapais Itée logging road project.

Ecological characteristics	Main corridor		Alternate corridor	
	Area (ha)	Percentage of the assessment area	Area (ha)	Percentage of the assessment area
Forest cover				
Softwood stands	5,819	59.7	5,796	59.7
Mixed stands	274	2.8	131	1.3
Hardwood stands	20	0.2	11	0.11
Forestry planting	164	1.7	164	1.7
Total windfall	0	0	0	0
Burn	574	5.9	535	5.5
Recently logged area (15 years or less)	220	2.3	220	2.3
Other considerations				
Water	233	2.4	229	2.4
Barren wetland (peat bog)	1,925	19.7	2,028	20.9
Barren dryland (rock)	68	0.7	79	0.8
Operating or abandoned gravel pit	3	0.03	3	0.03
Power transmission line	447	4.6	518	5.3
Total area	9,748	100	9,713	100

According to Table 7.4, for the main road corridor, 72.4% of the local assessment area consists of a forest ecosystem dominated by softwood stands. For the alternate road corridor, this percentage is slightly lower, at 70.2%. The areas affected by logging or plantations represent 4% of the local assessment area. Once more, a significant part of this percentage is due to the recovery of burned timber. Between 5.5% and 5.9% of the local assessment area is made of burnt forest that has not been recovered.

Water bodies, at 2.4%, are obviously under-represented. The percentage of peat bogs and barren wetlands varies between 20.9% and 19.7% of the buffer zone, depending on the road corridor that is selected. Barren drylands (rock outcrops) represent slightly less than 1% of the territory. Human presence (i.e. the power transmission line) in the local assessment zone represents 5.3% of the territory, in the case of the main road corridor, and 4.6% of the territory in the case of the alternate corridor.

If logging is taken into account in the calculation, 8.63% of the buffer zone of the main corridor is affected by human presence. For the alternate corridor, this fraction reaches 9.33%. In this case, the presence of the power transmission line has an impact on the percentage of the territory affected by human presence.

A comparison of the overall assessment area with the local assessment area indicates that the road construction project crosses territories that have already been impacted by human presence. In fact, 0.61% of the overall assessment area shows the effects of human presence, while, on average, 9% of the local assessment area would be affected. This significant difference is caused by the fact that the road follows the power transmission line over a distance of 22 km.

Maps 7.3 to 7.6 show close-up views of the local assessment area. These maps give an overall view of the sensitive information available concerning ground cover.

7.3. Assinica wildlife reserve

The area covered by the assessment overlaps, in part, the Assinica wildlife reserve. Spanning a geographic area of 25,285 km², this wildlife reserve is the subject of negotiations regarding the conversion of part or all of its territory into protected areas. Thus, the *Paix des braves* agreement provided that the territory of the Assinica wildlife reserve would be the subject of negotiations aiming to transform it into a Cree Heritage Park.

As a result of this agreement, several studies have been initiated in order to better understand the physical and ecological characteristics of this vast territory. In particular, Mr. Gauthier has carried out an extensive inventory of the vegetation present in the reserve. Even though this work does not cover the whole reserve, it does not indicate the presence of any special status floristic species within the assessment area (Gauthier, 2004).

The boundaries of the Cree Heritage Park were not yet finalized, at the time this assessment was being drafted. However, after private consultations with Messrs. Gagnon and Lamarre, an outline of the future park indicating a western boundary which would follow Hydro-Québec's power transmission line was presented to the authors of this assessment. It is mostly on the basis of such information that the road construction corridors were defined.

7.4. Physical environment

The assessment area is located in the Mistassini Highlands, also known as natural province G according to Quebec's ecological reference framework.

The Mistassini Highlands are in general described as slightly mountainous. They chiefly consist of small hills dotting a vast plateau (MDDEP, 2009).

Subsoil composition has been the subject of intense research aimed at discovering base metals and several precious metals, and is believed to be rich in various metals.

INSERT MAP 7.3

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INSERT MAP 7.5

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In general, the soil surface consists of thick glacial drifts. These drifts generally present the characteristics of basal or De Geer moraines. Glaciofluvial drifts are also present, though more rarely. Such cases involve mainly eskers.

This natural province is located within a continental setting, and prevailing temperatures are typical of such an environment, with a mean annual temperature of between a minimum of -2.5°C and a maximum of 0.6°C . Temperature variations can be extreme, with very hot summers (maximum temperatures of 35°C) and very cold winters (minimum temperatures of -43.3°C) (Environment Canada, 2009).

7.5. Hydrographical environment

The assessment area is covered in large part by watercourses of varying sizes. There are two main drainage basins in the assessment area, namely the Chibougamau River and the Broadback River. The first covers a large portion of the southern part of the assessment area, while the latter covers mainly its northern part. These two basins are not affected in any way by the road construction project. We will therefore focus on the watercourses that may be affected by the project.

As shown in Table 5.1, the planned road will cross over three significant watercourses, which do not have any specific names.

On Map 5.3, these watercourses bear the following identifications: 2009-06, 2009-10b and 2009-34. The same map provides an overview of the drainage basins of each watercourse crossed by the planned road. Analysis of the drainage basins shows that the majority of these waterways have their source right near the northwestern boundary of Assinica Park. Accordingly, for those drainage basins, the road construction work would not have any impact on water quality in the future park.

There is an existing triple culvert at crossing number 2009-06; it was installed during the construction of the access road needed to build Hydro-Québec's power transmission line. This little used water crossing is in an advanced state of decay. Hydro-Québec does not maintain this access road. For a photograph of this structure, please see the next chapter.

At main watercourse crossings 2009-10b and 2009-34, there is no existing infrastructure.

Among all the watercourses crossed by the planned road, no major obstacle to the passage of fish or to navigation was noted while overflying the assessment area.

According to the information gathered during public consultations, the majority of the watercourses are not used for the purpose of navigation. However, there might be an existing hydraulic link connecting Lake Ruth and Lake Caupichigau, which fishermen may be using. This information, however, has not been officially confirmed.

The main water bodies include, among others, lakes Capiebagimau, Omo and Caupichigau. There is also Lake Ruth and Lake Harnois, though their areas are smaller. It should be noted that Lake Ruth plays a central role in this assessment, because of its location. As mentioned already several times in this report, the road corridor must go around this lake, either to the west (main corridor) or the east (alternate corridor).

7.5.1. Peat bogs

As indicated by Table 7.1 in the introduction to this chapter, peat bogs occupy a significant place in the ecological landscape of the area under assessment. According to available data, more than 19% of the area under assessment is covered by barren wetlands. According to the classification system used by the *ministère des Ressources Naturelles et de la Faune*, a barren wetland is any station devoid of trees that is located in a wetland. However, this definition is insufficient to understand this special ecosystem found in Northern Quebec.

According to Payette and Rochefort (2001), a peat bog is an ecosystem whose substrate is not sufficiently drained to allow decomposition of organic matter, causing the accumulation of the latter. It is usually accepted that a peat bog must contain at least 30 cm of peat before it can be considered as such.

According to the same authors, there are two main types of peat bogs, i.e. minerotrophic and ombrotrophic peat bogs. Minerotrophic peat bogs are in general influenced by the surrounding water table, while ombrotrophic peat bogs are only influenced by precipitation. The latter category is considered, by the authors, to form one of the poorest ecosystems on the planet. Minerotrophic peat bogs are usually found along watercourses, where the accumulation of organic matter promotes the development of such bogs. Conversely, ombrotrophic peat bogs are never found on the edge of water bodies; rather, the development of such bogs depends on the surrounding topography.

According to Payette and Rochefort (2001), the region in which the assessment area is located is mainly composed of semi-forested ombrotrophic peat bogs.

As Map 7.7 shows, the territory under assessment is mostly covered by peat bogs. Furthermore, this type of ecosystem is uniformly distributed on the territory.

7.6. Ecological environment

7.6.1. Description of the vegetation

This logging road construction project is located within the realm of the spruce-moss stand. This bioclimatic zone has an area greater than 410,000 km² (MRNF, 2009). The vegetation cover in this zone consists mostly of black spruce. This species may be found together with balsam fir, silver birch, quaking aspen and, more rarely, balsam poplar. Within its understory, it is possible to find several mosses or herbaceous plants together with shrub-like plants such as heaths (ericaceae).

In general, the natural perturbation cycle of this bioclimatic zone is dominated by fires. The fire cycle is usually longer than for the province's more eastern bioclimatic zones. Map 7.8 (see next page) shows Quebec's bioclimatic zones.

The *ministère des Ressources Naturelles et de la Faune* has created small protected areas called « exceptional forest ecosystems » (EFE's). The overall assessment area does not contain any such EFE. However, in the immediate surroundings of Chapais-Chibougamau, two such areas are to be found (see Map 7.8). These are the old-growth forest of Baie-du-Poste, located east of the assessment area, and the rare forest of Lake Phooey. The latter is located south of the assessment area.

INSERT MAP 7.7

INSERT MAP 7.8



Old-growth forests consist of trees older than the average within the region. These forests have not been subjected to any man-made or natural disturbances. Rare forests are in general small ecosystems randomly distributed within the Quebec territory.

7.6.2. Special status floristic species

In response to a request for information made to the MDDEP in Rouyn-Noranda, via the *Centre de données sur le patrimoine naturel du Québec* (CDPNO), it was learned that the overall assessment area contains no special status floristic species. A copy of the letter sent by Mr. Benoit Larouche, biologist, M.Sc. can be found in Appendix 7.1.

In previous meetings with Messrs. Gagnon and Lamarre of the MDDEP's *Direction du patrimoine écologique et des parcs*, they mentioned the presence of rare plant species near the assessment area. Table 7.5 lists the various species mentioned by Messrs. Gagnon and Lamarre, including their habitats.

Table 7.5: Special status floristic species referred to by Messrs. Gagnon and Lamarre in communications regarding the Barrette-Chapais Itée logging road project.

Floristic species	Locations where they may be found	Habitat	Photo available on the Web
Woolly beachheather (Hudsonia tomentosa) Status: Likely to be designated as vulnerable	Near the Rupert River and within boundaries of the future Assinica Park	Sand dunes and plains	
Dragon's mouth (Arethusa bulbosa) Status:	Lake Ashuapmoushuan and within the boundaries of the future Assinica Park	Orchidacea that grows preferentially in peat bogs	
Nardia insecta bryophyta Status:	Assinica wildlife reserve	Bryophyta that grows preferentially in ombotrophic peat bogs or on the edge of swamps	

Please note that the species listed in Table 7.5 are not found in the overall assessment area and are therefore absent from the local assessment area.

7.7. Description of the fauna

7.7.1. Special status faunal species

Woodland caribou (*Rangifer tarandus caribou*) was designated as an endangered species by the Government of Quebec in 2005 (MRN, File #53, 2009). The woodland caribou population has the largest distribution area of all species, since its habitat, the boreal forest, covers one third of the province of Quebec (MRN, FAPAQ, 2009). It can be found, for instance, in the James Bay area and within the local assessment area, in the form of a small head east of Lake Ruth.



Due to its wide distribution, the woodland caribou is the least studied caribou ecotype (COSEWIC, 2009). Even though sport hunting of woodland caribou is forbidden in Quebec, the main causes of its decline are accidental killings during the hunt for barren-ground caribou, harvesting by Aboriginals, poaching, disturbances to its habitat, and predation by wolves and black bears (MRN, File #53, 2009).

The boreal forest is characterized by the presence of black spruce and balsam fir of variable age and height, as well as ground and arboreal lichens. Softwood stands within the assessment area, in particular spruce-moss stands, are the main feeding grounds sought by the caribou. Its chosen habitat may vary according to seasons. The choice depends on various factors, such as food availability, predators, reproductive needs (rutting and calving) and possibly the quietness of the environment (MRN, File #53, 2009). In spring, woodland caribou uses mainly peat bogs, islands and peninsulas, for feeding and calving (Hydro-Québec, 2004).

In April 2009, the 2005-2012 Plan for the recovery of woodland caribou in Québec was made public. This plan, prepared by Quebec's woodland caribou recovery team, includes an update on the status of the woodland caribou, the strategy favoured by the team in order to reach its goal and recovery objectives, as well as an action plan designed to reach these objectives. It should be noted that one of the approaches examined in the plan, in order to maintain woodland caribou populations, is based on the absence of logging roads.

The southern limit of the woodland caribou distribution area in Quebec has not stopped regressing towards the north since the mid nineteenth century. Recent aerial surveys have shown the precarious state of the entire population. Sport hunting and forestry are considered the main causes of the historical decline in woodland caribou populations throughout North America. Sport hunting of woodland caribou is now forbidden in Quebec, but accidental killings during the hunt for barren-ground caribou, harvesting by Aboriginals, as well as poaching constitute additional threats to this species. Even though the impact of logging is poorly documented, this activity affects the quietness of the environment, reduces significantly the size of choice habitats and attracts large predators, such as grey wolves and black bears, by making the environment favourable to large densities of caribou. According to the 2005-2012 Plan for the recovery of woodland caribou in Quebec, construction of logging roads fragments the territory and may increase predation on pregnant females or calves.

Again, this time in response to a request for information from the CDPNQ through Mathieu Morin, biologist in the *Direction de l'expertise Énergie-Faune-Forêts-Mines-Territoire du Nord-du-Québec* (MRNF), we received confirmation that no special status faunal specie (threatened, vulnerable or likely to be so designated), except woodland caribou, is listed for this territory. However, for

reasons of confidentiality, Mr. Morin was not able to indicate the exact locations where the caribou may be found. A copy of the email sent by Mr. Morin is available in Appendix 7.2

Despite the lack of specific information regarding the woodland caribou, the team preparing this assessment was able to discuss the presence of this species with the MDDEP representatives. Thus, according to the information provided by Messrs Gagnon and Lamarre of the MDDEP, a small herd of caribou is likely to be located east of Lake Ruth.

7.7.2. Spawning grounds

According to available data (MRNF, 2003, 2007 and 2008), the overall assessment area contains five spawning grounds. As the land use map (Map 7.9) shows, the five spawning grounds are mainly located on the edge of the assessment area. Two spawning grounds are located in the southern part of the assessment area (La Trève and Crinkle Creek – Brock River). The Lake La Trève spawning ground is located directly under the Hydro- Québec transmission line. A water crossing was installed there by the government corporation. The Crinkle Creek spawning ground is entirely to the east of the assessment area and does not belong to the drainage basin affected by the project. Three other spawning grounds are located in the northern part of the assessment area. They are the Comancho Lake, Lake Boisy and Lucky Strike Creek spawning grounds. Of these three spawning grounds, two are upstream of watercourses that cross the proposed road. The Lucky Strike Creek spawning ground is the only one that may be affected by the construction of the road. However, again, it is located very far, so that no impact is expected.

As this assessment was being prepared, no information was available concerning the exact nature of this spawning ground.

7.8. Description of the social environment

7.8.1. Socio-economic environment of the Cree community

7.8.1.1. Historical background of the Cree

The Cree Nation inhabits the Bay James region since about 5,000 years ago. It is the third largest First nation in Quebec in terms of population (MTQ, 2009). In the 1950's, the growing presence of the federal government, the introduction of mandatory schooling, the construction of permanent housing, and the decline in the fur trade disrupted their way of life (SAA, 2009a).

In 1975, following negotiations with the governments of Quebec and Canada, the Cree and Inuit signed the James Bay and Northern Quebec Agreement (JBNQA). Pursuant to such agreement, they gained special rights over a vast territory, including ownership or exclusive use of territories, as well as exclusive hunting and fishing rights (SAA, 2009a; MTQ, 2009). Several entities were then created, including the Cree Regional Authority, the Cree School Board, the Cree Board of Health and Social Services of James Bay and the Cree Hunters and Trappers Income Security Board.

The government of Quebec and the Cree reached an agreement in principle that led, on February 7, 2002, to the signing of the Agreement Concerning a New Relationship between le Gouvernement du Québec and the Crees of Québec, commonly known as the *Paix des braves* agreement. The Cree Nation thus takes on new responsibilities regarding economic and community development (MTQ, 2009). This agreement guarantees their participation in the

INSERT MAP 7.9

development of forestry and mining resources, as well as in the execution of large hydroelectric projects on the James Bay territory, thus ensuring a large economic impact (SAA, 2009b).

7.8.1.2. Particular historical backgrounds of the Waswanipi, Mistissini and Oujé-Bougoumou communities

This project affects three Cree communities in particular, namely the Waswanipi, Mistissini and Oujé-Bougoumou. As explained further, each community has trapping grounds that are affected by the project. Basic information regarding these communities will be discussed in order to better understand the issues raised by the road's construction. These communities have modernised and adapted with time, but this project is committed to taking into account all the richness of their cultural heritage and to respecting their traditions.

7.8.1.3. Waswanipi

The Waswanipi community has a population of approximately 1,445 people (Stat. Canada, 2006). The current community was established in 1976, at the junction of the Chibougamau and Waswanipi rivers, along highway 113.

The community is engaged in the development of natural resources, as exemplified by its forestry company (*Mischuk Corporation*, a municipal sawmill) (Waswanipi, 2009). The village contains an administrative centre, schools, day-care centres, businesses and an arena intensely used by the population, known for the high calibre of its hockey and broomball players.

Tourism offers several opportunities for outdoor activities in an exceptional environment, including snowshoeing, snowmobiling, as well as hunting and fishing.

7.8.1.4. Mistissini

The current location of the Mistissini community, near Lake Mistissini, had been its summer camp since the beginning of the 19th century following the establishment of a Hudson's Bay Company post at that location (Mistissini, 2009).

The Mistissini form the largest population of the three communities affected by the project. According to 2007 data from Statistics Canada (SAA, 2009c), this community includes slightly more than 3,400 people. Its population has increased with time, and it has established modern public services: schools (preschool to adult education), a day-care centre, a clinic, a sports centre and playing fields, a post office, a police and fire service, a geology centre, a radio station, public and private, and an administrative centre housing several regional entities.

The local economy has also developed through business development initiatives. The businesses set up include, among others, a mineral exploration company, a logging company, construction and transportation companies, and a tourism business (Mistissini, 2009).

7.8.1.5. Oujé-Bougoumou

For a long time, the Oujé-Bougoumou led a nomadic way of life based on hunting and fishing, but they were forced to adapt due to the disruption brought about by mineral exploration in the region. The influx of people and the establishment of mining camps led to the birth of towns. From 1920 to 1970, the Oujé-Bougoumou had to move seven times (Oujé-Bougoumou, 2009).

In 1992, an agreement confirmed the federal government's share in the construction of a new village and recognized their right to live as a community. In 2007, the village's residents numbered 600 (Table 4.6). Oujé-Bougoumou has become a popular tourist destination, and local businesses and services continue to develop.

At the local level, there are considerable efforts invested in the protection and the promotion of Cree culture. Oujé-Bougoumou is open to visitors and holds educational activities and events, including several festivals (Oujé-Bougoumou, 2009).

7.8.2. Demographics

7.8.2.1. Cree populations

In order to make it easier to compare statistics regarding Aboriginal populations and detect trends, this analysis relies on data from after 1985, since many natives, especially women, were not included in the data before then. The abrogation, in 1985, of discriminatory provisions of the Indian Act effectively restored the status of many persons (INAC, 2009a). The comparison of population statistics for 2001 and 2007 shows an increase. This data provides a reasonably accurate description of the situation, without any bias due to differences in the enumeration criteria.

Table 7.6 Comparison of the populations of Cree communities between 2001 and 2007.

Cree Nation communities	Residents 2001	Non-residents 2001	Total 2001	Residents 2007	Non-residents 2007	Total 2007
Chisasibi	3,109	131	3,240	3,681	132	3,813
Eastmain	544	26	570	620	36	656
Mistissini	2,621	280	2,901	3,441	541	3,982
Nemiscau	522	70	592	608	15	623
Oujé-Bougoumou	511	106	617	611	98	709
Waskaganish	1,640	481	2,121	2,017	379	2,396
Waswanipi	1,138	426	1,564	1,386	404	1,790
Wemindji	1,057	116	1,173	1,248	113	1,361
Whapmagoostui	709	23	732	811	10	821
	11,851	1,659	13,510	14,423	1,728	16,151

Source of the 2001 data: HAYEUR, G. 2001.

Source of the 2007 data: SAA, 2009c.

Tables 7.6 and 7.7 show that all Cree communities are growing. According to 2006 Statistics Canada data (Table 7.7), this represents a 12.7% increase in population over five years, compared to 2001. During the same period, the rest of the province only grew by 4.3%. Since 1996, the overall Aboriginal population of Canada has increased by 47%, compared to 8% for the non-native population (INAC, 2009b).

Pushing this analysis further and focusing on the three communities that are affected by the project, Table 7.7 shows that, as a whole, they represent close to 5,000 people. In 2006, the average age of Cree populations is lower than for that of the rest of the population of Quebec, while their median age is 23.6 years compared to 41 years, for the rest of Quebec (Table 7.6). (The median age is the age such that exactly half of the population is older and the other half is younger). This is easily explained by the higher birth rate among Aboriginal populations.

Young Cree less than fifteen years old constitute 36.4% of these communities, compared to 16.6% for the same age group in the province as a whole. Compared with the country as a whole, in 2006, approximately one third of the members of First nations were children less than 15 years old and only 5% were seniors aged 65 years or older (Stat. Can 2006a).

Table 7.7: 2006 Community profiles

Profile	Waswanipi	Oujé-Bougoumou	Mistassini	Average of all three	Province of Quebec
Aboriginal population	1,445	565	2,810	4,820 (total)	108,425 (Aboriginal)
Total population on lands reserved for Crees	1,473	605	2,897	4,975 (total)	7,546,131 (total Quebec pop.)
Population variation from 2001 to 2006 (%)	16.8	9.6	11.6	12.7	4.3
Median age	22,2	24,2	24,5	23,6	41
Total population > 15 years	910	380	1,920	3,210	6,293,620
Percentage of the population > 15 years	61.7%	62.8%	66.2%	63.6%	83.4%

(Source: Stat. Canada, 2006b, c and d)

7.8.2.2. Education and professional training

The educational level of young natives has improved over the last 30 years, but progress still remains to be made with respect to school attendance rates in secondary, college and university courses (SAA, 2009a). In fact, despite the notable improvement, there is a gap between Aboriginal and non-native populations in terms of successful completion of secondary education. They enter secondary school with a modal age¹ greater than other young Quebecers (MEQ, 2004), which appears to put them at a disadvantage with respect to their studies, since they are more likely to suffer failures and to drop out, thus attaining a lower success rate. Quantitative studies of the relationship between this phenomenon and the graduation rate for secondary education have shown that almost two thirds of students that enter secondary school one year late eventually abandon their studies and constitute half of all drop outs (MEQ, 2004). The situation regarding secondary education has an impact on postsecondary studies. As a result, the educational level among Aboriginal communities is lower than the non-native population of Quebec taken as a whole.

¹Note: The normal progression of a student in the whole of Quebec, expressed in terms of age and grade, is as follows: 4 and 5 years old in preschool, 6 years old in 1st grade (primary school), 7 years old in grade two, etc., 12 years old in secondary I, up to 16 years old in secondary V (the last year of this level of education). The age corresponding to each grade is referred to as the modal age.

In several Aboriginal communities, the transition from learning in a First Nation language to learning in a second language (French or English) in grade 3 explains in part the gap in modal age at the beginning of secondary education, since such an adaptation provokes a higher repeat (failure) rate among Aboriginal students. The gap that appears during primary education reaches 25.8% in grade 6. This phenomenon always affects a large number of high school students. Accordingly, in 2001-2002, only 28.1% of secondary I students were of modal age for their grade, compared to 71.3% for the whole of Quebec. Another cause of the observed Aboriginal modal age gap at the start of secondary education is the continuation of grade 7 in band primary schools.

In 2006 in Canada, 42% of the members of First Nations (aged 25 to 64 years), i.e. 2 adults out of every 5, had completed their secondary education, compared with 61% of the non-native population in the same age group (Clement, J. 2008). According to the same source, members of First Nations were less likely to have graduated from university or college. For example, 7% of the members of First Nations had graduated from university, versus 23% of non-natives; 17% of the members of First Nations had graduated from college, versus 20% for non-natives.

The percentage of natives aged 25 to 64 years who have graduated from university has slightly increased since 2001 (from 6% to 8%). However, this rate remains lower than that of the non-native population (23%) and the gap between the two populations has continued to increase from 2001 to 2006 (INAC, 2009b).

In Table 7.8, it can be seen that the educational level within the three communities affected by this project is very similar to the overall situation of First Nations in Canada described above. Graduation rates remain lower for natives at almost all levels, except CEGEP, where the Aboriginal graduation rate of 16.6% is very similar to the rate for the whole of the province (16%). For all other education levels, the gaps in graduation rate are pronounced when compared to the whole of the province, since only about half of the members of the Waswanipi, Oujé-Bougoumou and Mistissini communities hold a diploma, versus 75% for the whole population of Quebec. While this gap is approximately one in two for graduation from secondary education (average of 12.2% for natives versus 22.23% for Québec as a whole), it increases to one in four at the university level (4.3% for the communities concerned by this assessment versus 16.5% for Québec as a whole).

Table 7.8: Population 15 years old and over according to the highest certificate, diploma or degree completed

Education	Waswanipi Number and (%)	Oujé- Bougoumou Number and (%)	Mistissini Number and (%)	Average of the three communities	Quebec	Quebec %
No certificate or diploma	385 (42.3)	185 (48.1)	1140 (59.4)	49.9	1,547,875	25.0
High school graduation certificate or equivalent	140 (15.4)	45 (11.7)	190 (9.9)	12.3	1,377,585	22.3
Trades certificate or apprenticeship	140 (15.4)	60 (15.6)	205 (10.7)	13.9	945,965	15.3
College or CEGEP certificate or diploma	175 (19.2)	65 (16.9)	260 (13.5)	16.6	992,365	16.0
University certificate or diploma (bachelor level)	30 (3.3)	15 (3.9)	35 (1.8)	3.0	301,140	4.9
University certificate, diploma or degree	40 (4.4)	15 (3.9)	90 (4.7)	4.3	1,019,550	16.5
Total	910 (100)	385 (100)	1920 (100)	100	6,184,480	100.0

(Source: Stat. Canada, 2006b, c and d)

The finding that emerges from the May 2004 Education Statistics Bulletin (MEQ, 2004) is that in spite of the evident progress in education among Aboriginal communities in Quebec over the past 25 years, education remains a challenge for First Nations. One such challenge is to reconcile the pursuit of higher education with respect for Aboriginal values and cultures. The challenge is to create a teaching relationship based on the current Aboriginal context as a whole, including all its traditional and modern elements.

A study carried out by Health Canada, based on the review of 36 megaprojects, including 31 hydro-electricity projects, concludes that some of the benefits promised to local communities never materialise (Health Canada, 2006). According to this study, most promises pertaining to training, hiring, attractive salaries or local purchasing are never fulfilled once the project approval is secured. Businesses seek available skills and do not necessarily wish to wait to benefit from specific skills. Training remains therefore a major issue. For this situation to change, First Nations must therefore take control of the tool that is provided through education. The adult Aboriginal population has access to postsecondary education as mature students (MEQ, 2004). Several colleges and universities offer training programs tailored to the needs of Aboriginals, in particular in the fields of education and social services.

Those two fields are actually among the postsecondary training areas that are the most in demand, as illustrated by the following list of training areas by order of importance, according to the 2001 Census of members of Quebec First Nations (15 years old and over) :

- Technical and applied science trades
- Commerce, management and business administration
- Social sciences and related disciplines
- Education, leisure activities and guidance

Since the fall of 2005, a new vocational education training centre located at Waswanipi offers, among other things, programs in carpentry and joinery, small vehicle mechanics, accounting and computer support. In addition, a permanent education service is offered in the region (Sabtuan) and is managed by the Cree School Board. It offers refresher courses for adults (secondary IV and V), vocational training courses and distance learning courses that prepare Cree students for college and university studies.

7.8.2.3. Employment

Table 7.9 shows that jobs in the three communities are mainly found in the areas of health care and social services, agriculture and other resource-related industries, as well as educational services. The main employers in the communities are also found in the "Other services" category, which includes public administration, i.e. the band councils, the Cree School Board and the Cree Board of Health and Social Services of James Bay (CBHSSJB).

In spite of a significant decrease since 2001, the unemployment rate within the Aboriginal population 25-64 years old remained almost three times greater than for the non-native population in 2006. It exceeds the national average in all regions (Stat. Canada, 2006b, c and d).

The Waswanipi, Ujé-Bougoumou and Mistassini are no exception to this rule. In 2006 (see Table 7.9), the average unemployment rate for persons aged 15 years and over in these communities was 17.5% versus about 7% for the rest of Quebec. The same trend was observed in Canada, where the unemployment rate among members of First Nations aged 25 to 54 years old and living on reserves was 23.1%, while the rate for members living off reserve was 12.3%, versus 5.2% for the non-native population (Stat. Canada, 2006a). The Northern Quebec economy shows relatively little diversification, since it is concentrated in the areas of natural resources and services, a focus which tends to reduce the availability of skilled workers (MRN, 2002b).

Table 7.9: 2006 Community profiles

Profile	Waswanipi	Oujé-Bougoumou	Mistassini	Average of the communities	Province of Quebec
Aboriginal population	1,445	565	2,810	4,820 (total)	108,425 (Aboriginal)
Total population on lands reserved for Crees	1,473	605	2,897	4,975 (total)	7,546,131 (total pop. of Quebec)
Population variation from 2001 to 2006 (%)	16.8	9.6	11.6	12.7	4.3
Median age	22.2	24.2	24.5	23.6	41
Total population > 15 years	910 61.7%	380 62.8%	1,920 66.2%	3,210 63.6%	6,293,620 83.4%
Unemployment rate (15 years old and over)	13.2	20.4	18.9	17.5	7.0
Median 2005 income after taxes (all enumerated families)	47,360	53,120	56,986	52,489	50,719
Median income after taxes – 15 years old and over (\$)	20,949	19,936	21,824	20,904	22,471
<u>Classification according to industry</u>				<u>Total</u>	
Total experienced population 15 years old and over	635	265	1,450	2,350	3,929,675
Agriculture and other resource industries	105	20	275	400	145,985
Construction	20	20	90	130	205,665
Manufacturing	55	0	10	65	573,550
Wholesale trade	0	0	10	10	173,190
Retail trade	30	10	90	130	472,030
Financial and real-estate services	15	0	30	45	211,230
Health care and social services	115	50	265	430	441,705
Educational services	90	30	195	315	270,895
Business services	35	35	105	175	673,565
Other services	175	100	390	665	761,855

(Source: Stat. Canada, 2006b, c and d)

7.8.2.4. Individual income

In Canada, in 2005, the median annual income of First Nation members 15 years old and over was approximately \$11,000 less than that of the non-native population, \$25,955 (Stat. Canada, 2006a). In the three communities involved in this study, the annual median income within the same age group amounted to \$20,904, yielding a smaller income gap compared to the rest of the province (\$22,471) and to the rest of Canada (see Table 7.9).

7.8.3. Hunting, fishing and trapping activities

First nations engage in hunting, fishing and trapping on public land in Quebec. These activities are governed by agreements or by laws and policies involving the federal and provincial governments (SAA, 2009a). This aspect of the Aboriginal way of life constitutes a sensitive point during negotiations with several communities, since it is deeply connected to the preservation and the development of their culture. Furthermore, these activities play a key role in their economic development and in their participation in the management of wildlife. In accordance with the agreements they have signed, the Cree, the Inuit and the Kaskapi engage in hunting, fishing and trapping within a legal system that is different than for the rest of Quebec. Assistance programs have been established in order to promote the preservation and the development of the activities of these three nations. In accordance with the James Bay and Northern Quebec Agreement (JBNQA), they participate since 1975 in the Income Security Program (ISP), which guarantees them an income from hunting, fishing and trapping activities (Hayeur, G. 2001).

In the 1930's, the government of Quebec created several beaver reserves, in order to set up a framework for the management of trapping activities. Such reserves are now referred to as "fur-bearing animal management units" (FAMU). Each FAMU is subdivided into registered trapline areas, each of which is managed by a tallyman. Within these territories, First Nations hold exclusive rights to trap fur bearing animals. Furthermore, when a First Nation member visits his trapping area within a FAMU, he has the right to hunt other species and to fish to ensure his subsistence. Regular users of trapping areas are mainly members of the tallyman's family, of his extended family and of the families of his hunting partners. In the context of this impact assessment, seven (7) trapping areas are affected by the planned logging road. All are included in FAMU #17 and FAMU #22 (to be verified).

The system governing the territory divides it into three categories of land: categories I, II and III. Cree communities hold exclusive rights to hunt, fish and trap on category I and II lands, while, on category III lands, they hold exclusive rights to harvest several faunal species and to trap. Non-natives are also allowed to hunt and to fish on category III lands.

Many trails and forest roads promote access to faunal resources, but their state varies considerably and users need specially adapted vehicles, such as all terrain vehicles, four wheel drive trucks or snowmobiles to explore this territory (MRN, 2009d). This MRN study, i.e. the Northern Quebec Resource Development Plan, also mentions the presence of numerous outfitters and the fact that of the 1,831 listed public land leases, 701 are for personal vacation purposes and 1,130 are for temporary shelters usually used for hunting. The majority of such temporary shelters are located in hunting areas #16 and #17.

In Quebec, 3.4 million people practice at least one recreational activity connected to wildlife and nature (MRN, 2007a). These enthusiasts spend 290 million days and 3 billion dollars on their leisure activities, creating or maintaining the equivalent of 32,100 full time jobs, with salaries totalling 818 million dollars.

In Northern Quebec, 179 jobs are connected to wildlife tourism, including 136 related to sports fishing, 33 related to hunting and 10 related to faunal activities that do not involve harvesting. The salaries in each area of faunal activity will be discussed in further detail in the following sections (MRN, 2007c).

7.8.3.1. Fishing

This vast territory is therefore not only used by residents, as its numerous water bodies also attract many sports fishing enthusiasts. Residents of Northern Quebec engage in fishing at a significantly higher rate than the average population of Quebec, i.e. 46.3% of northern residents are fishermen versus 17.3% for the overall population of Quebec (MRN, 2002a). With approximately 37,000 devotees, including close to 31,000 visitors (26,408 from Quebec)(MRN, 2007d), this activity ranks first among all nature activities practiced in Northern Quebec. For Quebec as a whole, the fishing trips made by visitors' last an average of 4.4 days.

In 1998, 74% of the visitors to the organized territories (Assinica and Lakes Albanel-Mistassini-and-Waconichi wildlife reserves) were fishermen that came from just about everywhere in Quebec (MRN, 2002c). However, this figure does not include fishermen residing in Chapais-Chibougamau, who made up 13% of the total client base. Fishermen from the United-States, along with fishermen from other Canadian provinces, formed most of the balance of the fishermen that visit the organized territories. The species most prized by fishermen visiting Northern Quebec outfitters are the yellow walleye, the northern pike, the brook trout and the lake trout, found in fishing areas #17 and #22.

Wildlife-related recreational spending in Northern Quebec totals more than \$20 million, of which 74.1% is attributed to sports fishing, 19.4% to hunting and 6.5% to faunal activities that do not involve harvesting (MRN, 2007c). In terms of salaries, sport fishing creates economic spin-offs totaling nearly \$2.9 million in Northern Quebec, which is mainly generated by visitors from Quebec and abroad (\$2,037,906) (MRN, 2007d).

7.8.3.2. Hunting

Demand for sports hunting in Northern Quebec is notably less well documented than the demand for fishing. Besides permit sales statistics, there are few tools that allow measurement of the significance of this activity in the region. Only big-game hunting generates sufficient information to provide an accurate view of the activity, through outfitter occupancy data and follow-up data on the yield per hunting area. Otherwise, available information only gives an overall view of the situation in Quebec and a partial view for the region. It is however known that in Northern Quebec, 20.4% of nature enthusiasts engage in sport hunting (MRN, 2002c).

There are considerably less hunters than fishermen in Quebec, and hunting permit sales are in decline. From 1990 to 2000, there was an overall decrease of 25% in the number of permits sold, except for the northern caribou, which generates the highest economic returns for these regions and for the outfitters who depend on it (MRN, 2002c) and which does not form part of the area covered by this impact assessment.

Based on the number of hunting permits sold in Northern Quebec, black bear is mainly hunted by non-residents in area #17, since only Aboriginals are entitled to harvest this animal in area #22 (MRN, 2002b). Less than 300 black bear hunting permits were sold in Northern Quebec during the 2000 season. Data on moose hunting permit sales in 2000 indicate that 557 hunters tried their luck in areas #17 and 423 chose area #22. The vast majority of these hunters are residents.

For a period of two weeks during the spring, goose hunting absorbs all the attention of the majority of the users of the territory and of many institutions, including schools and the local administrations, which are closed during this period called "Goose Break". In the fall, during goose migration, hunting is less intense than in the spring. Since geese won't be mentioned anywhere else in this assessment, except for a request made during public consultations to limit

timber transportation during these two weeks, we wish to highlight an amusing fact discovered in many studies. It has been shown that migrating waterfowl prefer to stop in borrow pits located on the side of roads and trails, since these are the first water points to open in spring (Hayer, J. 2001). The surrounding of the planned road could therefore be favourable to goose hunting and facilitate the hunt.

Since hunting has less of an economic impact than fishing, we have not researched this aspect further. The following data is used "as is", knowing that it is naturally biased towards caribou hunting, which does not involve the area covered by the assessment since the woodland ecotype found in our area is a protected species. In Northern Quebec, there are 11,758 sport hunters, of which 3,543 are residents (MRN, 2007e), while the salaries generated by this activity total approximately \$725,000, mostly generated by visitors (approximately \$500,000) (MRN, 2007e).

It is worth mentioning that in the province of Quebec, as a whole, only 11% of Quebecers declared having an interest in hunting, while 37.4% are interested by fishing. Since 6.7% of Quebecers engage in hunting, the development potential in this area is relatively low (MRN, 2002b).

7.8.3.3. Trapping

Trapping is the exclusive preserve of the Aboriginal holders of northern agreements on the entire territory, except for a portion of fur-bearing animal management units #03 and #04. In Northern Quebec, the Cree community harvests the largest number of fur-bearing animals, with 14,362 captures during the 2000-2001 season. In comparison, the Inuit and the Kaskapis harvested, respectively, 167 and 172 skins during the 2000-2001 season. However, income derived from fur sales is difficult to estimate, since many pieces may be kept by the trapper or his family for their own use (handicrafts). Nevertheless, it is estimated that, in 2001, the total market value of the fur-bearing animal harvest in Northern Quebec amounted to nearly \$470,000 (MRN, 2002c).

As is the case for hunting and fishing, trapping is an important traditional activity of the Cree. Northern agreements have therefore established structures that provide a framework for and promote the practice of this activity, such as the *Cree Trapper's Association* and the *Cree Hunters and Trappers Income Security Board*. Thus, close to 2,800 people benefit from the income security program for Cree hunters and trappers, which injects almost \$15 million annually into these communities (MRN, 2002c). Traditional hunting, fishing and trapping constitute therefore a significant component of the economy for Aboriginal communities of the North.

7.8.3.4. Activities without harvesting

Despite its remoteness, Northern Quebec has a strong potential for the development of outdoor activities (forest hiking, nature relaxation, picnicking, camping, photography and pleasure boating). The value added derived from activities that do not involve wildlife harvesting brings \$1.3 million to the region, which represents 6.2% of the wildlife-related recreational spending in Northern Quebec (MRN, 2007c). The large number of outfitters on the territory also creates many opportunities for accommodation in natural environments (MRN, 2009d).

Outdoor activities are important for Quebecers, as shown by the figures on their economic impact. In 1999, \$1.2 billion was spent on outdoor activities and \$293.4 million on wildlife-related travel. Thus, these activities represent approximately 50% of nature-related recreational spending in Quebec (MRN, 2002c). The proposal by the *Société de la faune et des parcs du Québec*

(FAPAQ) to create a network of northern national parks aims to develop this almost untapped potential in Northern Quebec.

For Quebec as a whole, if the number of visitors related to each wildlife-related field of activity increased by only 10% in the various regions concerned, the additional economic impact would total \$38 million (MRN, 2007b).

7.8.3.5. Projections

Compared with the rest of the Canadian population, the Aboriginal population is still very young and should consequently continue to grow faster than the rest of the population. According to projections (2001-2017), Aboriginal populations in Canada are expected to grow at an average annual rate of 1.8%, more than double the growth rate forecast for the whole of Canada, 0.7% (Stat. Canada, 2005).

In the next 16 years, the trend will obviously be towards the aging of Aboriginal populations, but at a slower rate than for the Canadian population, as a whole. By 2017, the median age of the Aboriginal population will reach 27.8 years, versus 41.3 years for the whole Canadian population (average growth scenario).

Given that the Aboriginal birth rate reached its maximum in 1967, approximately 10 years after the birth rate of the Canadian population peaked, the Aboriginal population will not age significantly during the period covered by the projection. The ratio of Aboriginal people aged 65 years and over will only increase from 4.0% in 2001 to 6.5% in 2017. On the other hand, the percentage of Canadian seniors is expected to go from 12.6% in 2001 to 16.6% in 2017.

In 2001, the largest age group comprised children aged 0-14 years, who formed a third of the total Aboriginal population. A large number of young adults will enter the job market. The population of young adults aged 20-29 years is expected to grow by 41.9% from 2001 to 2017 (versus 8.7% for the young adult population of Canada, as a whole), for a total of 71,400 Aboriginal young adults in 2017.

Since 2001, the population of Aboriginals aged 15-64 years (i.e. working age) increased by 25%, versus 6% for the non-native population (Steffler, J. 2008). Young Aboriginals will constitute an abundant labour force in the future. From 2001 to 2026, more than 600,000 young Aboriginals will enter the job market. In particular, the Aboriginal population aged 15-29 years could increase by as much as 37%, versus a growth of 6% for the Canadian population as a whole (Hull, J. 2008). In Quebec, the Aboriginal population forms 1.3% of the population and is expected to increase slightly to reach 1.6% in 2017.

8. Impact assessment

8.1. *Impact assessment approach*

The impact assessment examines the impacts of the project both in the short term and the long term. Accordingly, this section of the impact assessment describes the direct and cumulative impacts of the project on the preservation of the quality of both the social and the ecological environments.

The goal of this section is to identify the potential impacts of the project on the region and on the tallymen, and to determine which actions should be taken in order to mitigate their consequences. This assessment is being carried out in preparation for the planned construction of the Barrette-Chapais Itée logging road, in order to take into account sensitive elements.

In order to integrate the impact assessment process into the project, sensitive elements have therefore been evaluated. Thus, sources of impacts are identified further down, both for the road construction stage and for the operational stage. The positive and negative aspects of the impacts are then weighed in order to assess their significance.

The weighing of the impacts is for the most part based on discussions held with the MDDEP, the Cree communities that were consulted and the personal experience of the authors of this assessment. This chapter relies therefore mostly on a subjective approach and could therefore be the subject of legitimate criticism. However, in adopting this approach, the authors have sought, to the maximum extent possible, to remain free from the influences of both the project's proponent and the users who may benefit or suffer from the impacts.

The approach taken to assess impacts is based on the evaluation of the direct impacts produced by various sources, followed by the evaluation of cumulative impacts.

Since two alternate road corridors are being proposed, distinct assessments are made in order to facilitate the selection of the final corridor.

This chapter is therefore a prelude to the next chapter which focuses on mitigation measures.

8.2. *Impact sources*

Impact sources are elements of the project, such as road construction and activities related to its operation, temporary or permanent structures that will be built, and activities that are directly related to the addition of this road in the region. Impact sources have been identified within the overall assessment area and within the local assessment area.

8.2.1. Construction stage

The construction of the Barrette-Chapais Itée logging road will require the installation of various structures and a series of works that will cause several impacts.

The following impacts have been identified, either by the MDDEP, the Cree or by the authors of this assessment:

- Setup and operation of a temporary camp in order to house workers;

- Installation of large bridges over two or three watercourses, depending on the selected corridor;
- Installation of culverts at each water crossing;
- Disturbance of the woodland caribou population;
- Potential risk of hydrocarbon spills;
- Increase in sediment influx into watercourses;
- Hiring of qualified Aboriginal personnel during the construction stage.

In addition to the above-mentioned impacts, there are a series of impacts usually associated with the construction of a road of this size. For example, traffic can be expected to increase on existing roads leading to the construction sites. These are temporary impacts that are mainly related to road safety and the increase in dust due to travel on such roads.

8.2.2. Operational stage

Once the project is completed, temporary impacts related to construction will cease, to be replaced by permanent impacts. The following list identifies the permanent impacts of the project:

- Fragmentation of the woodland caribou territory;
- Operation and maintenance of the road for the benefit of other users;
- Decrease in the area of peat bogs;
- Opening of the territory to non-natives, including access to category II lands of the Cree;
- Opening of the family hunting grounds of tallymen;
- Increased number of visitors on the territory;
- Road dust production near vacation and Aboriginal camps;

The potential for a significant increase in the number of tourists from the south of the province is unlikely. That risk is therefore not included in the impacts. Should there be a significant increase in the number of visitors on the territory for the purpose of hunting or fishing, this could cause both positive and negative impacts. The Waswanipi and Oujé-Bougoumou Cree communities could draw positive advantages from tourism, including the potential of the future Assinica Park. However, it is possible that the non-native population from the South would prefer to stay in the tourist lodges of Chapais and Chibougamau, which would bring no benefit to the Cree communities.

8.3. *Impact assessment methodology*

The methodology used to evaluate the environmental impacts is based on a review of impact assessments prepared by various consultants. It is designed to fulfil the expectations of the MDDEP, of the Cree communities and of the project's proponent.

Potential impacts (changes caused by the project to an element of the environment) are first identified for each stage of the project (construction and operation). The significance of these impacts is then evaluated based on objective criteria, such as their intensity, their extent and the duration of anticipated changes.

8.3.1. Intensity

The intensity of an impact describes the relative magnitude of consequences, both positive and negative, of the modification of an element of the environment. Intensity can take a low, medium or high value:

- A low intensity impact modifies or improves imperceptibly an element, without modifying its characteristics, its usefulness or its quality;
- A medium intensity impact causes the loss or the modification of certain characteristics of the element, modifying to some degree its usefulness, intrinsic nature or quality.
- A high intensity impact means that the characteristics of the concerned element are significantly altered, thus affecting its integrity in a way that could considerably decrease or increase its usefulness or quality.

8.3.2. Extent

The extent of an impact can be local, regional, or limited to a point. The extent of the consequences varies according to the magnitude of the impact in question and the number of people affected:

- An impact that is limited to a point refers a disturbance that is clearly limited and affects a small area, or that affects an element that is only used or perceptible by a few individuals;
- A local impact refers to a disturbance that affects a larger area, such as a series of trapping areas, or that affects several individuals or groups;
- Finally, a regional impact refers to a disturbance that affects large tracts of land or large communities.

8.3.3. Duration

The duration of an impact indicates the period during which the impact lasts. It corresponds to the temporal dimension of the affected element of the environment. The duration of the impact may be short, medium or long.

- An impact is considered to have a short duration when the effects may be felt temporarily or permanently during the road construction or operation stages. This period has been set at two years.
- The impact is considered to be of medium duration when the effects may be felt over a period of 2 to 5 years;
- The impact is considered to be of long duration when the effects may be felt over a period of more than 5 years.

The combination of these three parameters (intensity, extent and duration) is used to establish the significance of direct impacts. These three parameters all have the same weight when evaluating the significance of impacts. The parameters cannot be taken individually, which is why they are multiplied by each other to calculate the cumulative effect of all three. The weighing of these parameters and the cumulative impact is described in Table 8.1.

Once the impacts have been identified and evaluated, actions designed to either minimize negative impacts or magnify positive outcomes of the project are put forward. These actions will be discussed in the chapter on mitigation measures. The impacts that are quantified as described above are those that are expected without the application of mitigation measures. The impacts are therefore not definitive and will be re-evaluated in the next chapter.

In order to evaluate the significance of synergetic effects of impacts and to identify impacts that will require stronger mitigation efforts, the following cumulative weighing is applied:

- **Large** cumulative impact: 15 points and more
- **Medium** cumulative impact : 5-14 points
- **Low** cumulative impact: less than 5 points

Table 8.1: Grid used to establish the significance of impacts and their cumulative effect.

Intensity	Extent	Duration	Cumulative impact
High (3)	Regional (3)	Long (3)	Large (27)
		Medium (2)	Large (18)
		Short (1)	Medium (9)
	Local (2)	Long (3)	Large (18)
		Medium (2)	Medium (12)
		Short (1)	Medium (6)
	Limited (1)	Long (3)	Medium (9)
		Medium (2)	Medium (6)
		Short (1)	Low (3)
Medium (2)	Regional (3)	Long (3)	Large (18)
		Medium (2)	Medium (12)
		Short (1)	Medium (6)
	Local (2)	Long (3)	Medium (12)
		Medium (2)	Medium (8)
		Short (1)	Low (4)
	Limited (1)	Long (3)	Medium (6)
		Medium (2)	Low (4)
		Short (1)	Low (2)
Low (1)	Regional (3)	Long (3)	Medium (9)
		Medium (2)	Medium (6)
		Short (1)	Low (3)
	Local (2)	Long (3)	Medium (6)
		Medium (2)	Low (4)
		Short (1)	Low (2)
	Limited (1)	Long (3)	Low (2)
		Medium (2)	Low (2)
		Short (1)	Low (1)

8.4. Anticipated impacts during construction

During the construction of the Barette-Chapais Itée logging road, several impacts can be expected. Those impacts are the construction and operation of the forest camp, work carried out in watercourses, disturbance of the woodland caribou, hydrocarbon spills, increase of the sediment influx into waterways, hiring of qualified personnel, work carried out in peat bogs, and increased road traffic on existing roads.

Each impact has been evaluated according the evaluation grid presented in Table 8.1.

8.4.1. Impact assessment

Table 8.2 presents the weighing obtained after applying the evaluation grid to all the impacts that may be anticipated during the road construction stage. This evaluation is based on the recommendations made by the MDDEP and the Cree communities that were consulted, as well as on the personal experience of the authors of this assessment.

Table 8.2: Assessment of the anticipated impacts of the construction of the Barrette-Chapais Itée road.

Impacts	Description	Effects	Intensity	Extent	Duration	Significance
Environmental	Work carried out in watercourses	Installation of bridges	3	3	1	9 (medium)
		Installation of culverts	3	1	1	3 (low)
		Increase in sediment influx into watercourses	3	2	1	6 (medium)
	General work	Hydrocarbon spills	2	1	2	4 (low)
	Work carried out in peat bogs	Modification of the hydrological characteristics of the ecosystem	3	2	1	6 (medium)
Ecological	Road construction	Disturbance of the caribou	3	2	1	6 (medium)
Social	Road construction	Hiring of qualified Aboriginal personnel	3	2	1	6 (medium)
		Construction costs	3	1	2	6 (medium)
	Use of existing road network	Increased road traffic	3	2	1	6 (medium)

The table indicates that no impact of large significance is expected. Of the nine impacts listed, seven have a medium significance and two have a low significance.

Bridge construction work will have the largest impact during the road construction stage. The significance of this impact will depend on the number of bridges that need to be built. Two road corridors are under consideration; depending on which corridor is selected, the corridor that passes east of Lake Ruth or the corridor that passes west of the same lake, there will be one more or one less bridge to be built. This is consistent with the impact related to "construction costs". If the road corridor passes east of Lake Ruth, it will be shorter by one kilometre and it will require one less bridge. The corresponding decrease in construction costs is estimated at approximately \$150,000.

Other anticipated impacts worth mentioning include the influx of sediment into watercourses, the alteration of the hydrologic characteristics of peat bogs, the disturbance of woodland caribou, the hiring of qualified Aboriginal personnel (positive outcome), and the increased traffic on existing roads. The only low significance impacts are the installation of culverts and the risk of hydrocarbon spills. Such impacts only affect small areas and have a medium intensity or duration.

It should be noted that the impacts caused by the installation of bridges will not be only negative. In fact, the bridge identified as bridge #2009-06 on Map 5.3 will be installed in order to replace an existing water crossing. The water crossing that currently exists at that location dates back to the construction of Hydro-Québec's power transmission line. As shown on Photo 8.1, that crossing consists of three culverts (tubes), which restrict the river's flow. The installation of a bridge

built according to current standards will allow the free passage of fish and will not restrict the flow of the river.

8.5. Anticipated impacts during construction

Different impacts are expected once the construction of the road is finished. The most likely impacts of the project include the following: decrease of the area of peat bogs, fragmentation of the woodland caribou's territory and disturbance of this species due to timber transportation operations, operation and maintenance of the road; opening of category II lands and of family hunting grounds to non-natives, and finally disturbance of camp users along the road due to noise and dust.

Table 8.3 presents the weighing obtained after applying the evaluation grid to all the impacts that may be anticipated during the road operation stage. This evaluation is based on the recommendations made by the MDDEP and the Cree communities that were consulted, as well as on the personal experience of the authors of this assessment.

Table 8.3: Assessment of the anticipated impacts of the operation of the Barrette-Chapais Itée road.

Impacts	Description	Effects	Intensity	Extent	Durati on	Significance
Environmental	Crossing of peat bogs	Decrease in the area of peat bogs	2	1	3	6 (medium)
Ecological	Use of the alternate corridor only	Fragmentation of the woodland caribou territory	3	2	3	18 (large)
		Disturbance of the caribou	3	2	3	18 (large)
Social	Use of the road	Increased road traffic	3	2	1	6 (medium)
		Access to category II lands	2	2	3	12 (medium)
		Access to family hunting grounds	2	3	3	18 (large)
		Disturbance of users of camps located along the road	2	2	1	4 (low)

Table 8.3 indicates that the fragmentation of the woodland caribou's territory and the disturbances caused by the use of the road will have large impacts. It should be noted that this scenario is based on the selection of the alternate corridor, which follows the eastern shore of Lake Ruth. Conversely, if the road takes the corridor that follows the western shore of Lake Ruth, the increased access to family hunting grounds will also have a large impact.

These impacts are followed by the decrease in the area of peat bogs, increased road traffic, and increased access to category II lands, all of which have a medium significance.

Finally, the disturbance of the users of camps along the road will have a low impact.

8.6. Description of the impacts during road use

8.6.1. Opening up of family hunting grounds

The issue of increased access to family hunting grounds was raised during public consultations held in the Waswanipi and Oujé-Bougoumou communities. This issue was also raised during consultations with non-natives of Chapais and Chibougamau, during which it was mentioned that it would be both easy and interesting to open up these territories to promote hunting and fishing. The very consistency of these testimonies has made this impact very significant. However, this impact cannot be seen as being only negative. Actually, while participants in the public consultation in the Waswanipi community mentioned that opening up the territory to the non-native population would constitute a negative consequence, they also indicated that they would be able to use the road in order to reach their family hunting grounds.

In this assessment, this impact is regarded only as a negative one, but it could also be viewed as positive, since the road helps tallymen access more easily their territories.

One element, which was raised during discussions prior to the public consultations and during discussions held in June in the Waswanipi community, concerns the strong opposition of the Waswanipi community to the main corridor.

Indeed, tallyman Simeon Mianscum (#W12) is opposed to the road passing between Lake Ruth and Lake Caupichigau. Mr. Mianscum has declared that this corridor would promote greater access to Lake Caupichigau, which is, according to him, a very productive lake that he wishes to preserve. If non-natives are able to drive close to the lake, they will be able to bring boats to this area and thus fish in this lake. Several members of the audience concurred with Mr. Mianscum's point of view. The tallyman of area #W12 believes that it is not justified to protect the woodland caribou if the impacts on this lake are that significant.

However, members of the Oujé-Bougoumou community that were consulted held a differing point of view. Thus, Mr. Bosum declared that it would at any rate be impossible to protect the lake, since an existing, easily navigated, waterway links Lake Ruth to Lake Caupichigau.

8.6.2. Woodland caribou

Regarding the fragmentation of the woodland caribou's territory, the anticipated impact was raised by representatives of the MDDEP – *Direction du patrimoine écologique et des parcs*, who stated that the woodland caribou has a very low tolerance to human presence. They stated that the woodland caribou would not come to within 1-2 kilometres of the new road. Furthermore, the noise disturbance caused by construction work and by timber transportation will have a large impact on the habits of this species, especially when during gestation and calving. Therefore, even though the road will only fragment the woodland caribou territory over a distance of 6 km, the edge effect will be considerable. Applying a 2 km edge effect yields a 30 km² reduction of the area of the woodland caribou territory. Map 8.1 shows the edge effect of the road assuming a two kilometre buffer zone in the eastern portion of the alternate corridor.

It should be noted that the territory east of Lake Ruth is already partially degraded due to the construction, by Hydro-Quebec, of a road that follows the shores of that lake. Thus, despite the anticipated partial fragmentation of the territory occupied by woodland caribou, this territory may possibly already be subject to pressure due to human presence.

INSERT MAP 8.1

8.6.3. Access to category II lands

The issue of the accessibility of category II lands in the northwestern portion of the road stems directly from the consultations held in the Waswanipi community. Participants declared that it would be difficult to control access to the territory and that they anticipated the possibility that non-natives would engage in hunting or fishing in the region.

8.7. *Anticipated positive impacts*

Anticipated positive impacts of the construction of the road are of medium significance. In fact, as shown in Table 8.2, hiring of qualified personnel will have a low intensity impact over a short duration. However, the construction stage of the project could create business opportunities for the Aboriginal communities of Waswanipi, Oujé-Bougoumou and Mistissini.

Nevertheless, as mentioned in the "Description of the social environment" chapter, anticipated positive impacts and economic impacts are in general non-existent or have been overestimated in previous impact assessments for large projects such as those related to hydro-electric development (Health Canada, 2006, Eastmain-1A). Thus, without mitigation measures (see next chapter), it is difficult to predict whether the project will actually lead to economic spin-offs or significant hiring of Aboriginal qualified personnel from the region.

8.8. *Combination of impacts*

In order to combine the anticipated impacts of the project, an overall analysis of the impacts is presented in the following paragraphs.

Among the most significant anticipated impacts of the project, the fragmentation of the woodland caribou's territory and the disturbance of this species rank in first place, along with the opening up of family hunting area #W12. Table 8.4 lists the impacts by order of significance according to the evaluation grid applied in this assessment.

Table 8.4: List of the anticipated impacts of the entire Barrette-Chapais Itée road construction project (construction and operation).

Impacts	Description	Stage	Significance
Environmental impacts	Installation of bridges	Construction	Medium
	Influx of sediment into water bodies	Construction	Medium
	Decreased area of peat bogs	Operation	Medium
	Modification of the hydrologic characteristics of peat bogs	Construction	Medium
	Installation of culverts	Construction	Low
	Hydrocarbon spills	Construction	Low
Ecological impacts	Fragmentation of the woodland caribou's territory	Operation	Large
	Disturbance of the woodland caribou	Operation	Large
	Disturbance of the woodland caribou	Construction	Medium
Social impacts	Access to family hunting grounds	Operation	Large
	Hiring of qualified Aboriginal personnel	Construction	Medium
	Construction costs	Construction	Medium
	Increased road traffic	Construction	Medium
	Increased road traffic	Operation	Medium
	Access to category II lands	Operation	Medium
	Disturbance of users of camps located along the road	Operation	Low

As shown in Table 8.4, the main impacts concern the woodland caribou and access to family hunting grounds. The other impacts have either a medium or low significance.



Photo 8.1: Water crossing dating back to the construction of Hydro-Québec's power transmission line. This crossing will need to be completely replaced by a bridge built according to current standards.

9. Mitigation measures

9.1. Background

The next chapter details the measures that may be taken in order to mitigate the impacts described in the previous chapter. In order to make this chapter easier to read, Table 8.4 is repeated below.

Table 8.4: List of the anticipated impacts of the entire Barrette-Chapais Itée road construction project (construction and operation).

Impacts	Description	Stage	Significance
Environmental impacts	Installation of bridges	Construction	Medium
	Influx of sediment into water bodies	Construction	Medium
	Decreased area of peat bogs	Operation	Medium
	Modification of the hydrologic characteristics of peat bogs	Construction	Medium
	Installation of culverts	Construction	Low
	Hydrocarbon spills	Construction	Low
Ecological impacts	Fragmentation of the woodland caribou's territory	Operation	Large
	Disturbance of the woodland caribou	Operation	Large
	Disturbance of the woodland caribou	Construction	Medium
Social impacts	Access to family hunting grounds	Operation	Large
	Hiring of qualified Aboriginal personnel	Construction	Medium
	Construction costs	Construction	Medium
	Increased road traffic	Construction	Medium
	Increased road traffic	Operation	Medium
	Access to category II lands	Operation	Medium
	Disturbance of users of camps located along the road	Operation	Low

The most significant impacts and the impacts which are the most likely to materialize if the project is implemented are basically the long term impacts, i.e. those that follow construction of the road.

As a reminder, two corridors are proposed for this road and impacts differ according to which one is chosen. If the main corridor is chosen, the direct impact stemming from opening family hunting ground #W12 should be noted. This territory would be affected for an undetermined period of time, which causes considerable concern among the Waswanipi community.

Conversely, if the alternate corridor is chosen, the impacts will be felt by the woodland caribou population on the shores of Lake Ruth. In this case, the Oujé-Bougoumou community fears that the road may cause irreparable damages to the woodland caribou, driving this species out the territory, perhaps permanently.

The other potential impacts are mainly environmental in nature. They relate to the construction of bridges, to the influx of sediments in watercourses, to increased road traffic and to the decrease in the area of peat bogs.

9.2. Mitigation measures

The following list of mitigation measures was prepared based on the information gathered in the course of public and private consultations, as well as the knowledge of the authors of this impact assessment. For each of the identified measures, a weighing is applied in order to verify the effect of these mitigation measures on the impacts identified in the preceding chapter.

The application of this new weighing aims to be conservative. In fact, in many cases, there are no indicators available to verify the effectiveness of the mitigation measures, which explains the reservations regarding the application of such measures.

The *influence* of the mitigation measure can be estimated according to the following formula:

Intensity (score) + Extent (score) + Duration (score) = Significance of the measure (score)

Thus, contrary to the evaluation of the significance of impacts where intensity, extent and duration were multiplied, in this case, the same three factors are subtracted from the overall score calculated during the impact assessment.

The same evaluation grid (see Table 8.1) that was used to calculate the significance of impacts is used to score each mitigation measure.

9.2.1. Fragmentation of the territory and disturbance of woodland caribou (alternate corridor) (significance: high)

The partial fragmentation of the woodland caribou's territory has been identified as an irreversible impact. In fact, the literature on the woodland caribou identifies several direct factors that disturb the woodland caribou and fragment its territory, such as the presence of a logging road, the density of recreational spots, fishing, hunting and the use of all terrain vehicles (COSEWIC 2009; Hinterland Who's Who, 2009). Furthermore, specialists in this area contend that it is necessary to protect a minimum area in order to protect the species, and that such a minimum area must be established in accordance with the size of the home range, which varies in Quebec from 32 to 1,470 km² according to individual animals and populations (MRN, 2009b).

We must remember that the woodland caribou population identified in this assessment is located along the eastern border of the road, near Lake Ruth. The boundaries of the future Assinica Park were shown to us during public and private consultations. Those boundaries would thus follow the path of the power transmission line. The road would therefore be on the western border of the future Assinica Park. Given the presence of a large protected area such as Assinica Park, it may be assumed that the woodland caribou population will migrate towards old growth forests located inside the boundaries of the future park. However, it was not possible to verify this hypothesis by consulting the literature. As previously mentioned, the alternate corridor would subtract an area of 30 km² from the home range of the woodland caribou population of Lake Ruth. It is assumed here that the caribou would cease to visit the shores of Lake Ruth if the road were constructed. However, this 30 km² area is in reality already degraded by the presence of the road built by Hydro-Québec along the eastern shores of Lake Ruth.

A review of the literature has not found any mitigation measure for the fragmentation of the territory. At best, it is suggested that the woodland caribou might migrate towards territories that are more suitable to the needs of this species. The 2005-2012 Plan for the recovery of woodland caribou in Quebec also identifies a series of applicable mitigation measures. No measure is suggested in the case of a logging road, except avoiding such projects. It seems that, in the

case of the woodland caribou, the most effective mitigation measure consists in avoiding all contact with human beings.

In spite of the absence of recommended mitigation measures in the literature, several suggestions have been made during consultations in order to reduce the impacts. Those suggestions are listed here and discussed below:

- Timber should be transported in the fall or in the winter;
- The road should be closed when not in use for timber transportation;
- The main corridor should be chosen to avoid the caribou population.

9.2.1.1. Transportation of timber in the fall

This measure attempts to avoid disturbing gestating females. In addition, calves are more vulnerable when they are very young.

However, FMU #02665 is very conducive to summer harvesting. Conversely, logging areas more to the south of Barrette-Chapais Itée's TSFMA are less conducive to summer logging. The areas that are less conducive to summer logging are characterized by hydrological conditions that favour tracking by the machinery.

Thus, the company is not able to operate in all of its logging areas at the same time. It is therefore difficult for the company to harvest timber from FMU #02665 only in winter, though it is possible in certain conditions. Furthermore, the Chapais sawmill uses processing methods that require that the wood be processed quickly in order to preserve its merchantability.

For all these reasons, it is impossible at the present time to guarantee that timber will only be transported in the fall or in the winter. However, the company is committed to evaluating the possibility of transporting timber in the fall or in the winter when conditions permit it. The first evaluations indicate that it might be possible to use the road in the fall or in the winter, over a period of one to three weeks, thus further reducing disturbances to the woodland caribou herd. This way of proceeding might avoid causing disturbances likely to increase predation during the most vulnerable periods (gestation and calving interval)

The *influence* of the mitigation measure is calculated according to the following formula:

Intensity (2) + Extent (1) + Duration (3) = Significance of the measure (6)

We believe that this mitigation measure is the most promising of all those that are proposed in the woodland caribou study.

9.2.1.2. Closing of the road when not in use for timber transport

This suggestion was put forward during the public consultations. Even though it is not applicable, we would like to discuss it.

This measure aims to reduce disturbances during the gestation and calving interval that would be caused by use of the road for purposes other than timber transportation. This measure also aims to limit access to the family hunting grounds that would be opened up by this project.

Even if such a measure could legally be implemented, it would still be extremely easy for ATV's to use the road. Furthermore, it is inconceivable to block the road permanently when not in use for timber transportation.

In addition, during public consultations, several members of the audience expressed that they desire to use the road for their own purposes. This comment was made by both Aboriginals and by non-natives alike. The population would certainly not be very satisfied if the road were entirely controlled by the company. In the end, when the construction of the road is completed, the infrastructure becomes government property and a public asset. As such, it is impossible to block access to it.

Even if such a possibility existed, it would not be practical for the above mentioned reasons. After consideration, that measure was rejected.

9.2.1.3. Use of the main corridor to avoid the caribou population

Without any doubt, the most effective mitigation measure is to avoid the impact altogether. Thus, building the road along the main corridor would avoid entering the area that has been identified as territory used by woodland caribou and the known boundaries of the future Assinica Park. That option, however, causes a different impact, which is discussed in the next paragraphs.

The *influence* of the mitigation measure is calculated according to the following formula:

Intensity (3) + Extent (2) + Duration (3) = Significance of the measure (8)

9.2.2. Access to family hunting grounds (significance: large)

Access to family hunting ground has been identified as an impact of major significance, on par with the partial fragmentation of the territory and the disturbance of the woodland caribou.

The construction of the road along the main corridor would cause different impacts than those associated with the alternate corridor. As discussed in the chapter "Discussion of impacts", the use of the main corridor would actually involve opening up family hunting area #W12. Concern over the opening up of the territory was also widely expressed during public consultations held in the Waswanipi community.

The anticipated impacts on the woodland caribou population that ranges east of Lake Ruth would be significantly decreased. However, family hunting grounds would be more easily reached by other users. Despite the concerns expressed by the Cree community of Waswanipi, Oujé-Bougoumou representatives expressed scepticism with respect to the anticipated impacts. They stated that the territory could in any case be reached through the watercourse that links Lake Ruth to Lake Capiehagimau.

Therefore, after evaluation, there doesn't appear to exist any potential and applicable mitigation measure capable of restricting access to family hunting area #W12, should the road be built west of Lake Ruth.

On the other hand, if indeed there is a watercourse linking the two lakes, we believe that the alternate corridor will cause less impacts, with respect to opening up area #W12, than the corridor that passes west of the lake (main corridor), since the construction of the road east of the lake will draw users away from Lake Ruth, thus making Lake Capiehagimau less accessible to other users. We believe that if the road were to pass east of Lake Ruth, other users would have to

make a greater effort to reach Lake Capiehagimau and impacts would consequently be lessened. Conversely, if the construction of the logging road were to open up hunting area #W12 to other users, this impact would be irreversible, but it would remain, for the time being, very difficult to assess.

9.2.3. Installation of bridges (significance: medium)

The installation of bridges at major water crossings is often identified as a structure that might restrict river flow, thus preventing the free movement of fish and possibly navigation (Delisle *et al*, 2004).

The *ministère des Ressources naturelles et de la Faune* has included in the RSFM many measures aimed at reducing or preventing the effects listed above.

Section 26 of the RSFM contains the following provisions, among others:

26. Every person constructing or improving a road that crosses a watercourse or a fish habitat shall construct a bridge or install 1 or more culverts, ensuring the free passage of water and fish.

The construction of bridges or the installation of culverts shall not reduce the width of the watercourse by more than 20%, as measured from the natural high-water mark.

The construction of bridges or the installation of culverts shall not be allowed to cause erosion in the watercourse. In addition, those works shall be stabilized against any potential risk of erosion.

Section 33 specifies the following:

33. Every person installing a culvert or constructing a bridge over the watercourse of a developed canoe-camping course, downriver canoeing course or boat access route to trapping grounds shall ensure that its minimum clearance is at least 1.5 m above the natural high-water mark.

Section 36 stipulates the following:

36. Every person constructing or improving a bridge to cross a watercourse or a fish habitat shall ensure, at the time of the work, that diversion structures, such as channels, dikes and caissons, do not obstruct the passage of fish or reduce the width of the watercourse by more than 2/3, as measured from the natural high-water mark. At the end of the work, he shall remove the dikes and fill in any channels that were used to divert the watercourse and are no longer in use.

Finally, section 38 states the following:

38. Every person constructing or improving a bridge to cross a watercourse or a fish habitat shall stabilize the bed of the watercourse around the bridge's abutments and pillars.

These sections of the regulation govern the installation of bridges over water crossings. Accordingly, Barrette-Chapais Itée is not at liberty to depart from the provisions of the FSFM.

In addition, the Department of Fisheries and Oceans (DFO) has published a guide regarding the installation of clear span bridges (Fisheries and Oceans Canada, 2007). The DFO has also written a Best practices guide for the design and installation of culverts measuring less than 25 metres (*Guide de bonnes pratiques pour la conception et l'installation de ponceaux de moins de 25 mètres*). Even though such stipulations are echoed in the provincial regulation (RSFM), more restrictively in some instances, the suggestions contained in this guide will also be taken into account during the installation of the two or three bridges required to complete the Barrette-Chapais Itée project. A copy of the guide is included in Appendix 9.1.

The above described measures will lessen the anticipated impacts of the installation of the required bridges.

The *influence* of the mitigation measures is calculated according to the following formula:

Intensity (3) + Extent (1) + Duration (3) = Significance of the measure (6)

9.2.4. Decrease of the area and alteration of the hydrological characteristics of peat bogs (significance: medium)

Peat bogs occupy an important place within the landscape of Northern Quebec, as it constitutes an ecosystem encompassing 20% of the assessment area. The road corridors studied cross peat bogs over several kilometres.

This ecosystem is subjected to considerable pressure in the south of the province where, in many places, peat bogs have effectively almost completely disappeared. The reduction of the area occupied by peat bogs has therefore been identified as an impact of this logging road construction project.

However, as mentioned in Chapter 4 ("Description of the environment"), peat bogs exist in large numbers in the territory covered by the assessment. Thus, although the road may go through this ecosystem, we believe that the decrease in the area of peat bogs it will cause is not a major issue for Northern Quebec. Contrary to the south of the province, Northern Quebec peat bogs are not under pressure from extraction and drainage activities for agricultural or urban development purposes which means that, although the impacts on the ecosystem will be direct, globally the project will have few or no effects on the peat bogs taken as a whole.

Therefore, no measure is proposed to mitigate this impact.

9.2.5. Increased road traffic (significance: medium)

The increase in road traffic during the road construction and operation stages will be felt by the other users of the forest territory.

In general, people expressed concern over the possibility of coming across an oversized truck. This concern was also raised during public consultations held in the Waswanipi and Oujé-Bougoumou communities.

Therefore, special care will have to be exercised in order to inform the users of the road. Signs will be placed at the start of the road, and every 20 km, reminding users that the road is used for the transportation of timber using oversized trucks. These road signs will aim to make road users aware of the risk of collision with heavy vehicles transporting timber.

We believe that this measure, which is applied in several regions of Quebec, is likely to reduce significantly the rate of accidents. However, there are no comparative statistics available regarding the effectiveness of such a measure for reducing accident rates on forest roads. We are therefore not able to evaluate precisely the effectiveness of this mitigation measure.

The *influence* of the mitigation measure is estimated as follows:

Intensity (1) + Extent (1) + Duration (1) = Significance of the measure (3)

9.2.6. Influx of sediment into water bodies (significance: medium)

The literature reveals that the installation of bridges and culverts may cause an increase of sediments into watercourses (Delisle *et al*, 2004). Thus, the influx of sediments into watercourses during road construction has been identified as an impact of medium significance. Movements made by equipment may cause the suspension of matter in runoff water which, in turn, may cause water quality degradation, in particular clogging of spawning areas.

Since several years, large road construction sites have applied mitigation measures in order to reduce such impact. Barriers are installed in drainage channels in order to restrict water flow and promote sedimentation within the channels.

Therefore, though this impact has not been identified as a major impact of the project, the usual practice for this type of construction site will be applied. A barrier will thus be installed in each drainage channel, so as to cause sedimentation of suspended matter before the drainage channel reaches any watercourse. Sedimentation barriers will be installed 20 m from the natural high-water mark wherever the road crosses a watercourse.

Though this measure is not clearly specified in the RSFM, it will nevertheless be applied in order to fulfill the public's expectations regarding this type of project.

The *influence* of the mitigation measure is estimated as follows:

Intensity (2) + Extent (2) + Duration (1) = Significance of the measure (5)

9.2.7. Access to category II lands (significance: medium)

The opening up of category II lands is a major concern for the Cree nation. The opening up of the territory increases the overall pressure by non-natives on this territory.

However, although the road does indeed open up this territory, it is not up to Barrette-Chapais Itée to criticize the existing system, as it applies to forest management. The government of Quebec has issued the required permits for the company to harvest wood substances in this territory.

Thus, the creation of the road seeks to fulfil the object of such permits. As previously explained, should the project not move forward, the Company would have to use the roads located north of the territory, which involves a 100 km detour, in order to harvest wood substances. The opening up of category II lands of the (Waswanipi) Cree nation is therefore unavoidable.

Accordingly, no mitigation measure is applicable to this particular impact.

9.2.8. Installation of culverts (significance: medium)

The installation of culverts may be a source of impacts on navigation or the free passage of fish. Public consultations confirmed that tallymen consider that the existing culverts are too small. Please note that the RSFM stipulate the calculations used to size such a structure. However, the appendices of the applicable regulation allow the installation of oversized culverts.

Hence, even if the flow calculation yields a specific size of culvert, tallymen will be consulted and invited to share any concern regarding water crossings within their family hunting grounds. If they should judge a culvert to be too small for reasons they consider important, Barrette-Chapais will assess the feasibility of installing a larger culvert. Without committing to satisfying all requests put forward by tallymen, the company will verify the feasibility of installing culverts which are larger than the size calculated based on flow studies and the RSFM.

The influence of this mitigation measure is calculated as follows:

Intensity (1) + Extent (1) + Duration (1) = Significance of the measure (3)

9.2.9. Hiring of qualified Aboriginal personnel – Positive impact (significance: medium)

Several impact assessments mention the positive economic impacts of projects on Aboriginal populations. However, as stated in Chapter 5 (Description of impacts), such positive impacts are often less significant than expected.

This construction project is not an exception to that rule. Though positive economic impacts on Aboriginal communities could be significant, such a possibility is difficult to predict with accuracy. Hence, even though no explicit objectives are set regarding the hiring of qualified Aboriginal personnel or businesses, special care will be exercised in order to give interested contractors or individuals the possibility of participating in this project.

To this effect, representatives of the Waswanipi and Oujé-Bougoumou Cree communities have been invited to provide a list of contractors or individuals who wish to work on this project. Unfortunately, at the time this document was being drafted, no names of contractors had been provided to the authors of this assessment. Should such a list become available in the future, it will be taken into account.

This does not bind the company to hire the individuals that appear on such a list. The company reserves its right to evaluate the suitability of applicants, based on their experience and qualifications. It will ensure, however, that all applications are evaluated fairly and will hire equally qualified Aboriginal personnel.

The *influence* of this mitigation measure is calculated as follows:

Intensity (1) + Extent (1) + Duration (1) = Significance of the measure (3)

9.2.10. Construction costs (significance: medium)

The precise cost of the construction stage of the project depends on which of the main or the alternate corridor is selected. Should the main corridor be selected, three bridges would be built

and the road would be approximately half a kilometre longer. Conversely, the alternate corridor would be a little shorter, but it would require the construction of only two bridges.

The alternate corridor appears to be the most economical for the company, as well as for Quebec society, as a whole.

Construction costs associated with the project may seem secondary compared to the other impacts of the project. However, the choice of corridor will have direct impacts, in relation to construction costs, involving the construction of an additional bridge, the opening up of family hunting area #W12 and the fragmentation of the territory occupied by the woodland caribou near Lake Ruth.

It is impossible to apply any mitigation measure to this impact. The choice of corridor will dictate the cost of the project.

9.2.11. Hydrocarbon spills (significance: low)

As for the influx of sediments into watercourses, hydrocarbon spills can degrade water quality. Sometimes, such spills happen directly onto the ground without any water contamination.

For several years, Barrette-Chapais Itée is ISO 14001:2004 certified. Hence, the company's environmental management system procedures include many sections regarding risks such as hydrocarbon spills or leaks into the environment.

ISO 14001:2004 procedures require that any spill be immediately cleaned up and reported to the MDDEP in accordance to the Regulation respecting hazardous materials. This approach does not however protect water quality in case of a major spill near a watercourse. Furthermore, it ensures that appropriate measure will be taken to mitigate impacts on the watercourse.

Hence, in order to reduce the risk and the extent of spills into watercourses, hydrocarbon barriers will be installed at the junction between drainage channels and the affected watercourses. Once again, this approach is a common practice on large road construction sites (e.g.: Highway 175 in the Laurentides wildlife reserve). Even though the probability of a major spill into a watercourse is very low, the consequences of such an event could be significant. Thus, this mitigation measure will be applied during the road's construction in order to lessen any impact.

With regards to direct spills onto the ground, personnel working on the site will be made aware of the importance of cleaning up and reporting any spill to the site foreman. A register of spills that have taken place on site will also be maintained, and, in accordance with standard operating procedures at Barrette-Chapais Itée, a report will be submitted on a monthly basis to the MDDEP regarding small spills. Major spills will be reported immediately to *Urgence-Environnement*.

The *influence* of this mitigation measure is calculated as follows:

Intensity (1) + Extent (1) + Duration (1) = Significance of the measure (3)

9.2.12. Disturbance of users of camps located along the road (significance: low)

One of the most frequent criticisms expressed by other users of logging roads relates to the production of dust during droughts. This concern was also raised during public consultations held in the Waswanipi community.

Thus, in order to counteract this impact, Barrette-Chapais Itée will apply a dust control liquid of its choice near clusters of camps (three camps or more) used by Aboriginals and located along the new road. This dust control liquid will comply with the standards of the Bureau des normes du Québec (BNQ) for this type of product (e.g.: lignosulfates).

This measure will only be applied in accordance with transportation schedules and prevailing weather conditions. Thus, the company assumes no responsibility for any inconvenience caused by dust produced by any other road user when the company is not engaged in the transportation of timber.

The *influence* of this mitigation measure is calculated as follows:

Intensity (1) + Extent (1) + Duration (1) = Significance of the measure (3)

9.3. *Combination of mitigation measures*

In order to assess the influence of the mitigation measures proposed in the preceding paragraphs, their scores are combined with those of the impacts listed in Chapter 5.

Table 9.1 shows the influence of the mitigation measures in reducing the project's impacts. Please note that, for impacts, factors are multiplied, while, for mitigation measures, they are added. This is a conservative approach, since it does not include indicators that relate to the effectiveness of the mitigation measures.

Table 9.1: Combination of mitigation measures with impacts anticipated during both construction and operation of the Barrette-Chapais Itée logging road.

Impacts	Stage	Effect	Significance of the impact	Significance of the mitigation measure	Combined score
Environmental	Construction	Installation of bridges	9	6	3
		Influx of sediment into watercourses	6	5	1
		Modification of the hydrologic characteristics of peat bogs	6	None	6
		Installation of culverts	3	3	0
		Hydrocarbon spills	4	3	1
	Operation	Decreased area of peat bogs	6	None	6
Ecological	Construction and operation	Disturbance of the woodland caribou	18	6-8	12-10
	Operation	Fragmentation of the woodland caribou's territory	18	8 (alternate corridor)	10
Social	Construction	Hiring of qualified Aboriginal personnel	6	3	9 Positive impact
		Construction costs	6	None	6
	Construction and operation	Increased road traffic	6	3	3
	Operation	Access to family hunting grounds	18	None possible if main corridor is chosen	18
		Access to category II lands	12	None	12
		Disturbance of users of camps located along the road	4	3	1

Table 9.1 highlights the fact that the proposed mitigation measures could partially reduce the anticipated environmental, economic and social impacts associated with the project. However, the mitigation measures do not offset all the anticipated impacts, as several impacts are left unchanged.

Accordingly, Table 9.2 shows the impacts, sorted by order of significance, after application of the proposed mitigation measures.

Table 9.2: Impacts sorted by order of significance after the application of the proposed mitigation measures.

Impacts	Significance of the impact
Access to family hunting grounds	Large
Disturbance of the woodland caribou	Medium
Access to category II lands	Medium
Fragmentation of the woodland caribou's territory	Medium
Hiring of qualified Aboriginal personnel	Medium
Modification of the hydrologic characteristics of peat bogs	Medium
Decreased area of peat bogs	Medium
Construction costs	Medium
Installation of bridges	Low
Increased road traffic	Low
Influx of sediment into watercourses	Low
Hydrocarbon spills	Low
Disturbance of users of camps located along the road	Low
Installation of culverts	Low

Hence, the most significant anticipated impact would be the opening up of family hunting area #W12, for which the highest score was calculated. If the main corridor was chosen, there would be no possible mitigation measures to reduce this impact.

Conversely, impacts on the woodland caribou population are slightly reduced by the introduction of several measures. Thus, the significance of anticipated impacts on the woodland caribou population located east of Lake Ruth goes from large to medium.

With regards to the other anticipated impacts, some remain unchanged, when no mitigation measures are feasible, while others are almost completely counterbalanced.

In light of the analysis of the anticipated impacts and the proposed mitigation measures, it appears that the alternate corridor would be the choice that presents the least impacts on the social environment, but the most significant impacts on the ecological environment.

A consideration of social factors therefore indicates that the alternate corridor remains the most acceptable choice for society. Ecological considerations regarding the woodland caribou remain however a major concern. This recommendation is therefore open to criticism.

10. Monitoring and follow-up program

The monitoring and follow-up program takes into account the concerns expressed during public consultations held at Chapais, Waswanipi and Oujé-Bougoumou. Moreover, the program considers the mitigation measures discussed in the previous chapter, that relate directly to the anticipated potential impacts.

This program aims to be both interactive and dynamic. In response to concerns expressed by the Cree communities of Waswanipi and Oujé-Bougoumou, working meetings will be organised at the very start of the project, should the MDDEP issue the required authorizations to the company. Such meetings will involve the tallymen directly affected by the construction of the road. The goal of the meetings will be to determine the precise location where the road should be built. Obviously, any modification to the approved corridor will remain within the limits of the 500 m buffer zone of the local assessment area. Although the company is not committing to fulfil all requests for changes submitted by tallymen, it will strive to do so to the maximum extent possible.

10.1. Monitoring program

In addition to the laws and regulations applicable to the construction of the road, construction personnel will follow all the procedures included in the company's environmental management system.

Barrette-Chapais Itée's environmental management system is ISO 14001:2004 certified. Accordingly, all of the company's forestry operations must comply with federal, provincial and municipal legal requirements. In addition, all the elements of specific agreements with the appropriate authorities must be included in the company's environmental management system. Hence, contractual agreements entered into in order to obtain construction permits for this project are immediately entered into the company's environmental management system and become *ipso facto* requirements for future ISO 14001 certification. This special mechanism will ensure that the company is entirely committed to fulfil its legal and contractual obligations.

Furthermore, the mitigation measures proposed in the previous chapter are additional measures that will be fully integrated into all aspects of the construction of this road. Finally, any additional measure that government authorities might require (MDDEP and/or Environment Canada) will form an integral part of the contractual obligations of the company.

In order to ensure the fulfilment of operational requirements raised in the description of impacts and mitigation measures, a person will be continuously in charge of supervising the site. Such person will report to Barrette-Chapais, but will have all the latitude required to make recommendations and demand the application of corrective measures that may be required.

This person will perform, specifically, the following tasks:

- Implementation of measures to prevent hydrocarbon spills;
- Implementation of measures to prevent the influx of sediments into runoff water;
- Training of all the personnel working on site, including making them fully aware of the proposed mitigation measures;

- First responder in case of an environmental incident;
- Verification of conformity to plans and specifications;
- Verification of the proper operation of sanitary facilities, of waste management systems, of the drinking water take-off point and of the oil tank management system;
- Verification of the implementation of information measures and of the appropriate signage;
- Verification of the implementation of road safety measures.

10.2. Environmental and social follow-up program

At the time of the drafting this chapter, no specific environmental follow-up measure was required. However, several elements of information will need to be recorded in a register which will be available for inspection on demand by government representatives. Thus, the following information will need to be recorded in this register:

- Any permit required to operate the temporary forest camp;
- Any information pertaining to the proper operation of the equipment used in the temporary forest camp;
- Any permit required to build the bridges;
- Any alteration of the drawing and specifications pertaining to the approved road corridor;
- Any complaint regarding the construction and the operation of the road expressed by Aboriginal or non-native users;
- Any action plan in response to complaints brought forward by road users;
- Any information concerning environmental incidents;
- Any other communication with government authorities.

In addition, a number of Cree companies could be identified in the future in relation to their economic involvement in the construction stage of the project. Barrette-Chapais Itée wishes to give special care to ensuring that Cree businesses have the opportunity to bid on the construction of this road. However, none has been identified to date in spite of considerable efforts and repeated requests to the Cree communities concerned by the project in order to obtain the contact information of companies that might become involved in the project. Should a list of Cree contractors be supplied in the future, such contractors would be contacted directly by Barrette-Chapais in order to study their possible involvement.

Special care will also be given to the hiring of Cree personnel by non-native companies. An awareness building campaign will be directed at non-native subcontractors to encourage them to also hire members of the communities affected by the project.

At the completion of the project, a report on the project's economic impacts in both Aboriginal communities and the municipalities of Chapais and Chibougamau will be presented to the MDDEP. This report will deal with the economic spin-offs of the road's construction, as well as those of any future uses for the road.

11. Conclusion and recommendations

In light of the pre-consultations with tallymen and representatives of the MDDEP regarding the future Assinica Park, either the main corridor or the alternate corridor remain the most desirable options. In effect, the northern bypass approach is not economically feasible, while the straightest possible corridor gives rise to many social or environmental drawbacks. Thus, the option to bypass the boundaries of the future Assinica Park and to follow the old power transmission line seems, in our opinion, to represent the choice that abides most closely to the sustainable development principles adopted in Quebec.

Approximately 20% of both corridors (main and alternate) runs over humid regions, and only 2% of hardwood stands are affected by the project. The two corridors are identical until they near Lake Ruth. Both corridors entail the planned upgrade of a bridge that dates back to the construction of the power transmission line. The project will therefore cause beneficial impacts with respect to halieutic resources.

This assessment compares the two proposed corridors (main and alternate) in order to determine which one will have the least negative impacts on the environment and local populations, in order to allow an informed choice to be made. However, making the final choice is not a simple decision, since both corridors cause major impacts. The most significant issue with respect to the main corridor relates to the impact it would have on the Waswanipi Cree community: it would open up category I and II lands, and particularly affect the tallyman responsible for trapping area #W12 (Mr. Simeon Mianscum) and his family, given that the road crosses the said trapping area over a distance of 14 km. The alternate corridor crosses the same trapping area, though access will be limited since the alternate corridor follows the eastern shore of Lake Ruth and anyone wishing to reach the trapping area in question would need to use the waterway connecting Lake Ruth and Lake Caupichigau.

The main issue with respect to the alternate corridor relates to the disturbance that it will cause to the small herd of woodland caribou located east of Lake Ruth. This disturbance will perhaps push the caribou to move out of the region and take advantage of spaces available in the vast spaces of the future Assinica Park. This species has a special status since it is protected. In accordance with existing agreements, tallymen act as stewards of category I lands. They have the right to hunt any animal species to satisfy their needs, but they are expected to exercise judgement and promote a vision based on sustainability and the preservation of diversity. A road already exists along the alternate corridor. The proposed alternate road corridor overlapping the old road therefore does not, by itself, modify significantly the environment, except for the increased traffic on the road. In order to minimize impacts on the caribou, it is proposed, in this assessment, to transport timber preferentially in the fall and in the winter; Barrette-Chapais Ltée has shown that it is agreeable to such a suggestion, provided certain conditions are met. The company is effectively willing to invest the required effort to evaluate and use, as much as possible, this approach, but it reserves the right to include this consideration among all the other supply constraints that it must take into account. In order for projections to be valid for both proposed corridors and for anticipated impacts to be offset in actual fact, it is absolutely necessary that mitigation measures be applied.

Once mitigation measure are applied, it is in fact the alternate corridor, passing east of Lake Ruth, that becomes preferable, since its overall impact, involving mainly the fragmentation of the caribou's territory and the disturbance of the caribou, is considered to be moderate. In the case of the main corridor, no mitigation measures are planned to reduce its impact on the accessibility of family hunting grounds in trapping area #W12. Accordingly, the significance of

this impact remains large. Furthermore, from an economic standpoint, the alternate corridor would entail savings of \$150,000, since only two bridges are required, versus three for the main corridor.

The overall construction and maintenance costs of the road over 15 years total approximately \$13.5 million, while economic spin-offs, considering only stumpage fees, total \$7.8 million. In light of those figures, it is obvious that, from an economic point of view, spin-offs will significantly outweigh project costs. Therefore, the construction of the road entails real benefits. The possibility that qualified Cree personnel might be hired during the construction of the road might also represent an interesting spin-off for the Aboriginal communities affected by the project.

The evaluation of anticipated impacts has convinced the authors of this assessment that the alternate corridor should be selected for the construction of Barrette-Chapais Itée's logging road. This choice is based on anticipated impacts and the application of the mitigation measures described in this document.

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