CREE DEVELOPMENT CORPORATION

LA GRANDE ALLIANCE

LA GRANDE ALLIANCE

PRE-FEASIBILITY STUDY – PHASES II & III – TRANSPORTATION INFRASTRUCTURE

TECHNICAL NOTE 11

ROADS

FINAL VERSION

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EXECUTIVE SUMMARY

The purpose of Technical Note 11 is to describe the proposed roadway infrastructures foreseen in the Phase II of La Grande Alliance study, namely:

- **ROUTE 167: UPGRADE & EXTENSION TO TRANS-TAIGA**
  - CH 305+000 to CH 411+700 (106.7 km): Upgrading and paving the existing section from Mistissini community access road to Albanel Lake access road;
  - CH 411+700 to CH 553+370 (141.7 km): No projected work other than MTQ's 5-year programmed projects since the road was recently built (opened in 2014);
  - CH 553+370 to CH 642+640 (89.3 km): Upgrading the existing Stornoway Renard mining road;
  - CH 642+640 to CH 814+710 (172 km): Proposed extension to Trans-Taiga Road.
- **ROADWAY: LA GRANDE TO WHAPMAGOOSTUI/KUUJJUARAPIK**
  - A proposed road corridor connecting Chisasibi community access road and Whapmagoostui/Kuujjuarapik, over 207 km.

Based on the results of this Technical Note, we have determined that it is possible to develop both proposed road infrastructures that follow best technical practice, social-environmental design drivers and in addition, respect the following drivers:

- Respect, as much as possible, the natural site topography (mountains and plains);
- Consider the overall geology of the study area, including the locations of aggregate material deposits;
- Avoid, as much as possible, lakes and rivers; minimize the length of crossings and bridges where these are unavoidable;
- Avoid, as much as possible, existing and projected Protected Areas; minimize encroachment and/or provide mitigation measures where these are unavoidable;
- Minimize crossing and impacts on caribou migration corridors;
- Avoid, as much as possible, areas of cultural significance such as areas currently used by Cree land users, archeological sites, etc.; minimize encroachment and/or provide mitigation measures where these are unavoidable;
- Propose, wherever applicable, alignment variants that could offer added value, such as:
  - Locations that minimize environmental footprint;
  - Locations that minimize construction cost;
  - Locations that minimize the impacts on existing camps and facilities.

It is important to note that an important proportion of those proposed road infrastructures are planned in undeveloped areas. For these areas, we have identified additional processes to that further limit environmental risks impacts, with a view of accounting for the sensitivity of building new corridors in previously inaccessible areas (and entire regions), in line with the overall sustainable development objectives of the overall program which, it is hoped, will increase the overall social acceptability of these new corridors. Thus, for these areas tone of the main objectives of the goal of the Pre-Feasibility Study is to identify and propose alignments and locations that present the least risk, especially from the perspective of environmental sustainability and overall social acceptability of the proposed infrastructure.

Using the key drivers presented above, while at the same time respecting the related infrastructure retained Design Criteria, an alignment was developed first in plan, and then in profile. The design of any linear infrastructure is an iterative process to maximize the opportunities for improvement as more detailed information becomes available with the project development.

Therefore, the alignment presented at the Pre-Feasibility and Feasibility stage alignments do come with some is somewhat limited by the accuracy of information available at the time, as the collection of field data shall be carried out at future stage. As knowledge about fauna and flora is continuously evolving, the environmental factors and considerations will have to be updated at every step of the study. The environmental updates might result in the need for alignment correction/displacement to avoid sensible areas or mitigate the risks. Nevertheless, the various alignments presented in this report show on maps and figures on this mandate should be considered as potential corridors that require further optimization in the future steps.

As described in Technical Note 11, we recommend the use of MTQ road design standards (regional collector road) to ensure consistency in the construction of these roads and to facilitate their integration into the existing road network. We recommend that La Grande Alliance Implementation Committee asks the government to conclude a multiparty agreement on the financing of the construction, maintenance, and rehabilitation of these roads between HQ, MERN, the Société du Plan Nord, the Ministère des Finances du Québec, and the Secrétariat du Conseil du Trésor (SCT).

While it is recognized that building new corridors in previously inaccessible areas in the north needs to be done with extreme care for the environment and those who practice traditional activities in these areas, not to mention the uncertainty created by climate change and the potential social impacts of opening up the territory, we have nevertheless determined that it is possible to develop the proposed transportation infrastructures in a manner consistent with sustainable development.

LIST OF ABBREVIATIONS AND ACRONYMS

ABBREVIATIONS/ ACRONYMS	DEFINITION
JBNQA	James Bay and Northern Québec Agreement
SC	Service Centre
HSC	Highway Safety Code
ATGD	Abitibi-Témiscamingue General Directorate
AADT	Annual Average Daily Traffic
HQ	Hydro-Québec
HSA	Highly Sensitive Areas (see Technical Note 3 for details)
SFDA	Sustainable Forest Development Act
ARALDS	Act Respecting Agricultural Lands in the Domain of the State
MERN	Ministère de l'Énergie et des Ressources Naturelles (Ministry of Energy and Natural Resources)
MFFP	Ministère des Forêts, de la Faune et des Parcs (Ministry of Forests, Wildlife and Parks)
MTQ	Ministère des Transports du Québec (Québec Ministry of Transportation)
SCT	Secrétariat du Conseil du Trésor (Treasury Board Secretariat)
SDBJ	James Bay Development Corporation (JBDC), herein referred to by its French name and acronym ‘’Société de développement de la Baie James’’
JBEC	James Bay Energy Corporation
CDC/SODAB	Cree Development Corporation/James Bay Native Development Corporation
RADF	*Règlement sur l’Aménagement Durable des Forêts du domaine de l’État* (Regulation Respecting the Sustainable Development of Forests in the Domain of the State)

BRIEF STATIONS EXPLANATION

A station indicates the relative position along the horizontal centerline of a linear structure. In our specific case, the linear structures are the roads. A starting station is set at a specific location and the linear distance along the centerline is added to that starting station. Stations are usually presented as follows:

KKK+MMM

Where:

K: Kilometers

M: Meters

For examples:

1. If the starting station was set at 000+000, station 000+001 would be located on the centerline 1 meter away from the starting station.
2. If the starting station was set at 000+000, station 000+020 would be located on the centerline 20 meters away from the starting station.
3. If the starting station was set at 000+000, station 000+300 would be located on the centerline 300 meters away from the starting station.
4. If the starting station was set at 000+000, station 004+000 would be located on the centerline 4 kilometers away from the starting station.
5. If the starting station was set at 000+000, station 050+000 would be located on the centerline 50 kilometers away from the starting station.
6. If the starting station was set at 000+000, station 600+000 would be located on the centerline 600 kilometers away from the starting station.
7. If the starting station was set at 000+000, station 324+678 would be located on the centerline 324 kilometers and 678 meters (324 678 m in total) away from the starting station.
8. If the starting station was set at 100+000, station 324+678 would be located on the centerline 224 kilometers and 678 meters (224 678 m in total) away from the starting station.

TABLE OF CONTENTS

1 INTRODUCTION 1

2 EXISTING ROAD INFRASTRUCTURES 2

2.1 Existing Road Network in the Eeyou Istchee baie-James Region 2

2.2 Existing Road Network Conditions 3

3 PROPOSED ROAD INFRASTRUCTURES 7

3.1 Laws & Regulations related to roadwork 7

3.2 Road Classification 10

3.3 Financial Aspect 12

3.4 Design Criteria 14

4 ROUTE 167: UPGRADE & EXTENSION TO TRANS-TAIGA 17

4.1 Geotechnical Conditions 17

4.2 Roadwork Description 20

5 ROADWAY: LA GRANDE TO WHAPMAGOOSTUI/KUUJJUARAPIK 25

5.1 Geotechnical Conditions 28

5.2 Roadwork Description 31

6 CONCLUSIONS AND ADDITIONAL CONSIDERATIONS 36

TABLE OF CONTENTS

TABLES

Table 2-1 Agencies Responsible for the Main Roads and Paths in the Eeyou –Istchee Baie-James region 5

Table 3-1 Laws and Regulations Applicable to the Territory's Roads and Tracks 9

Table 3-2 MTQ Road Network Functional Classification 10

Table 3-3 The 4 Main *RADF* Road Classes 11

Table 4-1 Route 167 - Planned Work in this study 17

Table 4-2 Types of Soil – Route 167: Upgrade & Extension to Trans-Taiga (Value from TN10 – Geotechnical) 17

Table 4-3 List of Potential Major Bridges - km 642+640 to 814+710 21

Table 5-1 Types of Soil – Route 167: Upgrade & Extension to Trans-Taiga (Value from TN10 – Geotechnical) 28

Table 5-2 Roadway La Grande to Whapmagoostui/Kuujjuarapik – Road structures 28

FIGURES

Figure 3-1 Typical Cross Section / Average bearing capacity soils 14

Figure 4-1 Route 167: Upgrade & Extension to Trans-Taiga – Proposed alignment 18

Figure 4-2 Route 167 - Wetlands and Sedimentary Deposits 19

Figure 4-3 Route 167 - Traplines and Protected Areas 1 of 2 23

Figure 4-4 Route 167 - Traplines and Protected Areas 2 of 2 24

TABLE OF CONTENTS

Figure 5-1 Roadway La Grande to Whapmagoostui/Kuujjuarapik - Proposed 2013 alignments by Poly Géo 26

Figure 5-2 Roadway La Grande to Whapmagoostui/Kuujjuarapik – La Grande Alliance Proposed alignment 27

Figure 5-3 Roadway La Grande to Whapmagoostui/Kuujjuarapik - Wetlands and Sedimentary Deposits 30

APPENDICES

A Map of the existing road network

B James Bay Road Traffic Data (2014 and 2017)

C MTQ Standard Drawing – Rural Cross-Section (Type E)

D Protected Zones Detailed List

E Meeting Minute

F Road Structures

1 INTRODUCTION

The purpose of Technical Note 11 is to describe the proposed roadway infrastructures foreseen in the Phase II of La Grande Alliance study, namely:

- **ROUTE 167: UPGRADE & EXTENSION TO TRANS-TAIGA**
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  - CH 553+370 to CH 642+640 (89.3 km): Upgrading the existing Stornoway Renard mining road;
  - CH 642+640 to CH 814+710 (172 km): Proposed extension to Trans-Taiga Road.
- **ROADWAY: LA GRANDE TO WHAPMAGOOSTUI/KUUJJUARAPIK**
  - A proposed road corridor connecting Chisasibi community access road and Whapmagoostui/Kuujjuarapik, over 207 km.

Please refer to the Market Study for the roadway economic assessment as this Technical Note objectives is to describe the technical aspects of the proposed roadway infrastructures.

2 EXISTING ROAD INFRASTRUCTURES

2.1 EXISTING ROAD NETWORK IN THE EEYOU ISTCHEE BAIE-JAMES REGION

A map of the existing Eeyou –Istchee Baie-James region road network can be found in Appendix A of this document. This complete road network totalizes 3,235 km in length.

According to the provincial *Act Respecting the Lands in the Domain of the State*:

- Sections 45.2 and Section 57: All roads located on public lands remain collectively owned by the government, including forestry, mining and other publicly accessible roads (e.g. Billy-Diamond Highway)
- Section 46.2 and Section 58: Unless specifically restricted because it is in the "public interest", all roads located on public lands are automatically subject to an access servitude for other users, including the public (vehicle or by foot). Other than the public, all other "official" users are responsible for financially contributing to the roads' maintenance.
- Section 55: No entity other than forestry or mining companies are allowed to build roads on public lands unless authorized by the government (note that Cree land users, as per Section 24 of the JBNQA, are not subject to this rule, as long as it respects the "principle of conservation").

The Ministère des Transports du Québec, herein referred to as MTQ, is responsible for nearly half of the road network, i.e. 1,540 km of roads[1] (national, regional and collector roads).

- The Saguenay-Lac-Saint-Jean-Chibougamau Directorate General has a service centre (SC) near the city of Chibougamau; it is responsible for the maintenance and operation of parts of routes 113 and 167 as well as the Route du Nord from km 0 to km 258;
- The Abitibi-Témiscamingue General Directorate (ATGD) serves the territory with three service centres: the Val-d'Or SC, which covers parts of Route 113; the Macamic SC, is responsible for the roads around the communities of Valcanton and Villebois in the southwestern sector of the territory; and the Amos SC, is responsible for Route 109. The ATGD's Operations Branch is also responsible for Road 109 as well as the Waskaganish, Eastmain and Wemindji roads.

The remaining portion of the existing network is based on the "user-payer" principle. Roads on Category III lands have designated "users" who are financially responsible for the construction, maintenance, and operation of a said road. In the case of Eeyou –Istchee Baie-James region, there are a wide variety of "user-payer", but the four main ones are:

1. Hydro Québec, herein referred to as HQ, is responsible for the maintenance and operation of 985 km of access roads to its various power generation and transmission sites and assumes full financial responsibility for them.
    - Trans-Taiga Road: provides access, via Billy-Diamond Highway, to Caniapiscau Reservoir, LG-3, LG-4, LA-1, LA-2 and Brisay hydroelectric power plants;
    - Route du Nord [CH 258+000 to CH 408+000]: provides access to Albanel substation from the Route du Nord [CH 000+000 to CH 258+000], to Billy-Diamond Highway, to Nemaska access road and to ESR Road;

[1] Source : https://www.transports.gouv.qc.ca/fr/ministere/organisation/organisation-territoriale/nord-du-quebec/Pages/nord-du-quebec.aspx

- ESR Road: provides access, via Billy-Diamond Highway and the Route du Nord, to Eastmain-1 and Sarcelle hydroelectric power plants, and Newmont Éléonore mine (maintenance cost shared between Newmont and HQ).

2 The Société de développement de la Baie-James, herein referred to as SDBJ, is responsible for the maintenance and operation of:

- 710 km of roads, which are currently funded via subsidies from MTQ and HQ for maintenance namely:
  - Billy-Diamond Highway: connects the community of Radisson to Matagami and Route 109. It also serves the Robert-Bourassa generating station;
  - Chisasibi Road: connects the Cree community of Chisasibi and LG-1 to Billy-Diamond Highway.
- the 180 km Villebois-Selbaie-Joutel road, the costs of which are shared by the various users (mining and forestry companies).

3 The Forestry companies are responsible for the maintenance and operation of an extensive network of forest roads in the southern part of the territory (approximately 3,000 km).

4 The Mining companies have also built access roads to their operation sites, most notably Stornoway Diamond Corporation whose mining road of ±100-km long connects to the Route 167 (CH 553+00 to CH 650+000).

2.2 EXISTING ROAD NETWORK CONDITIONS

To better understand the context in which La Grande Alliance proposed roads are set, it is important to document the existing Eeyou –Istchee Baie-James region road network current conditions, its challenges and particularities.

2.2.1 TRAFFIC RATE

Traffic data for the portion north of km 380 of the Billy-Diamond Highway was provided by the SDBJ (see Appendix B of this document). This data provides a picture of the traffic in 2014 and 2017. The main observations resulting from this data are as follows:

- Traffic generated by Cree communities accounts for over 60% of traffic and appears to be increasing;
- Heavy vehicles account for over 33% of users;
- The Annual Average Daily Traffic, herein referred to as AADT, is below 500.

Since 2012, with the completion of work on the EM1-A and La Sarcelle sites, the volume of traffic generated by HQ's has decreased significantly, while the volume generated by other users (Éléonore mine, forestry industry and local populations) continues to increase.

2.2.2 SAFETY

Often-extreme weather conditions on the Eeyou –Istchee Baie-James region is another challenge for user safety. For example, an intense snowstorm in combination with the vastness of the road network might lead to poor road conditions and even road closures. This increases the pressure over the regular road maintenance program.

Many roads are unpaved, and the absence of pavement markings (painted lines dividing traffic lanes) tends to increase the insecurity between cars and heavy vehicle drivers. For example, traffic accidents/collisions may occur when vehicles going in opposite directions cross each other because the lanes are not clearly defined. Passing a vehicle can also be problematic on unpaved roads. For example, if the road is particularly dusty, a user might find it difficult to safely pass a slower vehicle. Unpaved infrastructures are also very demanding in term of maintenance to manage dust and wear and tear.

Especially considering the vastness of the territory, the current absence of an effective telecommunications network is problematic. The access to emergency services and the low availability of emergency vehicles make it difficult to organize interventions in the event of a traffic accident, which can increase the severity of accidents.

2.2.3 MAINTENANCE AND OPERATIONS

Responsibility for planning, regulating, and maintaining the territory's road network is shared among several stakeholders (MTQ, SDBJ, MERN, MFFP, HQ) which over-complicates the implementation of maintenance and repair projects and the obtention of the funds required to ensure adequate financing for its maintenance and preservation. The maintenance standards applied to these different roads also vary from one agency to another.

- In 1997, the Council of Ministers decreed (Decision No. 97-068) the formation of an interdepartmental committee, chaired by the MTQ, to review the entire issue of road infrastructure maintenance on the territory and to define an adequate financing plan. At that time, the orientations were to transfer the entire James Bay Road into the provincial road network under the responsibility of the MTQ. However, this was subject to obtaining a financial contribution from HQ based on the maintenance budgets that HQ was assuming as well as on the rehabilitation costs to be determined for each road. Since no agreement were reached between the parties, it resulted in a decrease in the overall maintenance of the Billy-Diamond Highway as well as the other roads managed by HQ. Current funding for the maintenance and rehabilitation of roads and highways managed by HQ comes from their generation and transportation sectors operation budgets. Since they don’t own theses roads and their owns needs are focus on accessing their infrastructures, the allocated budgets are limited and not oriented on capitalizing on the investments.
- The SDBJ's regionalized structure, its presence throughout the territory and the various business practices it has put in place to maximize the economic benefits of its various activities are important assets for the territory. Moreover, it is not governed by the *Public Service Act*, so it has more flexibility in recruiting staff. It should also be noted that two Cree people sit on its board of directors to represent their regional identity;
  - To carry out its various mandates, this organization operates an office in Matagami, Radisson and Chibougamau. It also operates a truck stop located at km 381 of the Billy-Diamond Highway, a camp located at km 257 of the Billy-Diamond Highway and various storage sites for de-icing materials on the Billy-Diamond Highway and the Chisasibi Road;
  - The MTQ has entrusted the SDBJ with the maintenance management of nearly 54% of the resource access roads under its responsibility. The maintenance standards applied to these roads are adapted to the volume of traffic, operational constraints (local businesses, base of operations, etc.) and northern conditions. The same applies to other roads managed by the SDBJ;
  - HQ has entrusted the SDBJ with the management of the maintenance of the roads under its responsibility. The MTQ also concluded a memorandum of understanding with the SDBJ entrusting it with the management of the maintenance of the Waskaganish, Eastmain and Weminji Roads and Road 109 connecting Lebel-sur-Quévillon to Matagami;
  - After several interventions, the SDBJ successfully obtained a grant from the MTQ in 2016 to increase the maintenance of the Billy-Diamond Highway and Chisasibi Road. HQ also committed to maintaining its annual financial contribution at a maximum of $3M as of 2018. These contributions have also been renewed for the next few years. However, HQ's financial contribution has not been indexed since then. In 2022, the annual maintenance budget for this road totals $8.3 million and is just enough to cover its basic maintenance;
  - Since then, the SDBJ has received grants totalling $333.9M from the federal and provincial governments to proceed with Phase 1 of the Billy-Diamond Highway and Chisasibi Road rehabilitation project, which will be completed by the end of 2026. A new funding application is being analyzed by the federal government for a maximum contribution of $132M out of an estimated total project cost of $291M to complete the rehabilitation of these roads. This phase 2 of the project should be completed by the end of 2027;

- Furthermore, the SDBJ is still lobbying the government to receive a recurrent asset maintenance budget following the completion of this work;

- As per the framework of the James Bay Eeyou Istchee Governance Agreement between the Crees of Eeyou Istchee and the Government of Québec, it was agreed in section 151 to review the regionalization of government services and offices in this territory[2];
- A new MTQ General Directorate covering the territory of Eeyou Istchee Baie-James has recently been founded (summer of 2022). The impacts of this new organization are yet to be defined.

The table below illustrates the current responsible entities of the existing main roads and paths network within the Eeyou –Istchee Baie-James region.

Table 2-1 Agencies Responsible for the Main Roads and Paths in the Eeyou –Istchee Baie-James region

RESPONSIBLE ENTITY	ROAD / PATH	LOCATION	FINANCIAL RESPONSIBILITY	MANAGING ENTITY
MTQ	R-109	Connects Abitibi-Témiscamingue (Amos) to the territory (Matagami)	MTQ	MTQ
	R-113	Connects Abitibi-Témiscamingue to the territory (Val-d'Or - Senneterre - Lebel-sur-Quévillon - Chapais)	MTQ	MTQ
	R-167	Connects Saguenay-Lac-Saint-Jean to the territory (Saint-Félicien - Chibougamau - Mistissini - Otish Mountains)	MTQ	MTQ
	Route du Nord	From km 0 to km 258.9, connects Chibougamau to Hydro-Québec's Albanel substation	MTQ	MTQ
	R-1005	Connects Lebel-sur-Quévillon to Matagami	MTQ	SDBJ
	Waskaganish	Connects the Cree Nation of Waskaganish to the Billy-Diamond Highway	MTQ	SDBJ
	Eastmain	Connects the Cree Nation of Eastmain to the Billy-Diamond Highway	MTQ	SDBJ
	Wemindji	Connects the Cree Nation of Wemindji to the Billy-Diamond Highway	MTQ	SDBJ
HQ	Trans-Taiga Road	Connects the Billy-Diamond Highway to the LG-3, LG-4, LA-1, LA-2 and Brisay hydroelectric generating stations	HQ	SDBJ
	Route du Nord	From km 258.9 to km 407.9, connects Albanel substation to the ESR Road and the Billy-Diamond Highway	HQ	SDBJ
	ESR Rd	Connects Eastmain-I and Sarcelle generating stations to the Billy-Diamond Highway and the Route du Nord.	HQ	HQ
SDBJ	Billy-Diamond	Connects the community of Radisson to Matagami and Route 109.	MERN and HQ	SDBJ
	Chisasibi	Connects the Cree Nation of Chisasibi and the LG-1 generating station to the Billy-Diamond Highway	MERN and HQ	SDBJ

[2] https://cdn-contenu.quebec.ca/cdn-contenu/adm/min/conseil-executif/publications-adm/saa/administratives/ententes/Cris/2012-07-24_cris-entente.pdf?1607003537

2.2.4 TECHNICAL CRITERIA

2.2.4.1 BILLY-DIAMOND HIGHWAY AND CHISASIBI ROAD

The design of the Billy-Diamond Highway was specifically based on the high and heavy traffic of freight required for La Grande hydroelectric development. At the time, the following characteristics were retained:

- Design speed: 100 km/h;
- Minimum horizontal curves' radius: 390 m;
- Width of paved surface: 7.3 m;
- Shoulder width: 3 m;
- Right-of-way width: 46 m;
- Bridges were designed to carry live loads equivalent to CL-625 (range of 50 tonnes).

2.2.4.2 ROUTE 167 TOWARDS OTISH MOUNTAINS

In 2012, the MTQ planned the construction of the northern extension of Route 167. This project started at the end of the existing road, at CH 411+600 and ran northward to the Renard diamond mine for an approximate distance of 243 km. However, for administrative reasons, the MTQ only completed 143 kilometres and the remaining section of approximately 100 km was built by the Stornoway Diamond Corporation.

The design of the 143 km long section built by the MTQ was based on the Tome 1 - Conception routière - ministère des Transports duQuébec, June 2021 Edition (Volume 1 - Road design - Québec Ministry of Transport, June 2021 Edition):

- Design speed: 80 km/h;
- Minimum horizontal curves' radius: 255 m;
- Width of unpaved road surface: 7.0 m;
- Shoulder width: 1.5 m;
- Right-of-way width: 35 m;
- Bridges were designed to carry live loads equivalent to CL-625 (range of 50 tonnes) with 60 m paved approach on each side.

The design of the 100 km long section built by the Stornoway mine road is based on a type of resource access road:

- single 7.5 m carriageway;
- an average cleared width of 28 m with passing zones located every 1000 m.

3 PROPOSED ROAD INFRASTRUCTURES

3.1 LAWS & REGULATIONS RELATED TO ROADWORK

3.1.1 JAMES BAY AND NORTHERN QUÉBEC AGREEMENT

The territory is subject to the *James Bay and Northern Québec Agreement* (JBNQA). The following two excerpts from the preamble of the JBNQA reveal the intentions of the Québec government, JBEC, SDBJ and HQ with respect to the development of the region:

> "WHEREAS it is desirable that the Province of Québec takes measures for the organization, reorganization, proper administration, and planned development of the regions concerned..."
>
> "WHEREAS the James Bay Energy Corporation, the James Bay Development Corporation and the Québec Hydroelectric Commission (Hydro-Québec) have the advantage of developing the said territory in a planned manner and have made commitments to this end;"

It should also be mentioned that under the JBNQA, certain commitments have been made by the signatory parties with respect to the roads and tracks that have been built on the territory.

Section 8.8.1 of the Agreement states that the Crees may use the roads built as part of the development of the La Grande complex.

> "8.8.1 Road network of the La Grande complex (1975)
>
> Roads constructed in the Territory by the James Bay Energy Corporation or the James Bay Development Corporation, or both, for the La Grande complex (1975) may be used by the Crees, apart from roads within work camps and construction sites, as soon as such roads are completed and are safe, subjected to compliance with any regulations that are or will be applicable..."

Section 28.16.1 also refers to the main road which is now designated as the Billy-Diamond Highway and the Chisasibi Road. This section also mentions the intention of the parties to negotiate the possibility to build and maintain access roads to the Cree communities of Waskaganish, Eastmain and Wemindji.

> "28.16 Pathways to Cree communities
>
> Canada, Québec and the James Bay Crees will continue negotiations for the construction and maintenance of access roads linking the Eastmain, Vieux-Comptoir and Fort Rupert settlements to the main Fort George-Matagami road."

The planning, development, and implementation of the proposed roadwork planned under La Grande Alliance will take place in three phases over a period of up to 30 years.

It is up to the government to determine which roads and highways are under the management of the MTQ. To do so, it must adopt an order-in-council under section 2 of the *Act respecting roads* (R.S.Q., chapter V-9) or under paragraph i of section 3 of the *Act respecting the Minister of Transport* (R.S.Q., chapter M-28). The funds required for their maintenance and repair come from the budgetary credits granted to the MTQ by the government.

3.1.2 HIGHWAY SAFETY CODE

The Highway Safety Code (HSC) applies to all roads for which the MTQ is responsible under the *Act respecting roads*.However, for roads for which the MTQ is responsible under the *Act respecting the Minister of Transport*[3], as well as for multi-purpose roads and mining roads, there is only partial application of the HSC, since only a few sections of the code apply, namely:

- License plate;
- Driving licence;
- Demerit points;
- Maintaining vehicles in good condition;
- Appropriate speed;
- Wearing a seat belt;
- Retention device;
- Truck load securing;
- Mechanical check;
- Ban on drinking and driving.

Thus, for multi-purpose roads and mining roads, there is no imposed limit on loads in normal as well as thaw periods.

High load limits contribute to faster deterioration of the road network but are good for the economy. Contrarily, low load limits reduce the maintenance costs of the road network but are detrimental to several economic sectors. In these circumstances, it is essential to strike a balance between these two positions.

It should also be mentioned that, following the major investments made in Phase 1 of the Billy-Diamond Highway rehabilitation project, MERN set up an interdepartmental committee to examine the legal solutions that would make it possible to regulate heavy transport on this highway. Until a legal solution is found, the main carriers using the Billy-Diamond Highway have agreed to voluntarily respect the load restrictions applicable during the same thaw period as the Abitibi-Témiscamingue territory.

[3] Ref.: *Provision 5.2 Highway Safety Code*

Table 3-1 Laws and Regulations Applicable to the Territory's Roads and Tracks

RESPONSIBLE ENTITY	ROAD / PATH	LOCATION	APPLICABLE LAWS				CERTAIN APPLICABLE REGULATIONS			
			Roads Act	Act on the Ministry of Transport	State Land Act	Sustainable Forest Management Act	Regulation respecting the sustainable development of forests in the domain of the state	Highway Safety Code	Load restrictions during normal periods	Load restrictions during thaw period
MTQ	R-109	Connects Abitibi-Témiscamingue (Amos) to the territory (Matagami)	x		x	x		x	x	x
	R-113	Connects Abitibi-Témiscamingue to the territory (Val-d'Or - Senneterre - Lebel-sur-Quévillon - Chapais)	x		x	x		x	x	x
	R-167	Connects Saguenay-Lac-Saint-Jean to the territory (Saint-Félicien - Chibougamau - Mistissini - Otish Mountains)	x		x	x		x	x	x
	Route du Nord	From km 0 to km 258.9, connects Chibougamau to Hydro-Québec's Albanel substation		x	x	x	x	in part		
	R-1005	Connects Lebel-sur-Quévillon to Matagami		x	x	x	x	in part		
	Waskaganish Road	Connects the Cree Nation of Waskaganish to the Billy-Diamond Highway		x	x	x	x	in part		
	Eastmain Road	Connects the Cree Nation of Eastmain to the Billy-Diamond Highway		x	x	x	x	in part		
	Wemindji Road	Connects the Cree Nation of Wemindji to the Billy-Diamond Highway		x	x	x	x	in part		
HQ	Trans-Taiga Road	Connects the Billy-Diamond Highway to the LG-3, LG-4, LA-1, LA-2 and Brisay hydroelectric generating stations			x	x	x	in part		
	Route du Nord	From km 258.9 to km 407.9, connects Albanel substation to the ESR Road and the Billy-Diamond Highway			x	x	x	in part		
	ESR Road	Connects Eastmain-I and Sarcelle generating stations to the Billy-Diamond Highway and the Route du Nord.			x	x	x	in part		
SDBJ	Billy-Diamond Highway	Connects the community of Radisson to Matagami and Route 109.			x	x	x	in part		
	Chisasibi Road	Connects the Cree Nation of Chisasibi and the LG-1 generating station to the Billy-Diamond Highway			x	x	x	in part		

3.2 ROAD CLASSIFICATION

3.2.1 MTQ STANDARDS

The MTQ has developed a road classification system that is the basis for the day-to-day management of the network for which it is responsible, i.e., functional classification.

The following table summarizes the classification framework for the whole network, specifying the main functions for each of the main classes.

Table 3-2 MTQ Road Network Functional Classification

CLASSIFICATIONS	FUNCTIONS
Motorway network	Includes all motorway infrastructure
National network	Mainly includes inter-regional roads and roads linking major cities (generally with more than 25,000 inhabitants)
Regional network	Links secondary agglomerations (generally 5,000 to 25,000 inhabitants) and between these and the main agglomerations
Collector network	Connects smaller agglomerations (less than 5,000 inhabitants) to larger ones
Local network	Connects small settlements to each other and to properties
Resource access network	Leads to forestry, mining, hydroelectric, recreation and conservation areas under government jurisdiction

Source: https://www.transports.gouv.qc.ca/fr/ministere/acces-information-renseignements-personnels/documents-reglement-diffusion/demande-acces/Documents/2017/03/lai-2016-2017-374-classification-fonctionnelle.pdf

3.2.2 RESOURCE ACCESS ROADS

Most access roads to the territory's resources are under the responsibility of agencies or ministries other than the MTQ. The promoter must fund the construction, maintenance, operation, and rehabilitation of that access road. If it is subsequently used by other users for all sorts of reasons (e.g., access to communities, forest, mines, etc.), based on the “user-payer” principle, the proponent tends to seek partners to share the maintenance and improvement costs.

The resource access roads are located on lands in the domain of the State and are therefore managed and administered by the Minister of Energy and Natural Resources under the *Act respecting the lands in the domain of the State (LTDE)*. In addition, since these roads are also located in a forest environment, they are "multi-purpose roads" as defined in the *Sustainable Forest Development Act* (SFDA). In this respect, they are under the responsibility of the Minister of Forests, Wildlife and Parks.

The *SFDA* was enacted on April 1st, 2010. It applies, among other things, to forest lands in the domain of the State , i.e., up to the northern limit of the forest tundra domain[4]. Under section 4 of the SFDA, the construction, repair and maintenance of infrastructures are considered forest management activities. Under section 38 of the Act, the government may, by regulation, enact standards for the layout, construction, improvement, repair, maintenance, and

[4] Source : https://www.legisquebec.gouv.qc.ca/fr/ressource/rc/A-18.1R0.01_FR_001_001.pdf?langCont=fr&cible=B0128A9D442DE2DDADE059590E5E280C

closure of roads for any person carrying out a forestmanagement activity. Moreover, section 41 stipulates that a multi-purpose road is a road in a forest environment, other than a mining road, built or used for multiple purposes, including to allow access to the forest territory and its resources.

The *Regulation respecting the sustainable development of forests in the domain of the State* (RADF, April 1st, 2018), stipulates that several standards are to be met when building or improving a multi-purpose road. Section 62 of the *RADF* specifies which roads are not subjected to these standards. These standards do not apply to roads that are managed by the Minister responsible for the *Act respecting roads* and that are classified as highways or national regional or collector roads. Furthermore, Appendix 4 of the *RADF*[5] details the different classes of roads in forest areas. As shown in the table below, these various classes are based on different parameters such as posted speed, dimensions, vertical and horizontal alignments, road surface, bridge width, etc.

Table 3-3 The 4 Main *RADF* Road Classes

	ROAD CLASSES			
	Higher Standard	1	2	3
Design criteria				
Duration of use	50 years	25 years	25 years	10-15 years
Posted speed limit	70 km/h	70 km/h	60 km/h	50 km/h
Minimum stopping sight distance (design)	170 m	110 m	85 m	65 m
Dimensions of the road				
Right-of-way	35 m	35 m	30 m	30 m
Roadway	9.1 m and over	8.5 m to < 9.1 m	8 m to < 8.5 m	7.5 m to < 8 m
Shoulder (each side)	1.0 m	1.0 m	1.0 m	1.0 m
Vertical and horizontal alignment				
Horizontal curve (minimum radius)	340 m	190 m	130 m	90 m
Maximum adverse slope	4%	6%	7%	8%
Maximum favourable slope	6%	9%	11%	14%
Material used				
Foundation	Natural gravel	Natural gravel	Natural gravel	Mineral soil
Road surface	Crushed	Crushed or screened gravel	Natural gravel	Natural gravel
Works allowed				
Type	Bridge* and culvert	Bridge* and culvert	Bridge* and culvert	Bridge* and culvert

** Carriageway width of the bridge = 4.3 m*

[5] Source : https://www.legisquebec.gouv.qc.ca/fr/ressource/rc/A-18.1R0.01_FR_002_001.pdf?langCont=fr&cible=5655C5DA1A6CC67BEACB47A6B3EE25DE

3.3 FINANCIAL ASPECT

Road projects in Eeyou Istchee are coordinated by the *Direction des Grands projets routiers du nord et de l'est du Québec* (Department of Major Road Projects in Northern and Eastern Québec), which reports to the *Sous-ministériat aux grands projets routiers et à la région métropolitaine de Montréal* (Deputy Minister for Major Road Projects and the Montreal Metropolitan Region). This branch is responsible for the construction of the Highway 138 extension project, which aims to link the various communities of the Basse-Côte-Nord region with each other and with the rest of Québec. The analysis of road projects led by this branch is carried out in accordance with the requirements of the Guide to cost-benefit analysis of public road transport projects[6].

However, it would likely be difficult to evaluate La Grande Alliance proposed roads according to the same criteria as those used in this guide because La Grande Alliance proposed roads have a high construction and maintenance cost that could not be compensated by the usual gains accounted for in that guide. Other non-monetary gains specific to La Grande Alliance proposed roads, such as life quality improvement, employment and economic development prospects, connecting isolated areas, etc., should be considered to properly evaluate the asset.

If the proposed infrastructures (all or separately) are deemed valuable by the communities, clarifying the funding structure will be necessary. We therefore recommend to proceed, in the next phase of detailed engineering, with a business study specific for each of La Grande Alliance proposed road. Although it is not yet confirmed whether La Grande Alliance proposed road infrastructures will be subject to the *Directive sur la gestion des projets majeurs d'infrastructure publique*[7] (directive on the management of major public infrastructure projects) which applies when the estimated project cost is over $100M, it is likely that this Directive framework be appropriate to facilitate the required funding process from the various government entities. It also allows for rigorous follow-up during the project by detailing the following:

1. Project context including a description and evaluation of its justification;
2. Project scope including the project breakdown structure, the functional and technical requirements analysis and the proposed change management process;
3. Project estimated total cost of the project, its financing strategy and its projected marginal budgetary impact;
4. The project timeline;
5. Human resources, including the project team roles and responsibilities;
6. Project governance structure;
7. Analysis of the project stakeholders;
8. Analysis of the project risks, including for each risk the probability of occurrence, the potential financial impact, and the proposed mitigation measures;
9. The communications plan;
10. Procurement strategies considering the intended mode of implementation.

In addition to the construction estimated budget, it will be important to consider a maintenance and operation budget to ensure the sustainability of new roads, the maintenance of assets and the maintenance of safety.

The MTQ and the SDBJ are familiar with the methodology of this Directive framework. They could potentially assist the Cree Development Corporation/James Bay Native Development Corporation (CDC/SODAB) if they are the foreseen organization to implement La Grande Alliance proposed roads.

[6] https://www.transports.gouv.qc.ca/fr/entreprises-partenaires/entreprises-reseaux-routier/guides-formulaires/documents-gestionprojetsroutiers/guideaac-methodologie.pdf

[7] https://www.tresor.gouv.qc.ca/fileadmin/PDF/infrastructures_publiques/directive_gestion_projets_majeurs.pdf

3.3.1 PROPOSED APPROACH

The planning, development, and implementation of La Grande Alliance proposed transportation infrastructure require stable funding that accounts for the construction but also for the long-term maintenance and rehabilitation.

The following could feed the thought process of next steps:

- The current situation of the Billy-Diamond Highway demonstrates, according to its current legal status, the difficulties in financing maintenance and operation activities when these budgets depend mainly on the will of the user payers. We therefore recommend the integration of La Grande Alliance proposed roads into the provincial network under the responsibility of the MTQ.
- CDC and the SDBJ have signed a memorandum of understanding to potentially create a regional airport authority. Such an approach could be favoured in the context of the implementation of La Grande Alliance proposed roads.
- As per Phase 1 of the Billy-Diamond Highway and Chisasibi Road rehabilitation project, federal funding is also potentially available. Through this project, SDBJ has set a governance structure deemed exemplary by Treasury Board of Canada Secretariat. SDBJ has also built an experienced and well-structured project management team to address local concerns such as the challenge of attracting labour to work in Northern Québec, setting the objective to allocate directly or indirectly (subcontracting) 30% of the contracts monetary value to regional businesses.
- With the creation of a new territorial branch within the MTQ for the Eeyou –Istchee Baie-James territory, the MTQ is giving itself a tool that will enable it to take responsibility for the entire James Bay upper road network. The MTQ could still delegate to the SDBJ certain management activities that it already performs.

We recommend that La Grande Alliance Implementation Committee asks the government to conclude a multiparty agreement on the financing of the construction, maintenance, and rehabilitation of these roads between HQ, MERN, the Société du Plan Nord, the Ministère des Finances du Québec, and the Secrétariat du Conseil du Trésor (SCT). This agreement should cover:

- The development of the road network regarding the needs of the various users of the network and in respect with
- the values and objectives of the local communities;
- Operation and maintenance of existing assets;
- Improvement of existing assets;
- Monitoring safety issues.

3.4 DESIGN CRITERIA

3.4.1 TECHNICAL ROADWAY DESIGN STANDARD

For La Grande Alliance proposed roads, we recommend the use of MTQ road design standards to ensure safety, durability and to facilitate their integration into the existing road network. Consequently, the forest road design criteria are discarded. This results in a higher estimated cost, but also a higher expected performance and life span.

Even though the proposed extension from the existing Billy-Diamond Highway towards the community of Whapmagoostui/Kuujjuarapik is likely to have an upward effect on the network's ridership, the AADT will most likely remain less than 500 vehicles/day. This information also confirms the choice of the road class that we have defined, i.e., a road classified as regional to respond to vehicle flows (AADT) of less than 500 vehicles/day. Thus, the proposed cross-section for this type of road is a modified type E (see appendix C of this document).

The following design parameters are based on the Tome 1 - Conception routière - Ministère des Transports du Québec, Edition June 2021 (Volume 1 - Road design - Québec Ministry of Transport, June 2021 Edition).

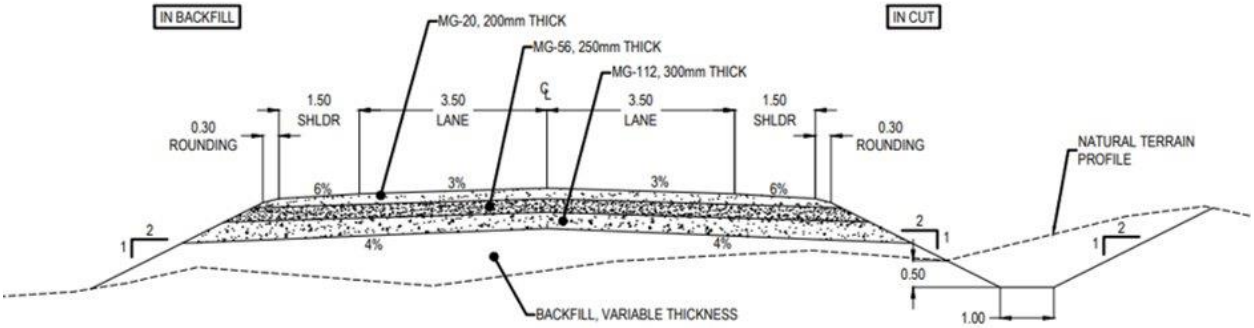


Figure 3-1 Typical Cross Section / Average bearing capacity soils

GEOMETRY

- Design speed: 80 km/h
- Displayed speed: 70 km/h
- Slope: less than 4% (up to 6% in extreme cases)
- Minimum radius horizontal curve: 255 m
- Two 3.5 m lanes and 1.5 m shoulders for a total of 10 m of platform
- Roundings: 300 mm
- Normal camber: 3%
- Maximum camber: 6%
- Right-of-way width: 35 m

SAFETY

- Semi-rigid on steel posts, guardrail end device includes a localized lateral deviation according to MTQ standard;
- 210 type guardrails for steel-wood bridges;
- Adequate coverage for emergency ambulance services on the road network;
- It is also necessary to ensure that the planned rest stops, parking areas, check points for heavy vehicles and emergency telephones are always sufficient in number and functional.

DRAINAGE

- Recurrence period:
  - Culverts: 25 years;
  - Bridges and engineering structures (culverts over 4.5 m diameter): 50 years;
  - Increase of 18% for the flow rates to account for climate change;
- Ditches 1 m wide, 500 mm under the substructure;
- Regarding culverts and drainage structures near watercourses, we recommend that criteria of the MFFP multi-purpose road be respected.

PAVEMENT STRUCTURE

- 200 mm MG 20b
- 250 mm MG 56
- 300 mm MG 112

BRIDGES

- Possibility of a completely wooden bridge;
- Preferably steel-wood bridges (due to the difficulty of producing concrete);
- 7.3 m wide single-lane bridge;
- Loads to be expected: 50 tonne trucks - in line with load limits in the south of the province.

3.4.2 LA GRANDE ALLIANCE INNOVATIVE APPROACH

Additional to applicable laws, regulations and technical parameters, specific parameters were designed at the outset by the client for La Grande Alliance studies, most notably, that the concept design must fully consider significant socio-environmental data, compiled in Report 2 prior to the design stage, including knowledge and perspectives gathered directly from Cree land users' engagement. The list below details the constraints imposed on the design approach:

- Respect, as much as possible, the natural site topography (mountains and plains);
- Consider the overall geology of the study area, including the locations of aggregate material deposits;
- Avoid, as much as possible, lakes and rivers; minimize the length of crossings and bridges where these are unavoidable;
- Avoid, as much as possible, existing, and projected Protected Areas; minimize encroachment and/or provide mitigation measures where these are unavoidable;
- Minimize crossing and impacts on caribou migration corridors;

- Avoid, as much as possible, areas of cultural significance such as areas currently used by Cree land users, archaeological sites, etc.; minimize encroachment and/or provide mitigation measures where these are unavoidable;
- Propose, wherever applicable, alignment variants that could offer added value, such as:
  - Locations that minimize environmental footprint;
  - Locations that minimize construction cost;
  - Locations that minimize the impacts on existing camps and facilities.

3.4.3 FUTURE CONSIDERATIONS

We must emphasize that the proposed alignments, presented in the next section, are conceptual and preliminary. Further studies and discussions with land users will be required to refine the design. The main objective of this current study is to identify and document the main design guidelines to be considered. As the study will progress, other issues will probably emerge and will influence the detailed design. The innovative process used has the great advantage of initiating dialogue between all the stakeholders allowing them to be involved throughout all the phases of the project development.

If the proposed infrastructures (all or separately) are deemed valuable by the communities, the specificity of those proposed roads, being of remote and sparsely populated area with long distances and low volume, must also be considered in the next stage of detailed design to include measures to reduce and mitigate the risks and consequences of that specificity such as:

- Using large curve radius and providing large sight distances that allow users to anticipate changes in the roadway alignment and adjust their speed accordingly;
- Roadway embankments should be as gentle as possible to minimize the impacts of roadway exits and the need for restraints;
- The right-of-way or tree-free zone along the road should be wide enough to prevent falling trees from obstructing the travel lanes;
- Large curves to avoid the need to widen the roadbed when there are more than 15 percent heavy vehicles;
- Speed on this type of road is often greater than 80 km/h;
- The road profile should provide a minimum pavement clearance from the design high water mark of 600 mm to 1000 mm for a normal 25-year flood return period.

4 ROUTE 167: UPGRADE & EXTENSION TO TRANS-TAIGA

As listed in the table and Figure 4-1 below, the planned work for this infrastructure has been divided into four different sections for which more detailed information is provided in the next sections (see introductory section for explanation on station). For the civil structure's details, please refer to Technical Note 14.

Table 4-1 Route 167 - Planned Work in this study

SECTION	STATION (START)	STATION (END)	LENGTH (KM)
Existing road			
Existing gravel road upgrade and paving	305+000	411+700	106.7
Existing unpaved MTQ road (no work)	411+700	553+370	141.7
Existing mine road upgrade	553+370	642+640	89.3
Extension to Trans-Taiga			
Proposed road extension	642+640	814+710	172

Note that if the upgrade work requires going beyond the existing rights-of-way and impact a protected area, it will be subject to the requirements of the relevant protected area's status.

4.1 GEOTECHNICAL CONDITIONS

From a geotechnical point of view, the soil condition, within a two-kilometre-wide corridor along the proposed alignment, presents some challenges. As shown in the table below, the high proportion of till tends to complicate the road construction since fills and spoil must be managed with caution. The presence of boulders, sometimes, makes till difficult to excavate. Furthermore, when poorly drained, the bearing capacity of the till can be significantly weakened. Figure 4-2 presents the wetlands and sedimentary deposits.

Table 4-2 Types of Soil – Route 167: Upgrade & Extension to Trans-Taiga (Value from TN10 – Geotechnical)

TYPES OF SOIL	% OF ROADWAY ON THIS TYPE OF SOIL
Organic soils	< 1%
Sand and gravel	3%
Till	96%
Rock	< 1%

The use of crushed granular material will be required to build this road. It should be noted that there are no active borrow pit leases or quarry leases along the length of the section. In fact, the only active mining leases are at the northern and southern ends of the section. At the north end, the nearest exclusive operating lease is owned by SDBJ and is located east approximately 35 km as the crow flies from the intersection with the Trans-Taiga Road. At the southern end, there are more non-exclusive mining leases and the closest one is to the north at about 3.6 km as the crow flies. In addition, the Renard Mine has approximately 5,000,000 m^3 of non-acid generating tailings that could be used as a source for granular materials. New quarries and/or gravel pits will have to be identified and developed to build the road. Our preliminary design is based on quarrying/graveling sites at every 60 km. Please refer to Technical Note 10 for more detailed information.

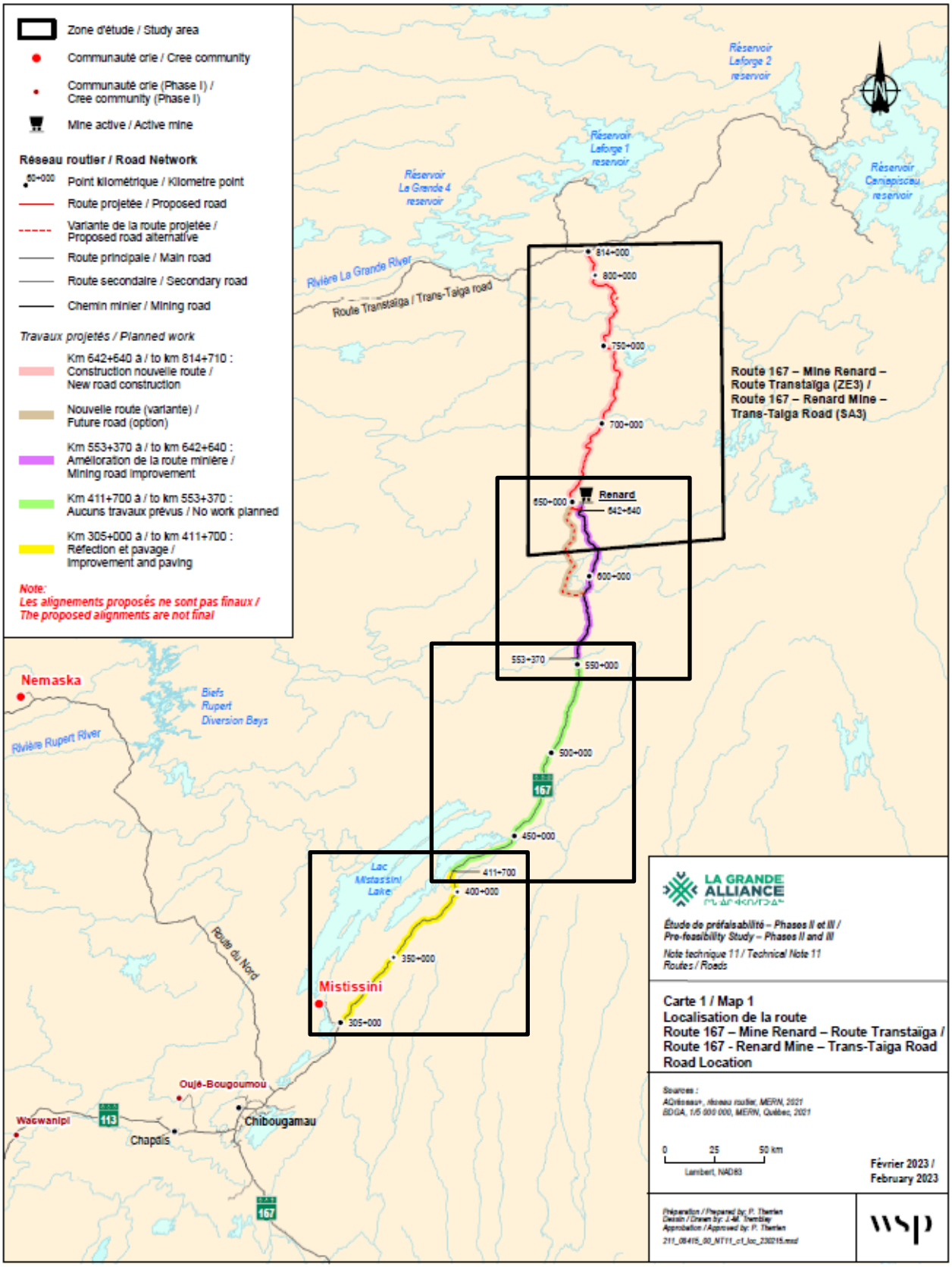


Figure 4-1 Route 167: Upgrade & Extension to Trans-Taiga – Proposed alignment

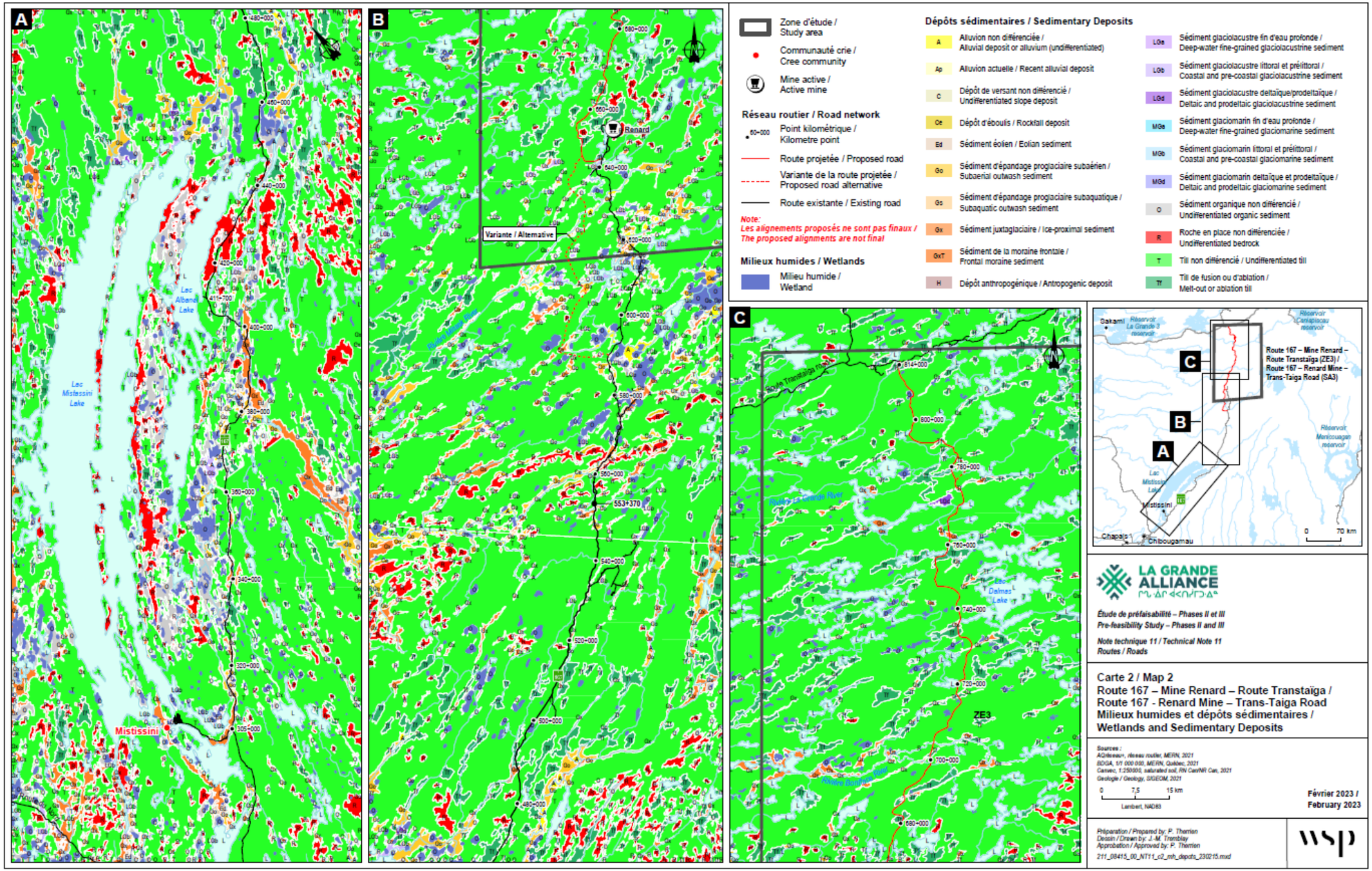


Figure 4-2 Route 167 - Wetlands and Sedimentary Deposits

4.2 ROADWORK DESCRIPTION

4.2.1 EXISTING GRAVEL ROAD UPGRADE AND PAVING (305+000 TO 411+700)

As confirmed by the site visit in June 2022, this existing 106.7 km section does not comply with the MTQ standards described in section 3.4. To identify the required work to be conducted, a meeting was held with the MTQ, owner, manager and operator of this road. Below is a summary of the anticipated work following the discussions with the representatives of the Ministry:

- Preparatory work will have to be done before this road can be paved:
- Clearing of roadside bush;
- Ditch cleaning (if required);
- Culvert repairs and replacement (as per inventories provided by the MTQ);
- Reinforcement of certain sections of the road for forestry use;
- Replacement of an old forestry bridge at km 351.9;
- General repairs (as per five-year program provided by the MTQ);
- Paving.

In their 5-year program, the MTQ planned work on the bridge P-0125A located at station 351+922. Nonetheless, it was agreed with the MTQ that all the planned work in their five-year program would be excluded from the work proposed as part of the La Grande Alliance. Furthermore, since there is no paving planned by the MTQ in the short term for this road, discussions would be required with the MTQ to define how the cost associated with this work could be shared or entirely covered by the proposed La Grande Alliance proposed infrastructures.

Impacted traplines: M50, M46D, M46, M42B and M42A.

4.2.2 EXISTING GRAVEL MTQ ROAD TO REMAIN (411+700 TO 553+370)

Since this existing 141.7 km section was recently built (opened in 2014) and the road is in a good condition (as per our site visit in June 2022), there is no work proposed as part of La Grande Alliance for this section.

Traplines: M42, M37, M36, M17C, M24A and M16.

4.2.3 EXISTING MINE ROAD UPGRADE AND PAVING (553+370 TO 642+640)

As confirmed by our site visit in June 2022, this existing 89.3 km section does not comply with the MTQ standards described in section 3.4. This upgrade would involve a road status change from a resource access road to a provincial road. To this end, a virtual meeting was also held with representatives of the Stornoway mining company, to validate the possibilities of a common use of the road. It appears from the mining company representatives that they would be willing to consider a shared use as they would benefit from it. Considering that a portion of the road is relatively new, we could assume that the civil structures are in good conditions. At this stage of the study, we consider that no repairs are required on these structures.

The following scope of roadwork would be required:

- Widening of the roadway by approximately 1.5 m;
- Lengthening existing culverts and other drainage structures;

- Horizontal curves correction;
- Vertical curves correction;
- Installation of guardrails.

In the next stage, that exact scope of work would need to be further studied based on a detailed and complete survey of the road including a complete inventory of the road structures and an analysis of the condition of the structures (culverts, guardrails, bridges, etc.).

Impacted trapline: M11

ALTERNATIVE OPTION (553+000 TO 642+640)

For comparison purposes, an alternative brand-new road was also considered within the study. This alignment is shown on the Figure 4-1. Even though this approach ensures to optimize the compliance with the design standards, this option was disregarded because the upgrade of the existing mine road section appears to bring the most value.

Indeed, the upgrade and integration of the mining road with Route 167 was retained over the alternative new road based on the following benefits:

- Significant less impact on the environment and territory by using an existing corridor;
- Cost reduction;
- Potential sharing of operation and maintenance costs with the mining company;
- No new impact that would be generated by the construction of a new route (new footprint);
- No new land borrowing;
- Road known by land users;
- Mining route is the shortest in length.

4.2.4 EXTENSION TO TRANS-TAIGA ROAD (642+640 TO 814+710)

As shown on Figure 4-1, the proposed extension of Route 167 is 172.6 km long. This proposed road begins at a stockpile area located south of the Renard Mine, at approximately station 642+640 of Route 167. It connects to the Trans-Taiga Road approximately 13.3 km east of the intersection between the Trans-Taiga Road and Laforge Road 1.

The proposed concept alignment requires 23 civil structures (bridges) out of which two are major crossings. Please find below a list of potential major bridges from TN 14.

Table 4-3 List of Potential Major Bridges - km 642+640 to 814+710

STATION (KM)	TRAPLINE	WATERWAY NAMES	APPROX. BRIDGE LENGTH (m)
704+080	M11		50
761+160	M01A	La Grande	150

As requested, the proposed alignment was established in respect with the socio-environmental data, compiled in Report 2 prior to the design stage, including knowledge and perspectives gathered directly from Cree land users. The proposed route follows the ridges as best as possible, avoids water bodies and crosses rivers at their narrowest point. As shown on Figure 4-3 and Figure 4-4, the proposed route crosses five traplines: CH26, M01, M01A, M04 and M11. The proposed alignment avoids, as best as possible, the highly sensitive areas (HSA) and the Aawiitakuch, Pipunishiwin-Saahkamiishtikw and Hirondelle protected areas, refer to Technical Note 3 for details on how the HSAs were identified.

IMPACTS ON TERRITORY

However, certain encroachments on habitats, trapping and hunting areas, boat routes and snowmobile trails were inevitable (as crossings). As of today, the proposed route crosses one HSA on traplines M11 and M01A. These works will have to be discussed with the tallymen during the study's future stages. More specifically, further discussions are required with the M01A tallyman regarding road crossing arrangements to consider for the canoe route and for the large wildlife, both woodland and migratory caribou as well as moose (For more details on the Quebec government's strategy regarding the caribou, see section 8 of the Technical Note 6).

STORNOWAY DIAMONDS' INTEREST

Stornoway Diamonds Corporation (Stornoway) and Systra Canada held a meeting (October 20, 2022) to discuss the La Grande Alliance project and Stornoway's interest regarding it.

The main interest of Stornoway is the possibility for Hydro-Quebec to build a high voltage transmission line along the Route 167. Currently, Stornoway produces its own electricity using liquified natural gas, so, obviously, having access to Hydro-Quebec's electricity would be major environmental and economic gains for Stornoway.

Also, Stornoway states that the general and winter maintenance of Route 167 under MTQ's responsibility (between Chibougamau and the mining road) is inadequate and below Billy-Diamond Highway standards. This problem impacts transportation contracts: local companies and drivers do not want to drive on the Route 167. The extension to Trans-Taiga Road will hopefully impact positively the maintenance standards.

Appendix E presents the meeting minutes.

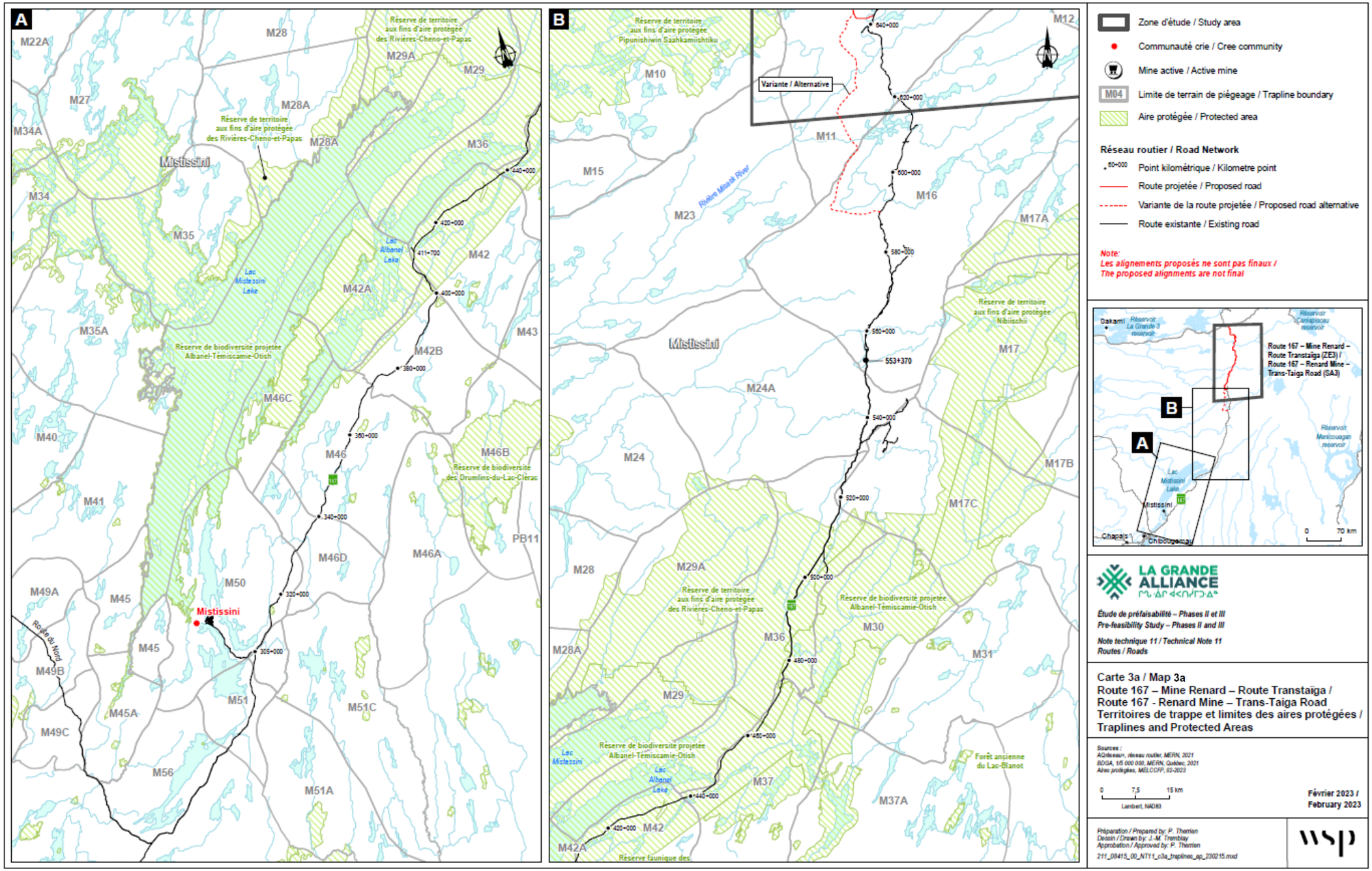


Figure 4-3 Route 167 - Traplines and Protected Areas 1 of 2

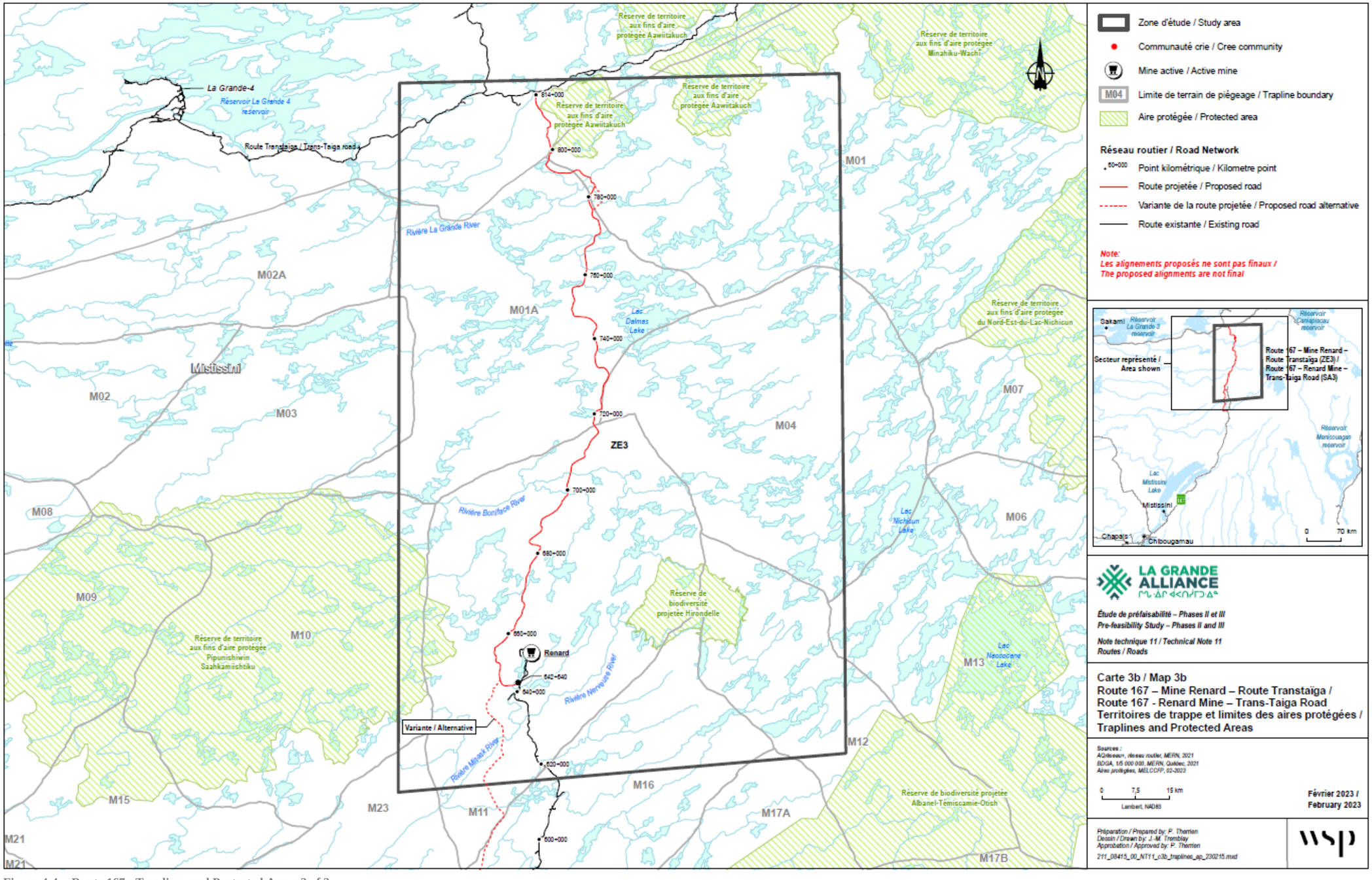


Figure 4-4 Route 167 - Traplines and Protected Areas 2 of 2

5 ROADWAY: LA GRANDE TO WHAPMAGOOSTUI/KUUJJUARAPIK

This proposed road alignment is located entirely within the traditional territories of the Cree communities of Chisasibi and Whapmagoostui and the Inuit community of Kuujjuarapik. This proposed road infrastructure is aiming to foster their economic and social development by connecting those communities with the existing road network.

Previously to La Grande Alliance transportation infrastructure study, road alignment studies were completed by Hydro-Québec and Poly-Géo. Figure 5-1 below shows both the coastal and the inland road alignments proposed by Poly-Géo in 2013. As of today, the inland proposed alignment has the highest potential:

- it is the most direct link to the Billy-Diamond Highway;
- it has the lowest impact on protected and significant areas;
- it is the shortest in length and time travel (most cost efficient);
- it has the narrowest water crossings;
- it has the lowest potential of service interruption since the crossing of the La Grande River is on the spillway of LG-2 and not the dam which is prone to maintenance work.

The current proposed road alignment, shown on Figure 5-2, is very similar to the inland proposed concept from 2013, but more respectful of protected and highly sensitive areas such as the *Réserve de territoire aux fins d'aire protégée du Lac-Burton-Rivière-Rogan-et-la-Pointe-Louis-XIV* and the Rivière-Kanaaupscow-et-Lac-Kukamaw one. The section between approximate stations 60+000 and 118+000 includes some alternatives that could be further studied in the next stage as each includes different benefits and impacts.

It should be noted that, during the Study, this proposed roadway infrastructure was moved to the feasibility stage and thus led to a helicopter-based site reconnaissance carried out from July 15th to 20th 2022 by a team composed of a hydraulic engineer (crossing structures sizing), a structural engineer (crossing structures design) and a civil engineer (road design) along the path envisioned for the proposed road.

This field work main objective was to confirm the desk-review analyses with helicopter flyovers, site visits and visual inspections. Design concept of the proposed road alignment is based and influenced by all the information gathered from this field campaign.

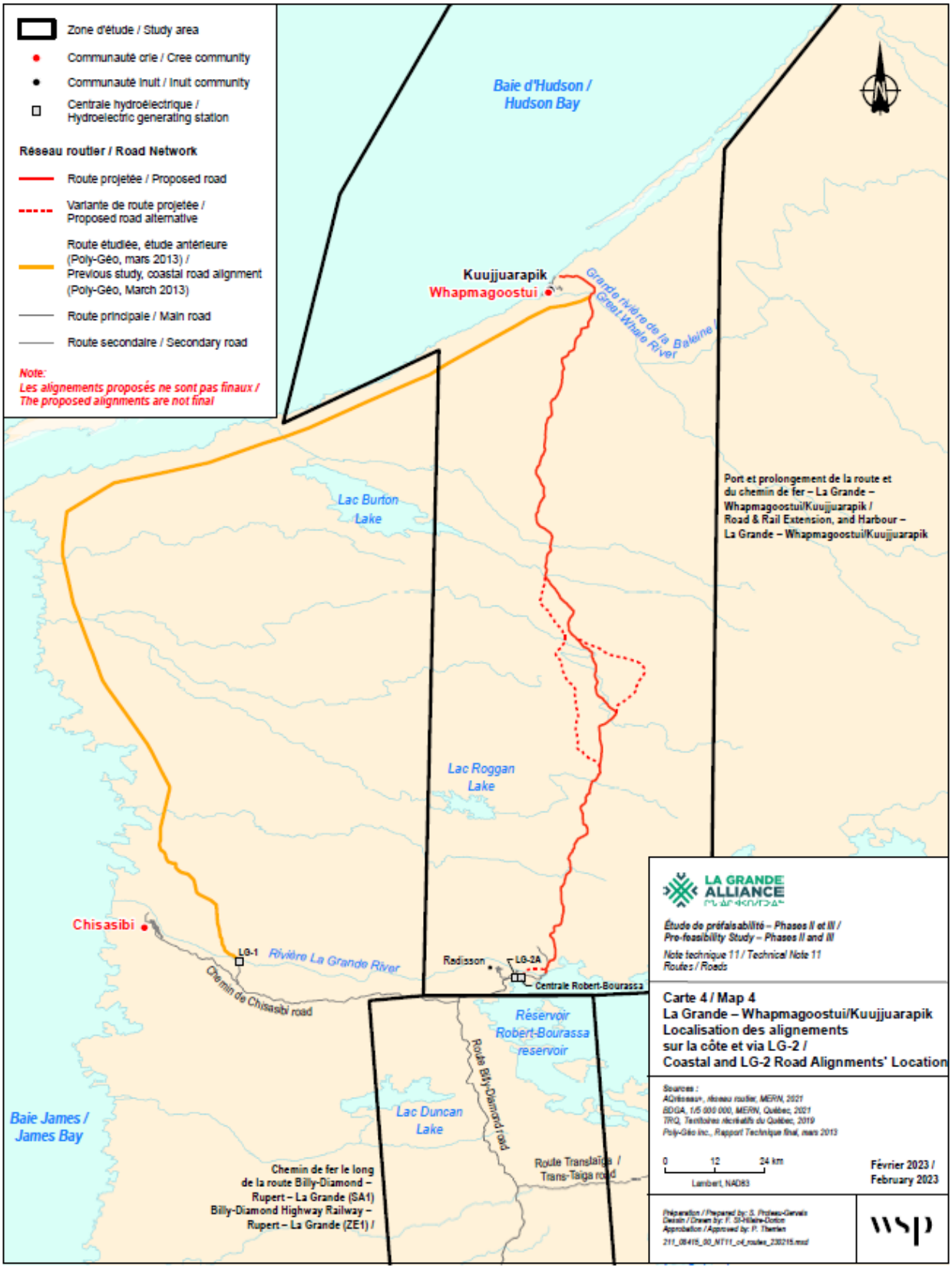


Figure 5-1 Roadway La Grande to Whapmagoostui/Kuujjuarapik - Proposed 2013 alignments by Poly Géo

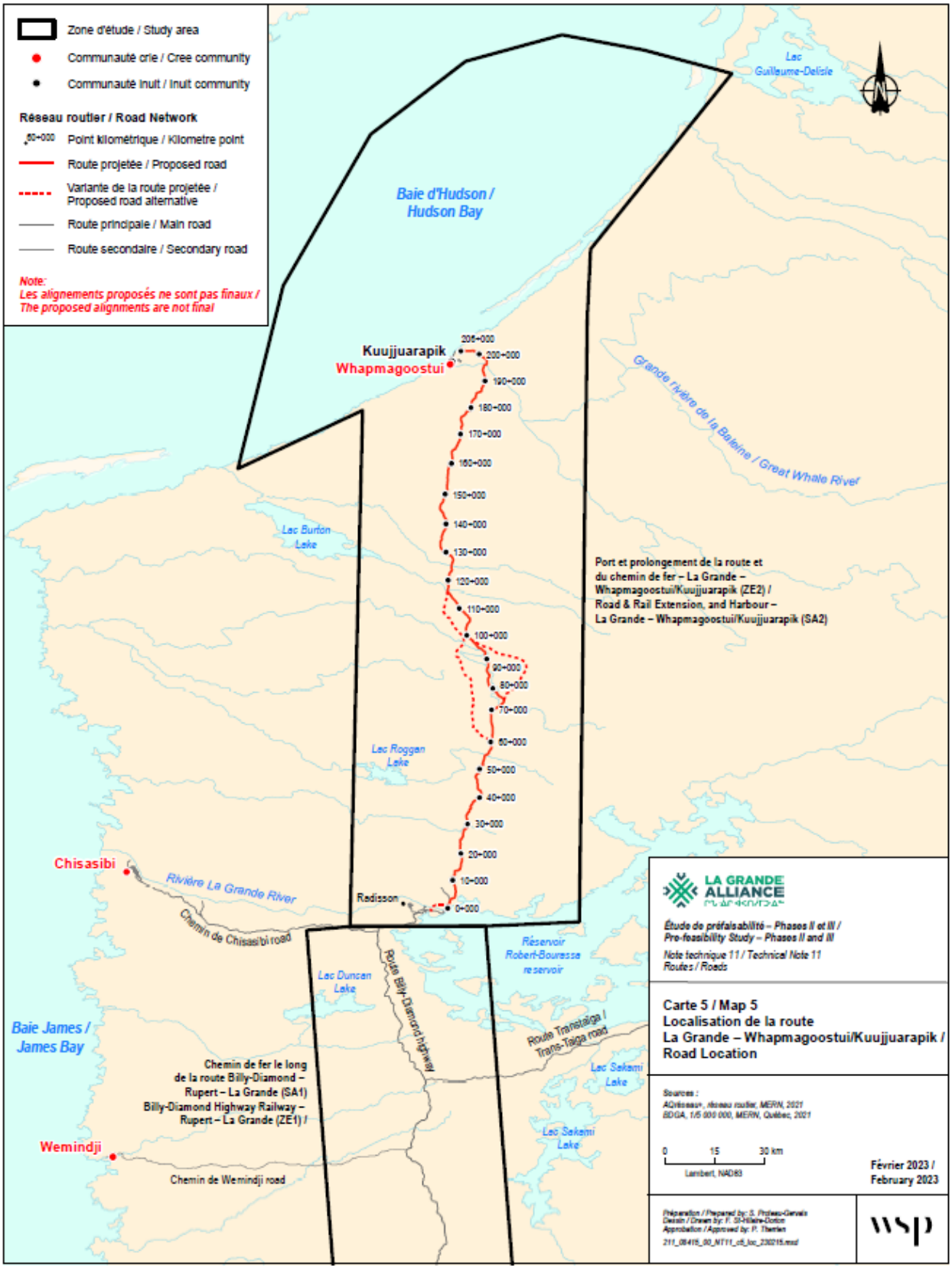


Figure 5-2 Roadway La Grande to Whapmagoostui/Kuujjuarapik – La Grande Alliance Proposed alignment

5.1 GEOTECHNICAL CONDITIONS

Based on Figure 5-1 of Technical Note 10, the route is located on sporadic permafrost (198 km) and discontinuous and dispersed permafrost (5 km). Sporadic permafrost means that less than 2% of the area is actual permafrost. Discontinuous and dispersed permafrost means that less than 50% of the area is actual permafrost. Based on these distances and percentages, the preliminary design considers permafrost on 6.5 km. The mitigation measures considered at this stage consist of a "fill only" pavement structure (1.5 m minimum above the natural terrain) with very gradual slopes (6H:1V).

Overall, the soil condition within a two-kilometre-wide corridor along the proposed road alignment is composed of the types of soil indicated in Table 5-1. Refer also to Figure 5-3 for the wetlands and sedimentary deposits.

Table 5-1 Types of Soil – Roadway La Grande to Whapmagoostui/Kuujjuarapik (Value from TN10 – Geotechnical)

TYPES OF SOIL	% OF ROADWAY ON THIS TYPE OF SOIL
Organic soils	5%
Silt and Clay	9%
Sand and gravel	10%
Till	29%
Rock	47%

Technical Note 10 presents in detail the potential geotechnical challenges related to the different types of soil encountered on the road alignment.

- Presence of rock requires expensive drilling and blasting operations, but the blasted rock can be reused as fill and granular material.
- Till is sometimes difficult to excavate when the percentage of boulders is significant. Till can also have a low bearing capacity when combine with high percentage silt and clay.
- Sand and gravel soils have a good bearing capacity when they are dense. Poorly drained and loose sand can lower its bearing capacity.
- Silt and clay can be very difficult to work with due to low bearing capacity, freeze-thaw susceptibility, consolidation settlement, low drainage capacity and liquefaction.

As shown on Table 5-2, the conceptual road design is based on an all-fill pavement foundation using three different road structures depending on the type of soil encountered. A specific road structure is determined based on the different soil conditions at each location (refer to Appendix F).

Table 5-2 Roadway La Grande to Whapmagoostui/Kuujjuarapik – Road structures

AVERAGE BEARING CAPACITY SOILS		BEDROCK		LOW BEARING CAPACITY SOILS	
GRANULAR MATERIALS	THICKNESS (MM)	GRANULAR MATERIALS	THICKNESS (MM)	GRANULAR MATERIALS	THICKNESS (MM)
MG 20	200	MG 20	200	MG 20	200
MG 56	250	MG 56	250	MG 56	250
MG 112	300	0-150 rock fragments	300	MG 112	1050
Fill	var.	Fill 0-1000 rock fragments	var.	Fill	var.

Additional detailed and extensive soil analysis, more specifically in the silt and clay sectors and permafrost characterization, would be required to further optimize the road infrastructure and hence assess more precisely the construction methods and costs. Frequent landslides near Whapmagoostui/Kuujjuarapik will also need to be thoroughly addressed in subsequent geotechnical studies to ensure users' safety.

The use of crushed granular material will be required to build this road. It should be noted that there are no active borrow pit leases and/or quarry leases along the length of the section. In fact, the only active mining leases are at the northern and southern ends of the section. At the north end, the nearest non-exclusive lease is owned by Kuujjuarapik and is located approximately 500 m north from the intersection between the new road and Rue Kanajuk. At the southern end, there are more exclusive and non-exclusive leases and the closest one is approximately 8.1 km west as the crow flies from station 000+000. Thus, new quarries and/or gravel pits will have to be identified and developed to build the road. Our preliminary design is based on quarries/borrow pits every 60 km. Please refer to Technical Note 10 for more detailed information.

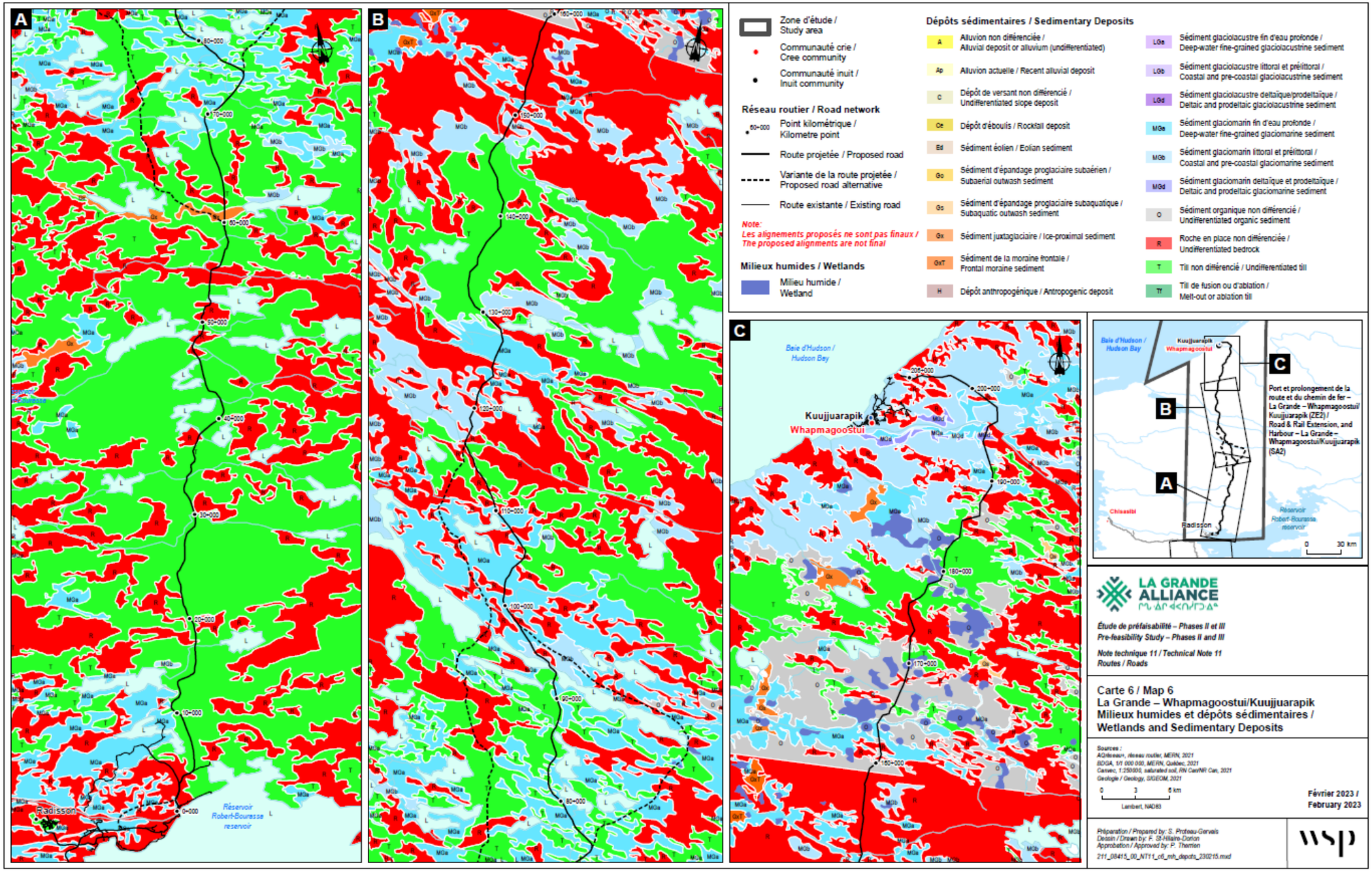


Figure 5-3 Roadway La Grande to Whapmagoostui/Kuujjuarapik - Wetlands and Sedimentary Deposits

5.2 ROADWORK DESCRIPTION

As shown on Figure 5-2, the proposed road begins as an extension of the existing Billy-Diamond Highway, north of the La Grande River (station 000+000), and ends 207 km northwards at the communities of Whapmagoostui and Kuujjuarapik. The proposed road alignment is broken down into segments for which more detailed information is provided in the next sections (see introductory section for explanation on station).

For the civil structure's details, please refer to Technical Note 14.

5.2.1 KM 0+000 TO KM 18+000

The proposed road alignment begins as an extension of the existing Billy-Diamond Highway. It uses the existing roads up to La Grande River spillway's deck on the Route de l'Évacuateur. As confirmed with HQ, the use of the spillway's deck is suitable for road traffic, this reduces the cost by eliminating the need for a new bridge to cross La Grande River. The 4.5 km will require an upgrade of the existing roads to address the foreseen traffic increase. Between km 7.5 and km 16.0, the proposed road alignment is sinuous to allow for the two major river crossings to be at their narrower point and thus limit the bridge length. There is a total of 4 civil structures required in this segment.

Impacted trapline: CH09.

Territory highlights:

- Hunting area for non-natives along the Route de l'Évacuateur (km 0 to km 4.5);
- Cultural camp at km 4.0;
- Inland waterway and a snowshoe trail at km 7.5;
- Opportunity for the proposed roadway to serve as an access road to the goose hunting area near km 12.0;
- Inland waterway and a snowshoe trail at km 15.5;
- Inland waterway at km 17.5.

5.2.2 KM 18+000 TO KM 37+000

Between km 18.0 and km 29.0, the proposed road alignment is sinuous to avoid waterbodies or to allow for their crossings to be at their narrower point and thus limit the bridge length. However, the alignment generally heads northwards. There is a total of 7 civil structures required in this segment and one of which is considered a major one.

For the next 2.0 km, the proposed road alignment is located between two caribou migration corridors. The proposed road alignment could also bypass them on the west side, but that would add approximately 10 km to the proposed road length. The shortest route has been retained for now, but this should be investigated more closely with the tallymen to identify the best option.

Impacted traplines: CH09 and CH10.

Territory highlights:

- Trapline CH10's entire territory is considered as a highly sensitive area (between km 29.0 and 37.0).
- Presence of two caribou migration corridors (between km 28.0 and 30.0).

5.2.3 KM 37+000 TO KM 58+000

Between km 37.0 and km 44.0, the proposed roadway alignment deviates eastwards to avoid a lake that is identified as a highly sensitive area for fishing and to cross the lake at its narrower point. If the second lake located east is confirmed as a highly sensitive area, a bypass could be required to avoid both lakes. This would add approximately 4.5 km to the proposed road length.

Hunting and fishing areas are crossed between km 46.5 and km 51.0, as trapline CH10's entire territory is considered as a highly sensitive area. The shortest route has been retained for now, but this should be investigated more closely with the tallymen to identify if a bypass eastward, with an additional 5.0 km in length, or westward, with an additional 8.5 km in length, would be more beneficial. Note that lakes near the fishing area are potentially considered also as HSA.

Following validation interviews (refer to Technical Note 17), the next lake between km 52.0 and km 53.0, is to be protected. That segment should therefore be optimized with an approximately 1.0 km bypass westward which would also result in one less bridge.

For the last 3.0 km, the proposed road alignment is sinuous to avoid waterbodies or to allow for their crossings to be at their narrower point and thus limit the bridge length.

There is a total of 8 civil structures required in this segment and three are considered major ones.

Impacted traplines: CH10 and CH11.

Territory highlights:

- Trapline CH10's entire territory is considered as a highly sensitive area (between km 29.0 and 55.0);
- Snowmobile trail crossed perpendicularly at km 39.0;
- Presence of fishing HSA between km 41.0 and km 42.5;
- Caribou hunting area between km 46.5 and km 51.0;
- Fishing area between km 48.5 and km 51.0;
- Presence of HSA lake between km 52.0 and km 53.0.

5.2.4 KM 58+000 TO KM 80+000

For the first 1.5 km, the proposed road alignment is sinuous to avoid waterbodies or to allow for their crossings to be at their narrower point to limit the bridge length.

Between km 59.5 and km 80.0, the roadway alignment is avoiding the *Réserve de territoire aux fins d'aire protégée du Lac-Burton-Rivière-Rogan-et-la-Pointe-Louis-XIV*. It remains north oriented until km 69.0, and then moves eastwards to avoid waterbodies or to allow for their crossings to be at their narrower point to limit the bridge length.

There is a total of 5 civil structures required in this segment.

Impacted traplines: CH11 and CH08.

Territory highlights:

- Snowmobile trail perpendicular crossing near km 80;
- Presence of HSA; the *Réserve de territoire aux fins d'aire protégée du Lac-Burton-Rivière-Rogan-et-la-Pointe-Louis-XIV*.

5.2.5 KM 80+000 TO KM 102+000

Between km 80.0 and km 91.5, the proposed road alignment is sinuous to avoid waterbodies or to allow for their crossings to be at their narrower point to limit the bridge length.

Between km 91.5 and km 98.0, the proposed alignment avoids the ptarmigan hunting area but crosses an HSA (lake and fishing area), a known spawning area and a bear hunting area. Alternatives were studied, as an eastwards bypass, but the impacts are similar except on different sensible areas, such as moose & ptarmigan hunting area and a known spawning area, while adding an extra 10 km to the proposed roadway length.

There is a total of 6 civil structures required in this segment and one is considered as a major one.

Impacted traplines: CH08, CH11 and CH12.

Territory highlights:

- HAS (lake and fishing area) crossed between km 91.5 and km 93.0;
- Known spawning area crossed between km 93.0 and km 93.5;
- Bear hunting area between km 93.0 and km 98.0.

5.2.6 KM 102+000 TO KM 122+000

Between km 102.0 and km 111.0, the proposed road alignment is sinuous to avoid waterbodies or to allow for their crossings to be at their narrower point to limit the bridge length.

It was noted, during the validation interviews (refer to Technical Note 17) that the proposed alignment impacts a beaver trapping area between km 111.0 and km 117.0 and crosses a caribou migration corridor around km 116.0. That segment should therefore be optimized with an approximately 2.0 km eastward detour to bypass the beaver trapping area and a 2.5 km deviation to remain parallel to the caribou migration corridor and avoid the crossing.

There is a total of 4 civil structures required in this segment and one is considered as a major one.

Impacted trapline: CH12 and CH07.

Territory highlights:

- Beaver trapping area between km 111.0 and km 117.0;
- Caribou migration corridor near km 116.0.

5.2.7 KM 122+000 TO KM 142+000

Between km 122.0 and km 127.0, the proposed road alignment is sinuous to avoid waterbodies or to allow for their crossings to be at their narrower point to limit the bridge length.

Between km 127.0 and km 134.0, the roadway alignment deviates westwards to avoid an HSA fishing area and to cross the lake at its narrower point. Two crossings occur near km 129.0 and 129.5, a caribou migration corridor and a significant First Nations path.

Then, the proposed alignment continues sinuously northwards/northwestwards until km 142.0 to avoid waterbodies or to allow for their crossings to be at their narrower point to limit the bridge length.

There is a total of 6 civil structures required in this segment and one is considered as a major one.

Impacted traplines: CH07, GW05 and GW20.

Territory highlights:

- Close to a highly sensitive fishing area at km 128.0;
- Caribou migration corridor near km 129.0;
- Significant First Nations path between km 129.0 and 129.5.

5.2.8 KM 142+000 TO KM 160+000

The proposed alignment continues sinuously northwards/northwestwards until km 160.0 to avoid waterbodies or to allow for their crossings to be at their narrower point to limit the bridge length.

The proposed alignment crosses an aquatic bird concentration area for diving ducks (km 149.5 to km 151.5) and crosses two porcupine habitat areas (km 142.5 to km 147.0 and km 152.2 to km 155.5). A snowmobile trail is perpendicularly crossed near km 158.0.

There is a total of 7 civil structures required in this segment.

Impacted traplines: GW20 and GW03.

Territory highlights:

- Porcupine habitat area crossed between km 142.5 and km 147.0;
- Aquatic bird concentration area for diving ducks between km 149.5 and km 151.5;
- Porcupine habitat area crossed between km 152.5 and km 155.5;
- Snowmobile trail perpendicular crossing at km 158.0.

5.2.9 KM 160+000 TO KM 178+000

The proposed alignment continues sinuously northwards/northwestwards until km 160.0 to avoid waterbodies or to allow for their crossings to be at their narrower point to limit the bridge length.

The proposed alignment is in proximity with an Areas of Heritage Interest (AHI) near km 167.5, a deviation could be investigated more closely with the tallymen to identify if a greater clearance distance is deemed required. The proposed alignment crosses a quad trail and two snowmobile trails towards the end of this segment.

There is a total of 8 civil structures required in this segment and two are considered as major ones.

Impacted trapline: GW03.

Territory highlights:

- Areas of Heritage Interest (AHI) near km 167.5;
- Quad trail near km 176.0;
- Snowmobile trails at km 177.0 and km 177.5.

5.2.10 KM 178+000 TO KM 207+000

The proposed alignment continues sinuously northwards/northwestwards towards the proposed Great Whale bridge structure. The Great Whale River crossing requires a major structure considering the width and the depth of the river at the projected crossing. The proposed alignment ends at its junction to the Rue Kanajuk, approximately 450 m south of the intersection between the 33N05-6 gravel pit access road and the Rue Kanajuk.

Even though the alignment was determined in respect to the significant socio-environmental data compiled in Report 2, the vastness of the sensitive areas and the need to cross Great Whale River at a feasible location, the impacts are unavoidable in that segment. The proposed alignment crosses a canoe route, a dabbling duck area, two diving duck areas, an Important Bird Area (IBA), a golden eagle area, three caribou migration areas and a possible polar bear area.

There is a total of 8 civil structures required in this segment and two are considered as major ones.

Impacted traplines: GW03 and GW01.

Territory highlights:

- Canoe Route at km 179.5;
- Dabbling ducks area between km 184.5 and km 201.5;
- Diving ducks area between km 184.5 and km 190.0;
- Important Bird Area (IBA) between km 187.5 and km 193.5;
- Golden eagle area between km 190.5 and km 202.5;
- Caribou migration corridors near km 195.0, 196.5 and 197.5;
- Possible polar bear area between km 201.1 and km 205.5;
- Diving ducks area between km 203.0 and the end of the proposed alignment.

6 CONCLUSIONS AND ADDITIONAL CONSIDERATIONS

Based on the results of this Technical Note 11, we have determined that it is possible to develop both proposed road infrastructures that follow best technical practice, social-environmental design drivers and in addition, respect the following drivers:

- Respect, as much as possible, the natural site topography (mountains and plains);
- Consider the overall geology of the study area, including the locations of aggregate material deposits;
- Avoid, as much as possible, lakes and rivers; minimize the length of crossings and bridges where these are unavoidable;
- Avoid, as much as possible, existing and projected Protected Areas; minimize encroachment and/or provide mitigation measures where these are unavoidable;
- Minimize crossing and impacts on caribou migration corridors;
- Avoid, as much as possible, areas of cultural significance such as areas currently used by Cree land users, archeological sites, etc.; minimize encroachment and/or provide mitigation measures where these are unavoidable;
- Propose, wherever applicable, alignment variants that could offer added value, such as:
  - Locations that minimize environmental footprint;
  - Locations that minimize construction cost;
  - Locations that minimize the impacts on existing camps and facilities.

It is important to note that an important proportion of those proposed road infrastructures are planned in undeveloped areas. For these areas, we have identified additional processes to that further limit environmental risks impacts, with a view of accounting for the sensitivity of building new corridors in previously inaccessible areas (and entire regions), in line with the overall sustainable development objectives of the overall program which, it is hoped, will increase the overall social acceptability of these new corridors. Thus, for these areas tone of the main objectives of the goal of the Pre-Feasibility Study is to identify and propose alignments and locations that present the least risk, especially from the perspective of environmental sustainability and overall social acceptability of the proposed infrastructure.

Using the key drivers presented above, while at the same time respecting the related infrastructure retained Design Criteria, an alignment was developed first in plan, and then in profile. The design of any linear infrastructure is an iterative process to maximize the opportunities for improvement as more detailed information becomes available with the project development.

Therefore, the alignment presented at the Pre-Feasibility and Feasibility stage alignments do come with some is somewhat limited by the accuracy of information available at the time, as the collection of field data shall be carried out at future stage. As knowledge about fauna and flora is continuously evolving, the environmental factors and considerations will have to be updated at every step of the study. The environmental updates might result in the need for alignment correction/displacement to avoid sensible areas or mitigate the risks. Nevertheless, the various alignments presented in this report show on maps and figures on this mandate should be considered as potential corridors that require further optimization in the future steps.

As described in section 3.4, we recommend the use of MTQ road design standards (regional collector road) to ensure consistency in the construction of these roads and to facilitate their integration into the existing road network. We recommend that La Grande Alliance Implementation Committee asks the government to conclude a multiparty agreement on the financing of the construction, maintenance, and rehabilitation of these roads between HQ, MERN, the Société du Plan Nord, the Ministère des Finances du Québec, and the Secrétariat du Conseil du Trésor (SCT).

TECHNICAL NOTE 11 – ROADS

While it is recognized that building new corridors in previously inaccessible areas in the north needs to be done with extreme care for the environment and those who practice traditional activities in these areas, not to mention the uncertainty created by climate change and the potential social impacts of opening up the territory, we have nevertheless determined that it is possible to develop the proposed transportation infrastructures in a manner consistent with sustainable development.

APPENDIX

A MAP OF THE EXISTING ROAD NETWORK

Responsabilité du réseau routier Eeyou Istchee Baie-James: financière et entretien

Transports Québec

EEYOU ISTCHEE BAIE-JAMES

Baie James

Island Akimiski

Island Charlton

Kuujjuarapik

Whapmagoostui

Chisasibi

Radisson

Wemindji

Eastmain

Waskaganish

Nemaska

Rte Transtaïga

Route Transtaïga

Rte Sarcelle

Rte Muskeg

Rte EM1

Rte Billy Diamond
Note 1

Rte du Nord

Rte 19 900

Ch Campbell

Matagami

Joutel

Val-Paradis

Villebois

Beaucanton

La Sarre

Macamic

Amos

ROUYN-NORANDA

Malartic

Val-d'Or

Senneterre

Lebel-sur-Quévillon

Miquelon

Desmaraisville

Waswanipi

Chapais

Oujé-Bougoumou

Mistissini

Chibougamau

Obedjiwan

Saint-Félicien

Dolbeau-Mistassini

Route de la Baie-James

KM 518

KM 348

KM 258

KM 237

KM 553

167

169

109

111

113

101

386

397

393

N

LÉGENDE

Mine et projet

Mine Statut - Minéraux

- active, Nickel
- active, Or
- active, Zinc
- en développement, Diamant
- en développement, Fer
- en développement, Lithium
- en développement, Or
- en développement, Terres rares

Réseau routier principal [entretien]

- MTQ, Pavée [MTQ]
- MTQ, Gravelée [MTQ]
- MTQ, Gravelée [SDBJ]
- HQ, Pavée [SDBJ]
- HQ, Gravelée [HQ]
- HQ, Gravelée [SDBJ]
- Autre, Pavée
- Autre, Gravelée
- Chemin de fer opérationnel
- Chemin de fer démantelé

Région administrative

- Nord-du-Québec
- Limite provinciale
- 55e parallèle
- MTQ CS Chibougamau

Transport aérien

Infrastructure - Responsabilité financière

- Aéroport majeur - Transports Québec
- Aéroport majeur - Hydro-Québec
- Aéroport majeur - Conseil Cri / Municipilité
- Autre aéroport - Transports Québec
- Autre aéroport - Transports Canada
- Autre aéroport - Hydro-Québec
- Autre aéroport - Conseil Cri / Municipilité
- Autre aéroport - Autres
- Hydroaérodrome - Autres
- Héliport - Hydro-Québec
- Héliport - Autres

Équipements divers

- Centrale hydroélectrique

Territoires conventionnés (CBJNQ et CNEQ)

Note: Les terres de catégies III ne sont pas indiquées sur cette carte.

- CRI Catégorie I
- CRI Catégorie I - En attente des actes de confirmation officielle
- CRI Catégorie II
- CRI Catégorie II - En attente des actes de confirmation officielle
- CRI et INUIT Catégorie II
- INUIT Catégorie I
- INUIT Catégorie II

Projection conique conforme de Lambert (NAD 83)
DPPA, Mars 2021

Note 1: responsabilité financière partagée entre HQ et MTQ.

0 40 80 160 Km

APPENDIX

B JAMES BAY ROAD TRAFFIC DATA (2014 AND 2017)

Traffic characterization on James Bay Road, year 2014 [1]

Destination	Sites	Distance travelled on the James Bay Road	Heavy vehicles				Total heavy vehicles	Vans	Cars	Other vehicles					Other types of vehicles	Total number of vehicles
			Bunkers	Tankers	Semi-trailers	Trucks				Bus	Campers	Caravans	Motorcycles	Others		
Hydro-Québec	Sarcelle	394	5	4	31	14	54	27	5	0	3	0	0	0	3	89
	LG-3	544	2	5	66	13	86	148	4	0	3	0	0	1	4	242
	LG-4	544	1	30	111	9	151	74	6	1	3	0	0	0	4	235
	LA-1	544	1	5	6	1	13	6	0	0	0	0	0	0	0	19
	LA-2	544	4	1	6	5	16	0	0	0	0	0	0	0	0	16
	Brisay	544	4	9	70	1	84	19	0	0	0	0	1	0	1	104
	LG-2	620	17	132	941	40	1130	145	19	1	2	0	1	0	4	1298
	LG-1	660	0	3	23	2	28	10	0	0	0	0	0	0	0	38
	Total Hydro-Québec sites		34	189	1254	85	1562	429	34	2	11	0	2	1	16	2041
Cree communities	Wemindji	518	24	37	244	65	370	2615	136	22	0	0	0	1	23	3144
	Chisasibi	600	52	98	566	128	844	6630	673	23	3	0	15	3	44	8191
	Total Cree communities		76	135	810	193	1214	9245	809	45	3	0	15	4	67	11335
Goldcorp's Opinaca Mine	Mining site	394	366	627	1925	155	3073	442	11	6	0	0	0	0	6	3532
	Total Opinaca mine		366	627	1925	155	3073	442	11	6	0	0	0	0	6	3532
Town of Radisson	Radisson	620	43	111	256	150	560	1360	324	9	26	1	120	3	159	2403
	Total Radisson		43	111	256	150	560	1360	324	9	26	1	120	3	159	2403
Total traffic			519	1062	4245	583	6409	11476	1178	62	40	1	137	8	248	19311

(1): Traffic volume excluding traffic from the northern highway and traffic between communities north of km 6 information kiosk

Traffic characterization on James Bay Road, year 2017 [1]

Destination	Sites	Distance travelled on the James Bay Road	Heavy vehicles				Total heavy vehicles	Vans	Cars	Other vehicles					Other types of vehicles	Total number of vehicles
			Bunkers	Tankers	Semi-trailers	Trucks				Bus	Campers	Caravans	Motorcycles	Others		
Hydro-Québec	Sarcelle	394	0	0	2	6	8	1	0	0	3	0	0	0	1	10
	LG-3	544	22	6	64	6	98	104	1	0	3	0	0	1	3	206
	LG-4	544	29	22	103	19	173	87	3	1	3	0	0	0	1	264
	LA-1	544	7	1	6	0	14	7	0	0	0	0	0	0	0	21
	LA-2	544	2	0	7	0	9	6	0	0	0	0	0	0	0	15
	Brisay	544	1	2	52	2	57	23	0	0	0	0	1	0	2	82
	LG-2	620	35	151	943	25	1154	91	1	1	2	0	1	0	4	1250
	LG-1	660	1	0	11	2	14	5	0	0	0	0	0	0	0	19
	Total Hydro-Québec sites		97	182	1188	60	1527	324	5	2	11	0	2	1	11	1867
Cree communities	Wemindji	518	41	26	280	32	379	2361	84						16	2840
	Chisasibi	600	70	97	557	107	831	6549	451						127	7958
	Total Cree communities		111	123	837	139	1210	8910	535	0	0	0	0	0	143	10798
Goldcorp's Opinaca Mine	Mining site	394	389	964	1086	49	2488	197	4						14	2703
	Total Opinaca mine		389	964	1086	49	2488	197	4	0	0	0	0	0	14	2703
Town of Radisson	Radisson	620	93	123	269	122	607	1135	150						140	2032
	Total Radisson		93	123	269	122	607	1135	150	0	0	0	0	0	140	2032
Total traffic			690	1392	3380	370	5832	10566	694	2	11	0	2	1	308	17400

(1): Traffic volume excluding traffic from the northern highway and traffic between communities north of km 6 information kiosk

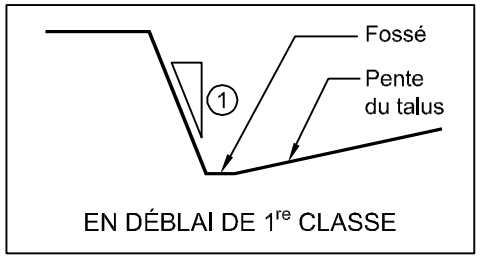
Users' profile

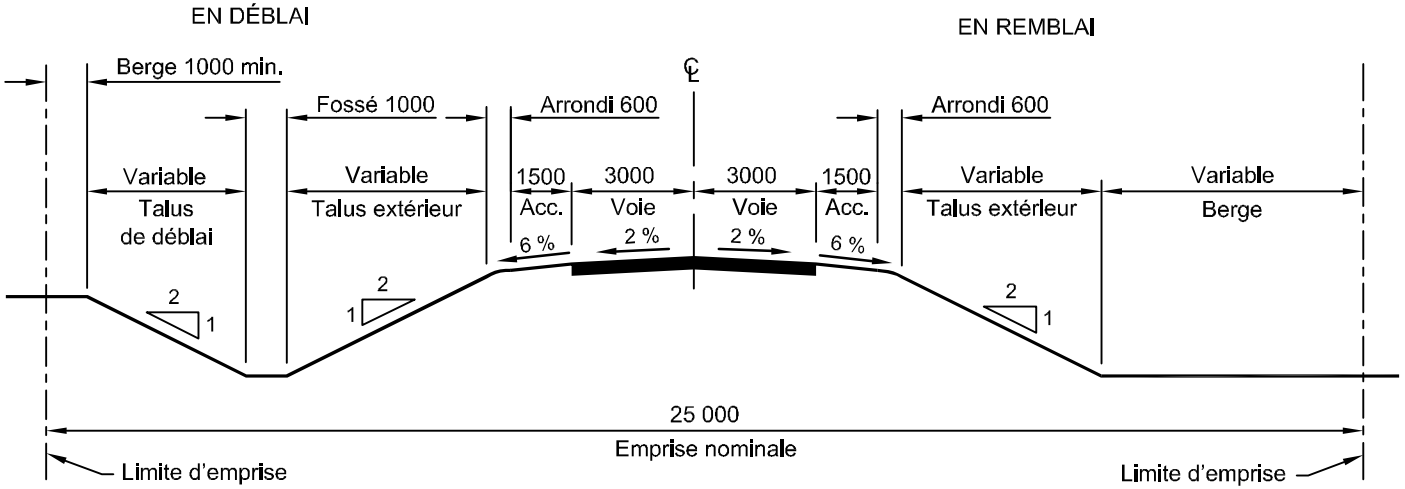
	Year 2014	Year 2017	Year 2014	Year 2017	Year 2014	Year 2017	Year 2014	Year 2017	Year 2014	Year 2017	Year 2014	Year 2017
Industrial users												
Hydro-Québec	1562	1527	463	329	16	11	2041	1867	10,6%	10,7%	8,1%	8,8%
Éléonore mine	3073	2488	453	201	6	14	3532	2703	18,3%	15,5%	15,9%	14,3%
Total Industrial Users	**4635**	**4015**	**916**	**530**	**22**	**25**	**5573**	**4570**	**28,9%**	**26,3%**	**24,0%**	**23,1%**
Local communities												
Town of Radisson	560	607	1684	1285	159	140	2403	2032	12,4%	11,7%	2,9%	3,5%
Cree communities	1214	1210	10054	9445	67	143	11335	10798	58,7%	62,1%	6,3%	7,0%
Total local communities	**1774**	**1817**	**11738**	**10730**	**226**	**283**	**13738**	**12830**	**71,1%**	**73,7%**	**9,2%**	**10,4%**
TOTAL	**6409**	**5832**	**12654**	**11260**	**248**	**308**	**19311**	**17400**	**100,0%**	**100,0%**	**33,2%**	**33,5%**

APPENDIX

C MTQ STANDARD DRAWING – RURAL CROSS-SECTION (TYPE E)

ROUTE RÉGIONALE : DJMA < 500
ROUTE COLLECTRICE OU LOCALE : DJMA 500 – 2000





TYPE E : ROUTE RÉGIONALE – COLLECTRICE OU LOCALE

① Pour les déblais de 1re classe, se référer au *Tome II – Construction routière*, chapitre 1 « Terrassement ».

Notes :

- la nécessité d'un dispositif de retenue et, le cas échéant, la surlargeur de l'accotement doivent être évaluées en fonction des critères énoncés au *Tome VIII – Dispositifs de retenue*;
- les cotes sont en millimètres.

Transports, Mobilité durable et Électrification des transports
Québec

NORME

DESSIN NORMALISÉ

PROFIL EN TRAVERS EN MILIEU RURAL (TYPE E)

Tome	Chapitre	Page	Date
I	5	005	2016 06 15

APPENDIX

D

PROTECTED ZONES DETAILED LIST

APPENDIX D

Biological and environmental elements

- Golden Eagles and Peregrine Falcon breeding habitats
- Nesting waterfowl summer abundance and distribution
- Diving ducks summer abundance and distributions
- Dabbling ducks summer abundance and distributions
- Polar bears – Dens, track, interaction
- Polar bears - Migration route
- Polar bears -Dens and sightings
- Computerized database of Québec Seabirds (CDQS)
- Bird corridors
- Bird Conservation regions (Land and marine)
- Migratory birds
- Occurrence of rare wildlife species (CDPNQ-Faune)
- Occurrence of rare plant species (CDPNQ-Flore)
- Important birds Area (IBA-ZICO)
- Caribou occurrence
- Fish species (fishing station)
- Protected area
- Watershed
- Caribou recovery plan area
- Woodland caribou habitat quality index

Human aspect elements

- Outfitter's area of operation
- Outfitter Camp
- Dike and barrage
- Cree trapeline
- Archaeological ressources – cultural affiliation
- Archaeological ressources – periods
- Archaeological ressources – site integrity

Elements related to the physical considerations of location links

- Projected pit borrow (2013 Poly-géo)
- Borehole
- Borrow pits (GESTIM)
- Existing Pit borrow
- Permafrost (Distribition, Thermkarst, thickness, temperature)
- SigeOM_WMS

APPENDIX D

Elements related to the use of the territory by the Cree communities

- Cree camps and camps areas
- Valued sites and valued areas
- Cultural sites and cultural areas
- Harvesting activities – huntinf and fishing (site and areas)
- Harvesting activities – spring water sources
- Harvesting activities – berry picking, plant or wood gathering, spring water source
- Airplance landing site
- Snowmobile trail
- 4 wheeler trail
- Boat landing
- Snowshoe or dogslide trails
- Navigation route
- Partages
- Springs water sources
- Bird migration corridor
- Bird resting area
- Mammal trails
- Caribou migration corridor
- Observed mammals (site and area)
- Spawning ground site and area
- Fish habitat area
- Burn area
- Non cree – outfitting camps
- Non cree – other building
- Hunting and fishing area
- Minig site
- quarry

APPENDIX

E MEETING MINUTE

Enquête avec expéditeurs

Société de développement crie

Étude de faisabilité, Phase I – Infrastructures de transport
La Grande Alliance

Ce compte-rendu est transmis en version préliminaire. Veuillez transmettre au soussigné tout commentaire, modification, correction ou ajout, avant le 16 novembre 2022. Une version définitive sera émise après cette échéance.

CONFIDENTIEL *Nous vous remercions de votre participation à cet entretien, qui est fort utile à notre étude. Veuillez noter que son contenu et celui de toute autre discussion de suivi, demeurent strictement confidentiels. Vous avez notre engagement que toutes les informations partagées avec nous resteront confidentielles, car seules des données agrégées seront partagées avec notre client, sauf si vous consentez à leur divulgation. Veuillez indiquer de manière globale ou spécifique les éléments d'information qui pourraient être communiqués à notre Client ou apparaître dans les documents finals, lesquels peuvent faire l'objet de diffusion publique.*

Client :	Société de développement crie			**Référence du Client :**	2020-01
Projet :	**Étude de faisabilité, Phase I – Infrastructures de transport, La Grande Alliance**				
Sous-projet :	**Étude de marché**				
Catégorie :	Enquête avec expéditeurs			**Réunion nº :**	A07
Objet :	***Présentation du mandat d'études d'infrastructures de transport de la Grande Alliance et discussion sur les besoins de Stornoway***				
Date de réunion :	2022-10-20	**Heure :**	De 15 h à 16 h (HAE)	**Référence SYSTRA Canada :**	21009-PCMM-0013_A
Date d'édition :	2022-11-02	**Rédigé par :**	Michel SIMARD	**Nb de pages :**	3

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Discussions, décisions et actions à prendre

Article	Discussions / décisions	Action : Responsable / échéance	
1	**Présentation du mandat d'étude et du programme de la Grande Alliance** M. Simard décrit le mandat d'étude de faisabilité/préfaisabilité des infrastructures de transport du programme de la Grande Alliance, de même que les projets d'infrastructures de transport et le phasage du programme de la Grande Alliance.	.	
2 ***2.1***	**Activités de transport de Stornoway** ***Approvisionnement en carburant et biens*** N'étant pas desservie par une ligne de distribution d'Hydro-Québec, la mine de Stornoway doit s'approvisionner en gaz naturel liquide pour produire l'électricité requise aux activités minières. Ce gaz est acheminé par camion. Le gaz naturel est livré à raison d'un camion par jour. Les produits pétroliers représentent un volume de 60 camions par mois en provenance de Québec (gaz naturel liquide) ou du dépôt de Chibougamau. Les intrants de béton sont transportés par camion. Le transport des pièces engendre un volume de 10 camions par semaine.		

2.2	***Déplacements du personnel*** L'horaire de travail est structuré sur une base 14-14 pour les employés et 7-7 pour les cadres. Stornoway dispose d'une piste d'atterrissage. La navette des employés est assurée par un vol le lundi (Saint-Hubert – Québec – Chibougamau) et deux vols le mardi et deux vols le jeudi (un vol de Saint-Hubert - Québec et un vol de Val-d'Or – Chibougamau). L'entreprise a aussi recours à des vols supplémentaires selon la demande.		
3	**Problématique de transport de Stornoway**		
3.1	***Surcharge sur le carburant*** Les coûts de transport par camion de Stornoway connaissent une forte hausse en raison de la hausse de la surcharge sur le carburant qui était de 35 % et maintenant de 73 %. Cela peut représenter un coût de 2 700 $ par expédition par camion. Un transfert modal au moins partiel vers le transport ferroviaire permettrait une réduction de coût à l'entreprise.		
3.2	***Condition et entretien de la route 167*** L'entretien et le déneigement de la route 167 sous la responsabilité du ministère des Transports du Québec entre Chibougamau et le début du tronçon de Stornoway est inadéquat et est source d'insécurité pour les mouvements de camions, le conducteur distinguant difficilement la plateforme et la rive de la route, pouvant occasionner des sorties de route. De plus, des débris métalliques se détachent des véhicules ou autres et jonchent la chaussée. On suggère d'équiper les chasse-neiges d'aimants pour enlever ces débris. Les problèmes surviennent surtout aux PK 304-352, 342-385, 500-540. De manière générale, la condition de la route 167 est en deçà de ce qui se fait sur la route Billy-Diamond. Ces conditions amènent des chauffeurs de camion de la région à ne pas vouloir emprunter la route 167. L'octroi d'une partie la prestation de transport a ainsi été octroyée à une entreprise à Québec plutôt qu'une entreprise dans la région, notamment en raison de manque de chauffeurs en raison de la réputation de la route 167 mais aussi du plus faible bassin de main-d'œuvre. Une partie du transport de biens se fait pour Gestion ADC par Kepa Transport, une coentreprise crie.		
2.3	***Déplacements aériens*** Les vols nolisés expressément par l'entreprise n'assurent pas pleinement la souplesse ou la fréquence des déplacements pour des besoins de quelques employés. Des services aériens multi-utilisateurs (employeurs) ou de lignes commerciales à des fins partiellement privées/nolisées pourraient répondre à ce besoin.		
3	**Alimentation électrique** La technique de production électrique actuelle ajoutée au transport par camion résulte en une grande émission de polluants. De plus, l'entreprise encourt des taxes de carbone en conséquence. Hydro-Québec aurait dit planifier la construction de cette ligne d'ici 5 ans [2027]. Le prolongement la route 167 plus au nord faciliterait le passage d'une nouvelle ligne électrique pour alimenter la mine.		
4	**Retombées économiques régionales**		
4.1	***Main-d'œuvre*** L'entreprise suit l'ordre de priorité suivant dans l'embauche de personnel : 1. Mistissini ; 2. Autres collectivités cries ; 3. Chibougamau Chapais ; 4. Autres collectivités jamésiennes. L'entreprise met en place des programmes d'accompagnement et d'apprentissage notamment du français. Toutefois, le manque de main-d'œuvre oblige à élargir de plus en plus le bassin géographique. Sur environ 500 employés, la mine emploie des gens d'Eeyou Istchee Baie-James dans une proportion de 20 %, soit 36 Cris, 54 Chibougamois, 13 Chapaisiens et 17 du reste de la région. Les employés de l'extérieur proviennent surtout d'Abitibi ou en transit de Québec.		

4.2	***Politique d'achat régional*** L'entreprise favorise la priorité d'achat local, notamment auprès d'entreprises ou coentreprises cries ou de Chibougamau-Chapais. Les achats régionaux représentent une dépense de l'ordre de 7-8 M$ sur une période de huit mois.		
5	**Conditions futures**		
5.1	***Durée de vie de la mine*** La durée de vie de la mine estimée à ce jour est jusqu'en 2028. Une réévaluation des réserves à publier à la fin octobre 2022 pourrait indiquer un prolongement de la durée de vie jusqu'en 2033.		
5.2	***Volumes futurs*** Les volumes existants devraient se maintenir de manière relativement constante pour les années futures d'exploitation de la mine.		

Documents annexés

Aucun	-

APPENDIX

F

ROAD STRUCTURES

Stations		Road Structure Type
From	To	
000+000	000+450	Bedrock
000+450	000+924	Average Bearing Capacity Soils
000+924	004+061	Bedrock
004+061	006+474	Average Bearing Capacity Soils
006+474	006+571	Low Bearing Capacity Soils
006+571	009+966	Average Bearing Capacity Soils
009+966	010+198	Low Bearing Capacity Soils
010+198	036+425	Average Bearing Capacity Soils
036+425	037+446	Bedrock
037+446	046+003	Average Bearing Capacity Soils
046+003	047+278	Bedrock
047+278	047+331	Average Bearing Capacity Soils
047+331	048+820	Bedrock
048+820	049+508	Average Bearing Capacity Soils
049+508	050+612	Bedrock
050+612	050+796	Average Bearing Capacity Soils
050+796	051+614	Bedrock
051+614	053+231	Average Bearing Capacity Soils
053+231	054+347	Bedrock
054+347	054+474	Average Bearing Capacity Soils
054+474	055+250	Bedrock
055+250	066+646	Average Bearing Capacity Soils
066+646	071+138	Bedrock
071+138	075+060	Average Bearing Capacity Soils
075+060	075+896	Bedrock
075+896	082+370	Average Bearing Capacity Soils
082+370	085+088	Bedrock
085+088	086+080	Average Bearing Capacity Soils
086+080	086+225	Low Bearing Capacity Soils
086+225	087+453	Average Bearing Capacity Soils
087+453	089+267	Bedrock
089+267	093+857	Average Bearing Capacity Soils
093+857	094+743	Bedrock
094+743	094+986	Average Bearing Capacity Soils
094+986	095+786	Bedrock
095+786	097+076	Average Bearing Capacity Soils
097+076	097+345	Bedrock
097+345	099+103	Average Bearing Capacity Soils
099+103	099+404	Bedrock
099+404	100+062	Average Bearing Capacity Soils
100+062	101+040	Bedrock
101+040	101+806	Average Bearing Capacity Soils
101+806	102+949	Bedrock

Stations		Road Structure Type
From	To	
102+949	103+635	Average Bearing Capacity Soils
103+635	104+088	Bedrock
104+088	105+100	Average Bearing Capacity Soils
105+100	105+320	Bedrock
105+320	105+716	Average Bearing Capacity Soils
105+716	105+874	Bedrock
105+874	106+316	Average Bearing Capacity Soils
106+316	106+453	Bedrock
106+453	107+265	Average Bearing Capacity Soils
107+265	107+508	Bedrock
107+508	107+931	Average Bearing Capacity Soils
107+931	109+465	Bedrock
109+465	109+744	Average Bearing Capacity Soils
109+744	110+346	Bedrock
110+346	111+512	Average Bearing Capacity Soils
111+512	111+834	Bedrock
111+834	112+089	Average Bearing Capacity Soils
112+089	112+381	Bedrock
112+381	112+794	Average Bearing Capacity Soils
112+794	113+714	Bedrock
113+714	113+815	Average Bearing Capacity Soils
113+815	114+250	Bedrock
114+250	114+631	Average Bearing Capacity Soils
114+631	114+850	Bedrock
114+850	115+198	Average Bearing Capacity Soils
115+198	115+319	Low Bearing Capacity Soils
115+319	116+856	Average Bearing Capacity Soils
116+856	117+832	Bedrock
117+832	118+023	Average Bearing Capacity Soils
118+023	118+196	Bedrock
118+196	118+664	Average Bearing Capacity Soils
118+664	119+789	Bedrock
119+789	120+311	Average Bearing Capacity Soils
120+311	120+510	Bedrock
120+510	120+817	Average Bearing Capacity Soils
120+817	121+772	Bedrock
121+772	124+358	Average Bearing Capacity Soils
124+358	124+525	Bedrock
124+525	124+739	Average Bearing Capacity Soils
124+739	126+297	Bedrock
126+297	128+073	Average Bearing Capacity Soils
128+073	128+180	Low Bearing Capacity Soils
128+180	144+714	Average Bearing Capacity Soils

Stations		Road Structure Type
From	To	
144+714	145+292	Bedrock
145+292	145+530	Average Bearing Capacity Soils
145+530	145+693	Bedrock
145+693	146+395	Average Bearing Capacity Soils
146+395	147+439	Bedrock
147+439	148+143	Average Bearing Capacity Soils
148+143	149+627	Bedrock
149+627	149+904	Average Bearing Capacity Soils
149+904	150+103	Bedrock
150+103	150+536	Average Bearing Capacity Soils
150+536	151+392	Bedrock
151+392	151+493	Low Bearing Capacity Soils
151+493	154+173	Bedrock
154+173	154+586	Average Bearing Capacity Soils
154+586	159+087	Bedrock
159+087	159+282	Average Bearing Capacity Soils
159+282	159+484	Bedrock
159+484	160+010	Average Bearing Capacity Soils
160+010	160+113	Low Bearing Capacity Soils
160+113	161+241	Average Bearing Capacity Soils
161+241	161+342	Low Bearing Capacity Soils
161+342	162+178	Average Bearing Capacity Soils
162+178	162+294	Low Bearing Capacity Soils
162+294	162+821	Average Bearing Capacity Soils
162+821	162+961	Low Bearing Capacity Soils
162+961	163+291	Average Bearing Capacity Soils
163+291	163+410	Low Bearing Capacity Soils
163+410	165+189	Average Bearing Capacity Soils
165+189	165+503	Bedrock
165+503	165+672	Low Bearing Capacity Soils
165+672	166+304	Average Bearing Capacity Soils
166+304	171+757	Bedrock
171+757	173+247	Average Bearing Capacity Soils
173+247	173+511	Low Bearing Capacity Soils
173+511	175+265	Average Bearing Capacity Soils
175+265	175+417	Low Bearing Capacity Soils
175+417	175+800	Average Bearing Capacity Soils
175+800	175+872	Bedrock
175+872	176+459	Average Bearing Capacity Soils
176+459	176+525	Bedrock
176+525	176+787	Average Bearing Capacity Soils
176+787	178+418	Bedrock
178+418	181+330	Average Bearing Capacity Soils

Stations		Road Structure Type
From	To	
181+330	182+035	Bedrock
182+035	184+078	Average Bearing Capacity Soils
184+078	184+396	Low Bearing Capacity Soils
184+396	185+073	Bedrock
185+073	185+178	Average Bearing Capacity Soils
185+178	185+428	Bedrock
185+428	185+771	Average Bearing Capacity Soils
185+771	185+883	Low Bearing Capacity Soils
185+883	186+087	Average Bearing Capacity Soils
186+087	186+276	Bedrock
186+276	187+088	Average Bearing Capacity Soils
187+088	190+129	Low Bearing Capacity Soils
190+129	191+265	Average Bearing Capacity Soils
191+265	191+783	Bedrock
191+783	191+838	Average Bearing Capacity Soils
191+838	193+768	Bedrock
193+768	194+316	Average Bearing Capacity Soils
194+316	195+029	Bedrock
195+029	195+290	Average Bearing Capacity Soils
195+290	195+539	Bedrock
195+539	195+962	Average Bearing Capacity Soils
195+962	196+552	Bedrock
196+552	197+065	Average Bearing Capacity Soils
197+065	202+593	Bedrock
202+593	202+927	Average Bearing Capacity Soils