



LA GRANDE ALLIANCE

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

TECHNICAL NOTE 17

PERFORMANCE EVALUATION

FINAL VERSION

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PREPARED BY:

J. Walter

Paul Wattez, Ph.D.

Antropologist Human environment and
Indigenous relation advisor

EXECUTIVE SUMMARY

As mentioned in Technical Note 3, La Grande Alliance's specific innovative approach has involved consultations with the land users prior to the preliminary design phase. All the human and environmental information and constraints gathered through the engagement process was considered in the development of the proposed infrastructure alignments to respect, as much as possible, the territory (refer to Report 3) and thus propose optimal technical design concepts.

The objective of this Technical Note is to document the Social-Environmental impacts induced by each of the proposed La Grande Alliance infrastructure components. These analyses provide different indicators to guide the client decision process. Those indicators include:

- A summary of the impacts on the territory and documentation of the discussions with Cree land users to collect their feedback regarding the proposed technical alignments;
- A summary of the proposed infrastructures alignment environmental impacts on the territory, including proposed recommendations;
- A summary of the proposed infrastructures alignment archeological impacts on the territory, including proposed recommendations;
- A summary of the concerns for the preservation of the Cree culture.

ROUTE 167: UPGRADE & EXTENSION TO TRANS-TAIGA

Users are generally satisfied with the proposed route, which would allow them to access the territory more easily. Some are planning to build camps along the proposed road. The overexploitation of resources in connection with the opening of the territory remains a concern. Users expect to benefit from economic opportunities and that the environment will be preserved as much as possible.

The great sinuosity of the preliminary route reflects the effort devoted to avoid the many on lakes the territory. The presence of a projected Biodiversity Reserve and two Land Reserves as Protected Areas are other elements avoided by the designed route. Finally, due to the presence of three herds of woodland caribou, the alignment is in the western half of the Study Area to minimize the impact on this species.

Six heritage sites are reported for SA3, on Chisasibi hunting grounds. They are limited to its north-western corner, on lac Des Voeux, 6 km north of the Trans-Taiga Road. All date back to the 20th century. This territory has been the object of very limited research, hence this low number of sites. No Area of Heritage Interest (AHI) was identified within that area.

RAILWAY: RUPERT TO LA GRANDE

Some of the users met did suggest minor or major variants to the proposed alignment. Some wanted to be better informed of the potential impacts, and had concerns about wildlife, water, the pursuit of their harvesting activities and their health. They would be more inclined to support the project if there were tangible benefits. Others are against the proposed infrastructure.

To minimize the impacts on the territory (avoiding as much as possible the large rivers, spawning grounds, abundant wetlands, numerous protected areas, as well as caribou herds (woodland to the south and migratory to the north), it was a mandatory requirement that the proposed railroad alignment shall be as close as possible to the Billy-Diamond Highway (BDH). As described in Technical Note 12, this was achieved for most of the overall length (70%). The remaining 30% which is not within 100 meters from the BDH is due to the railway design criteria that do not allow the railway to follow the highway curves.

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La Grande Alliance proposed Railway Corridor for Phase II counts with 35 Heritage Sites, out of which 28 have moderate to high value. All sites are affiliated to the Crees and their ancestors. They are located on Wemindji hunting grounds, except for three sites pertaining to Eastmain, Waskaganish, and Nemaska territories. Four Areas of Heritage Interest (AHI) of small superficies have been defined. All are associated to Wemindji hunting territories.

ROAD AND RAILWAY EXTENSION: LA GRANDE TO WHAPMAGOOSTUI/KUJJUARAPIK

In Whapmagoostui, the users of the traplines met are in favour of the project, although some concerns were raised. In Chisasibi, some objections were expressed, and alternatives were suggested.

The presence of several very elongated lakes is a particularity of this study area, implying a relatively sinuous projected road alignment. In addition, due to the large number of wetlands, encroachments are inevitable. Protected Areas are avoided. Only migratory caribous, which are less vulnerable to the project than woodland caribou, frequent the Study Area. However, concerns have been raised regarding the disturbance of migratory species' migration routes by the infrastructures.

The corridor of the proposed extension of the Railway and Roadway is heritage-rich, with 102 sites out of which 87 have a moderate to high heritage value. All sites attest to the Indigenous occupation of the territory, including Inuit, Paleoindian, Crees and their ancestors. Many sites have only been cursorily investigated so that their exact cultural affiliation remains uncertain. Sixty-six are located within Whapmagoostui hunting territories and 36 are on Chisasibi hunting grounds. Six Areas of Heritage Interest (AHI) have been defined within SA2. CHI01 is the only AHI within the Chisasibi territory, with two neighbouring paleohistorical sites (0.1 km²). The other five are in Whapmagoostui territory.

From a general perspective, the study area bears considerable interest regarding Indigenous occupation, with the Crees and their ancestors having occupied the whole study area, and the Inuit and Paleoindian its northern end. Traces of their presence concentrate along main rivers and lakes, and close to travelling routes and resources that could sustain their way of life, such as game, fish, plants, minerals, and stones.

HARBOUR IN WHAPMAGOOSTUI/KUJJUARAPIK

The preferred option for the port was defined following interviews with the land users, who generally felt that the more northerly options were the most appropriate, although goose hunting and other harvesting are practised in the spring and fall. Additional consultations with the Crees and Inuit would allow for a better definition of the harvesting and specificities of this sector.

According to the available information, the selected site is outside of the important zones, in particular zones for belugas, polar bears, and migratory birds. No Conservation or Protected Areas are located nearby. Despite the presence of some valued natural components, the selected site seems to offer several advantages from a technical and environmental point of view.

Available data regarding possible maritime heritage are scant. Since maritime heritage sites can be expected near areas of higher traffic where two major trade posts were established and where human groups gathered, the Great Whale and Little Whale rivers estuaries are areas of high potential. Special care for documenting possible underwater and maritime heritage should thus be taken there if the development of the proposed harbour is deemed valuable by the communities.

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GENERAL RECOMMENDATIONS

If the proposed infrastructures (all or separately) are deemed valuable by the communities, it would be important to:

- 1 Engage with the Inuit to consult their stakeholders and review the existing documentation regarding them;
- 2 Maintain a Cree liaison team made of the CIO of each Cree community and a Cree liaison officer within the consultation team, and other local Cree associate(s). This format guarantees that the engagement activities of the Cree are led by Crees, meaning that the interviews are conducted in Cree and translated into English to the consultant's anthropologist in a second time, for the note taking;
- 3 Promote, as much as possible, the ownership of the proposed infrastructures (construction and operation) by the Crees, and to a lesser extent the other First Nations and the Inuit;
- 4 Carry out a Health Impact Assessment [HIA] to determine mitigation and improvement measures specific to the health of the communities with a gender-differentiated, intersectional analysis approach (GDA+) to understand the differentiated impact on different groups such as youth, women, hunter-trappers, workers, etc.
- 5 Continue to engage with the Cree land users and both Cree and Jamesian stakeholders to identify detailed localized mitigation measures that could be implemented to protect as much as possible the integrity of the harvesting areas and the Highly Sensitive Areas (HSAs) and/or to alleviate the impacts on the territory;
- 6 Further environmental studies are required to:
 - a Validate the presence of woodland caribou wintering areas;
 - b Determine more precisely the location of wetlands for the pre-feasibility infrastructures components;
- 7 It is recommended to meet with the responsible authorities (MELCC) to clarify their requirements in relation to compensation for the loss of wetlands in the context where the compensation regime for the loss of wetlands and water bodies does not apply to the James Bay territory under the *Regulation respecting compensation for adverse effects on wetlands and bodies of water*;
- 8 In terms of protected areas, discussions will be recommended in the short term with government authorities to ensure that the various components of the proposed infrastructures are compatible with the proposed protected areas;
- 9 The change in land category (from II to III) caused by the presence of transportation infrastructure should be considered;
- 10 Further archaeological studies and field surveys are required considering that the extent of research is uneven across this vast territory. Research thus remains insufficient to accurately define the limits of the sensitive areas and more accurate data may help propose more specific recommendations;
- 11 Harbour:
 - a Special care for documenting possible underwater and maritime heritage should be taken for the Great Whale and Little Whale rivers estuaries, if the development of the proposed harbour is deemed valuable by the communities;
 - b Given that the majority of the available information is over 20 years old, additional field environmental studies will be required to confirm if the proposed location is an important habitat, for example for capelin reproduction (a sensitive element) or if the proposed infrastructure does not cause significant changes in a valued habitat located nearby such as seagrass, shoreline peatland, flora species or coastal habitat.

ADDITIONAL CONSIDERATION – PRESERVATION OF CREE CULTURE

This subject, which represents a major concern for the Crees, was frequently addressed during the engagement of the communities within the framework of the La Grande Alliance studies, since the territory, the culture and the Cree traditional knowledge are intrinsically linked. A specific engagement on this subject, involving the participation of Cree experts, is recommended to identify the right means to secure the preservation of Cree culture.

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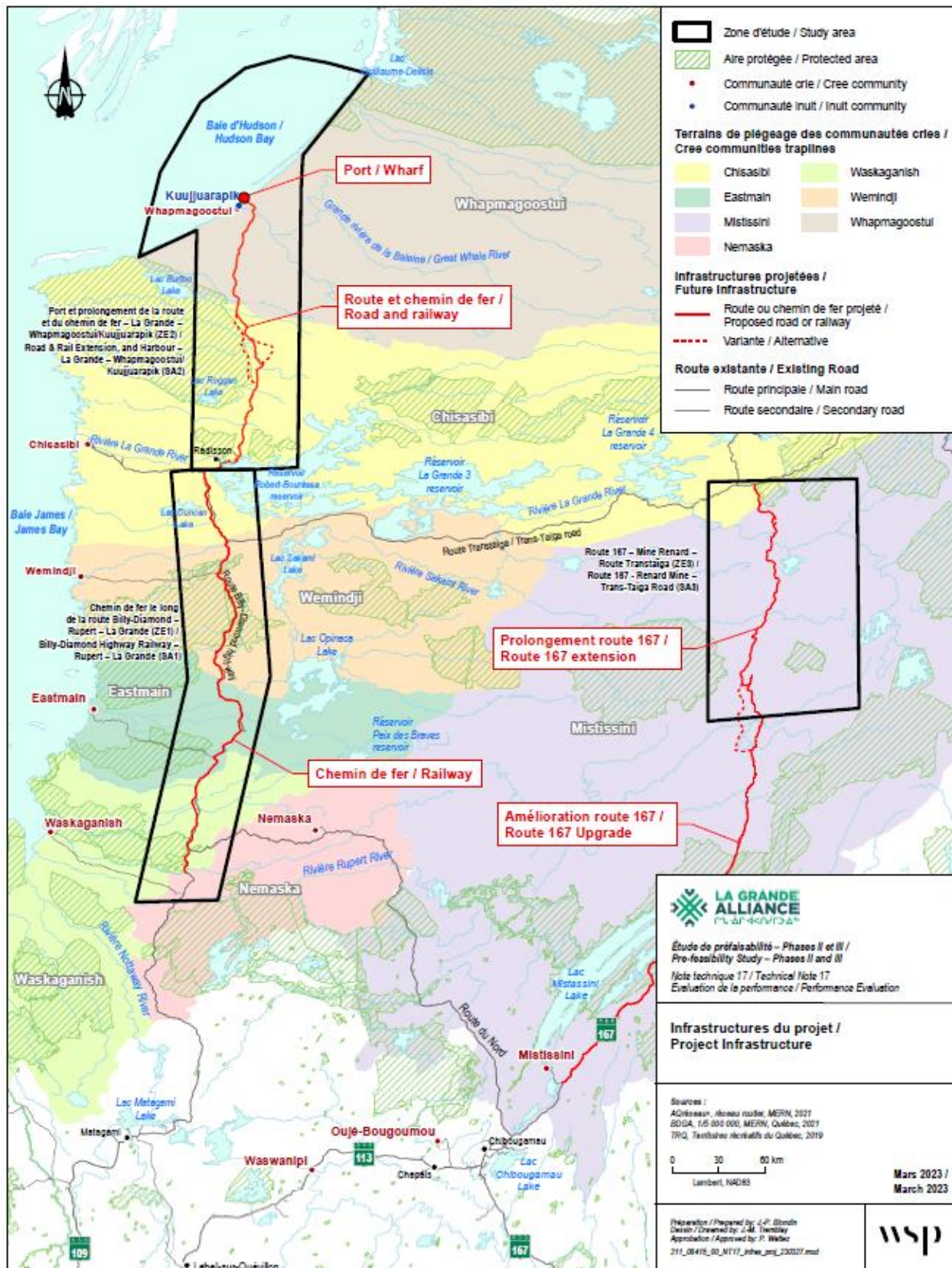


Figure Map of La Grande Alliance Phases II and III Proposed Infrastructures

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1 INTRODUCTION

As mentioned in Technical Note 3, La Grande Alliance's specific innovative approach has involved engagement of the Cree land users prior to the preliminary design phase. All the human and environmental information and constraints gathered through the engagement process was considered prior to the development of the proposed infrastructure alignments to respect, as much as possible, the territory (refer to Report 3) and thus propose optimal technical design concepts. Refer to Figure 1-1 for conceptual alignments.

The objective of this Technical Note is to document the Social-Environmental impacts induced by each of the La Grande Alliance proposed infrastructure components. These analyses provide different indicators to guide the client decision process. Those indicators include:

- A Summary of the impacts on the territory and documentation of the discussions held with Cree land users to collect their feedback regarding the proposed technical alignments;
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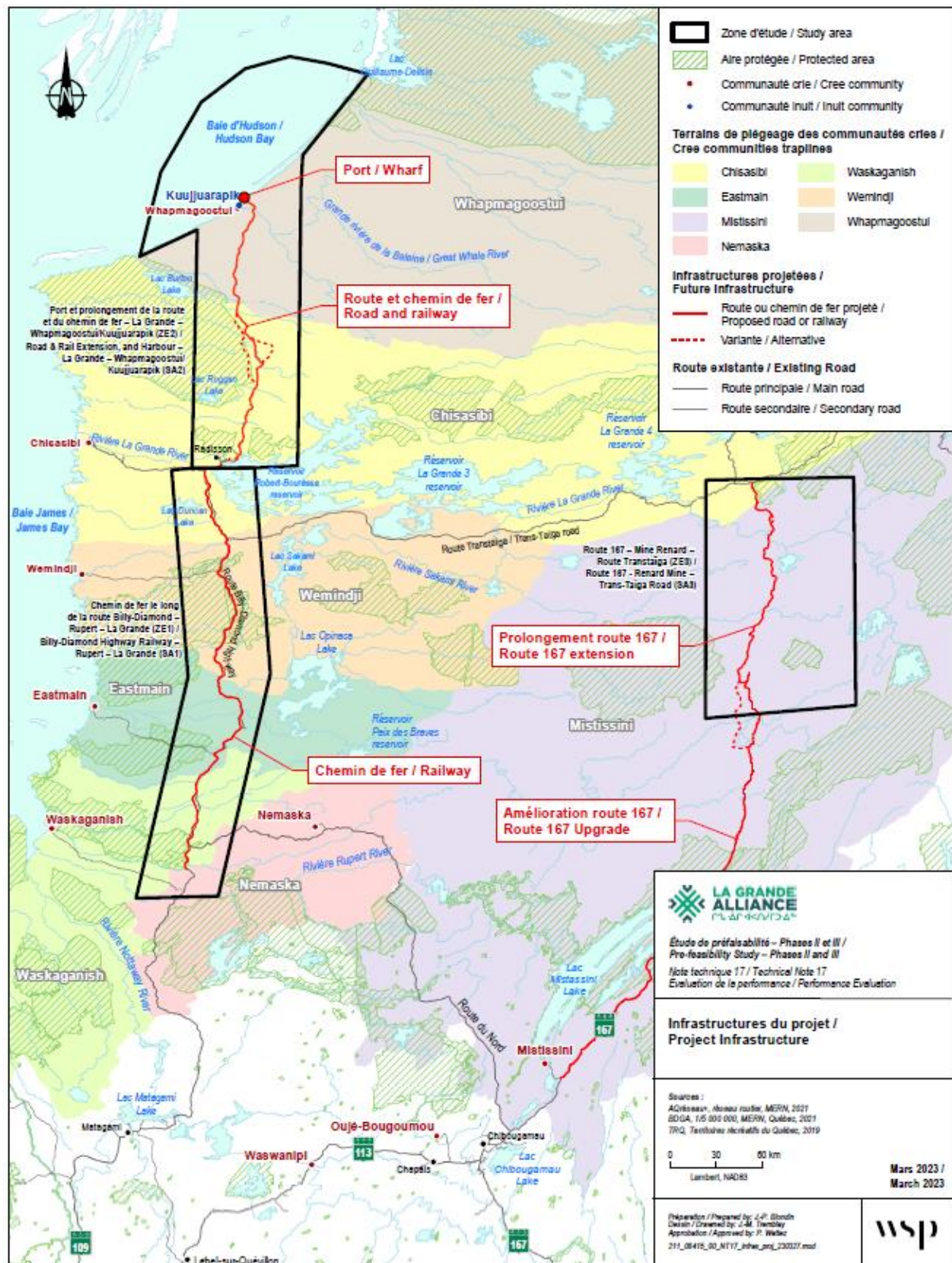


Figure 1-1 Map of La Grande Alliance Phases II and III Proposed Infrastructures

2 ALIGNMENT CONSTRAINTS & RECOMMENDATIONS FROM LAND USERS

The information presented in this section comes mainly from the validation phase of the land use data collected in the first round of interviews with Cree land users. The users, who were interviewed a second time during the validation interviews, expressed concerns and recommendations specifically related to the proposed alignments (refer to report 3). Overall concerns and information regarding the traplines are presented in Technical Note 3.

During interview validation sessions, interviewers encouraged land users to further refine HSAs to properly evaluate the level of impact that the users could feel or tolerate. To validate and complete, as needed, the data collected during the first interview, validations were organized through the CIOs. During the validation, a proposed alignment with some alternatives was presented to clarify certain data or possibilities. It should be noted that these alternatives were designed considering the land use data available at the time of their design.

The following information should be taken into consideration in the next stages to optimize the preliminary design concepts and, if required, identify and include mitigations measures. The Environmental and Social Impact Assessment study will require new rounds of interviews with land users and will require their participation in the elaboration of compensation measures or other types of measures, if necessary (e.g., preventive, enhancement, or mitigation measures).

2.1 ROUTE 167: UPGRADE & EXTENSION TO TRANS-TAIGA

Refer to Figure 2-1 for Proposed Alignment and Traplines identification.

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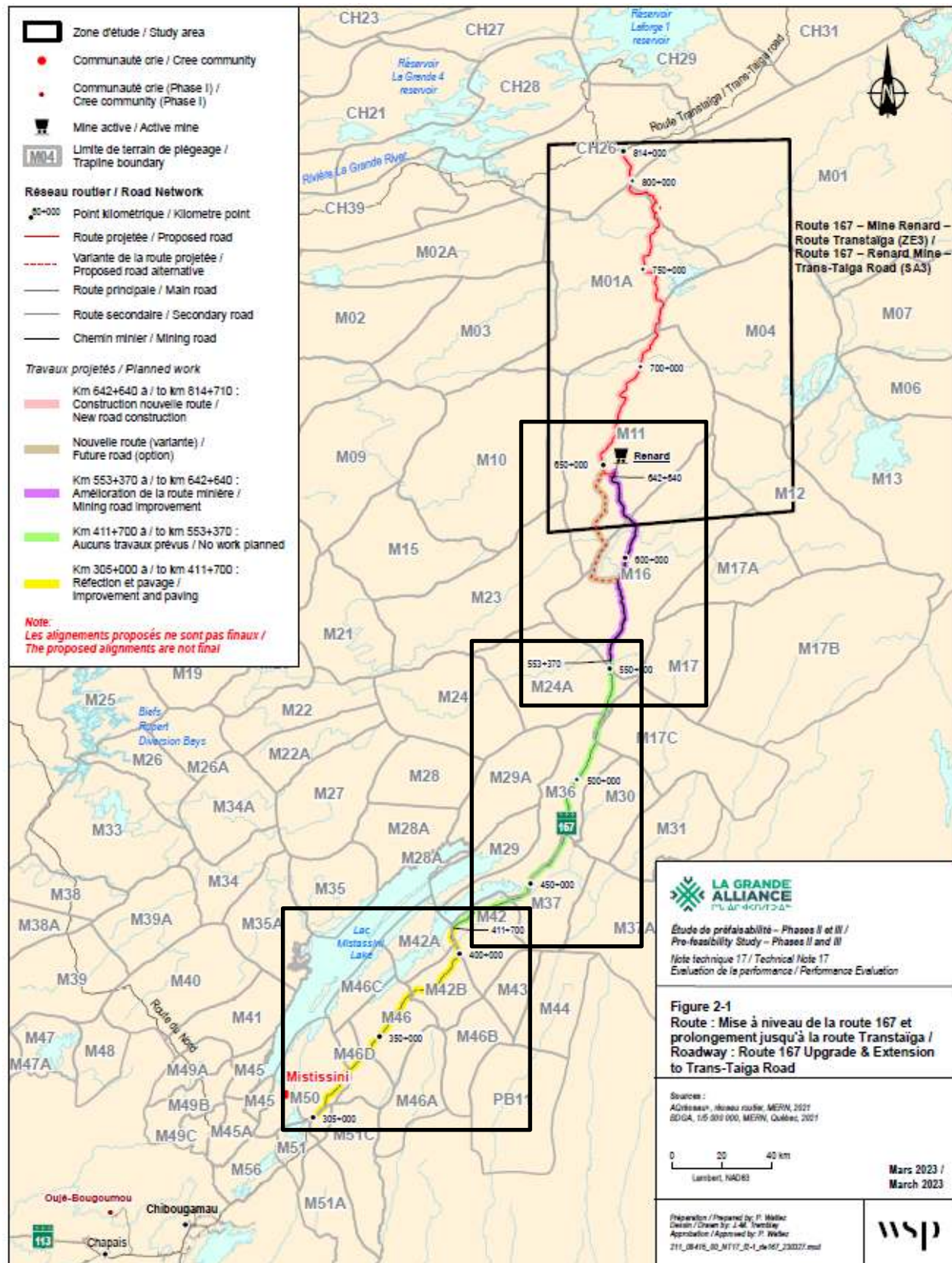


Figure 2-1 Roadway: Route 167 Upgrade & Extension to Trans-Taiga

2.1.1 GENERAL CONSIDERATIONS

Users are generally satisfied with the proposed alignment, which will allow them to access the land more easily. Some of them are planning to build camps near the proposed road. However, they would like to see access controls put in place to avoid over-harvesting of resources. Users expect to benefit from employment or other economic opportunities when the road is built. They also expect the environment to be preserved as much as possible during the construction of this proposed infrastructure.

2.1.2 SUMMARY OF INTERVIEWS IN MISTISSINI SECTOR

M01

Users support the more eastern route 167 alternative which extends over a longer distance on the trapline as they would like to build easily accessible camps on their own trapline rather than having to seek permission to occupy camps along the Trans-Taiga.

M01A

The tallyman is very satisfied with the proposed alignment that avoids the valued areas within the trapline, while allowing easier access to its land. He has no preference between the two proposed alternatives near his land and finds the alignment safe.

Users see the road extension as positive because it would reduce travel time (actually of 16 h) and would also be beneficial to younger people. They suggest installing signs along the road at the boundaries of the land to indicate which trapline is crossed to avoid poaching.

M02A

Trapline M02A is located outside the study area, but the tallyman feels that the road could be an asset if it provides easier access to his camp, which is currently reached from the Trans-Taiga Road.

M03

The proposed corridor affects a small portion of land that is used for hunting (migratory caribou, bear, moose) and fishing. The suggested alignment is approximately 35 km from these harvesting activities.

The tallymen mention that the road extension would facilitate their access to their traplines and that it could also promote the presence of young people on the territory. They could also reinvest certain parts of the land that have not been used for 20 years. One of the tallymen sees development opportunities such as the management of an Outfitting. Thus, they are in favour of the proposed road extension. They are in favour of sharing the territory's food resources with those who feed on them but would like to see access to their land built with gates that would allow for better control of non-Native activities on the land, particularly during construction work.

M04

Users indicate that the road extension would allow them to travel to their traplines more often and at various times of the year. Travel would be less expensive, and the elders would also be able to reach their camps more easily. With this access, they would also be able to better monitor their camps which are sometimes subject to theft. They report that non-native hunters arrive by snowmobile or plane from Schefferville, Manicouagan and Lac Saint-Jean.

Users expect to benefit from the economic opportunities (jobs) of the road construction if it runs through their land.

M06

Trapline M06 is outside the study area. The users support the road extension, but they expressed some concerns about the opening of the territory and the increasing presence of non-natives. They would like an access road to their land from the future road, but gates should be put in place to control or prevent access by unwanted visitors. They fear territorial appropriation by non-natives and the claiming of the territory by the Innu.

M07

Trapline M07 is outside the study area, but according to the main users, the trapline is not frequently used because of its high access costs (4 hours by snowmobile from the road to the Stornoway mine or \$4,000 by plane). The road extension could facilitate their access. They would also like a secondary access to their trapline; this would encourage family members to visit the territory.

M10

The road extension could provide better access to the northeast section of the trapline. However, this may result in pollution (dust, toxic leaks) in the water bodies that drain onto their land. Users are already concerned about pollution from the Stornoway mine and the existing road.

M11

The construction of a camp nearly 5 km east of the alignment is being considered by users, on a valued, old campsite.

The proposed alignment:

- crosses several kilometers of moose habitat and a large trapping area;
- crosses a snowmobile trail and a historic and valued navigation road;
- runs along two large HSAs to be protected for fishing.

The users identify different impacts of the road construction on their land. They identify benefits related to the opening up of the territory and accessibility, but also negative aspects, such as the increase in equipment theft in camps. They also indicate that the brook trout population has decreased in the water bodies near the road to the mine due to the vibration caused by the traffic. Thus, the proposed road extension could impact fishing near the alignment. More dust and sand would also affect hunting and trapping harvesting. Users are also concerned about soil contamination from exhaust fumes, drilling and blasting (from rain runoff). The road extension could also impact the migration cycle of caribou. However, the users are in favour of the road extension and have proposed an alignment that has been taken in consideration in the alignment elaboration.

M12

The users interviewed believe that the road will have no impact on their use of the territory since it will not cross their trapline, which is located southeast of the study area.

M13

The interviewed users are not concerned about the road extension being far from their land. Their concerns are more about the mining development and the water pollution that may result from it.

M16

Users do not expect the alignment to run through their traplines (the southern alternative that ran through M16 was abandoned), but they support the proposed infrastructure because it creates jobs and economic opportunities. They expect that any contamination from the proposed infrastructure will be addressed immediately. They pointed out that there are areas suitable for woodland caribou in the study area and near the southern alignment option.

M23

Route 167 passes approximately 12 kilometers to the east of the land, at the closest point. Users access their land by snowmobile from Route 167 or by air (plane or helicopter). The road to the mine has not resulted in an increased presence of non-native users on their trapline. However, they point out that the activities of the workers may scare wildlife.

FG26/CH26

The tallyman is satisfied with the proposed alignment that avoids his valued areas of activity on the southern part of the trapline. He also understands the advantage that this road represents for users of the Mistissini territory to access their traplines. Moreover, he believes it would ease the pressure on his land where several Mistissini users ask him for permission to build a camp along the Trans-Taiga, as a starting point to access their land by snowmobile.

However, the tallyman of the neighbouring trapline, who is also a main user of FG26/CH26 trapline, expressed reservations about the junction of the proposed road and the Trans-Taiga, since the road would arrive near his family goose hunting camp. He fears that traffic generated by the road would disturb their goose hunt and increase the risk of theft from their camps. He therefore proposed a new alignment that would instead bring the proposed road to the junction of the Trans-Taiga and Laforge-1 Road.

2.1.3 TITLES AND SERVITUDES

The proposed alignment does not cross any Category IA, IB or II lands. The northern portion of the proposed alignment borders a land reserve for protected area purposes, named Aawitakuch, for nearly 25 km. The proposed alignment crosses several mining claims held by three companies, one of which only affects an alternative alignment (see Technical Note 3).

2.2 RAILWAY: RUPERT TO LA GRANDE

Refer to Figure 2-2 for Proposed Alignment and Traplines identification.

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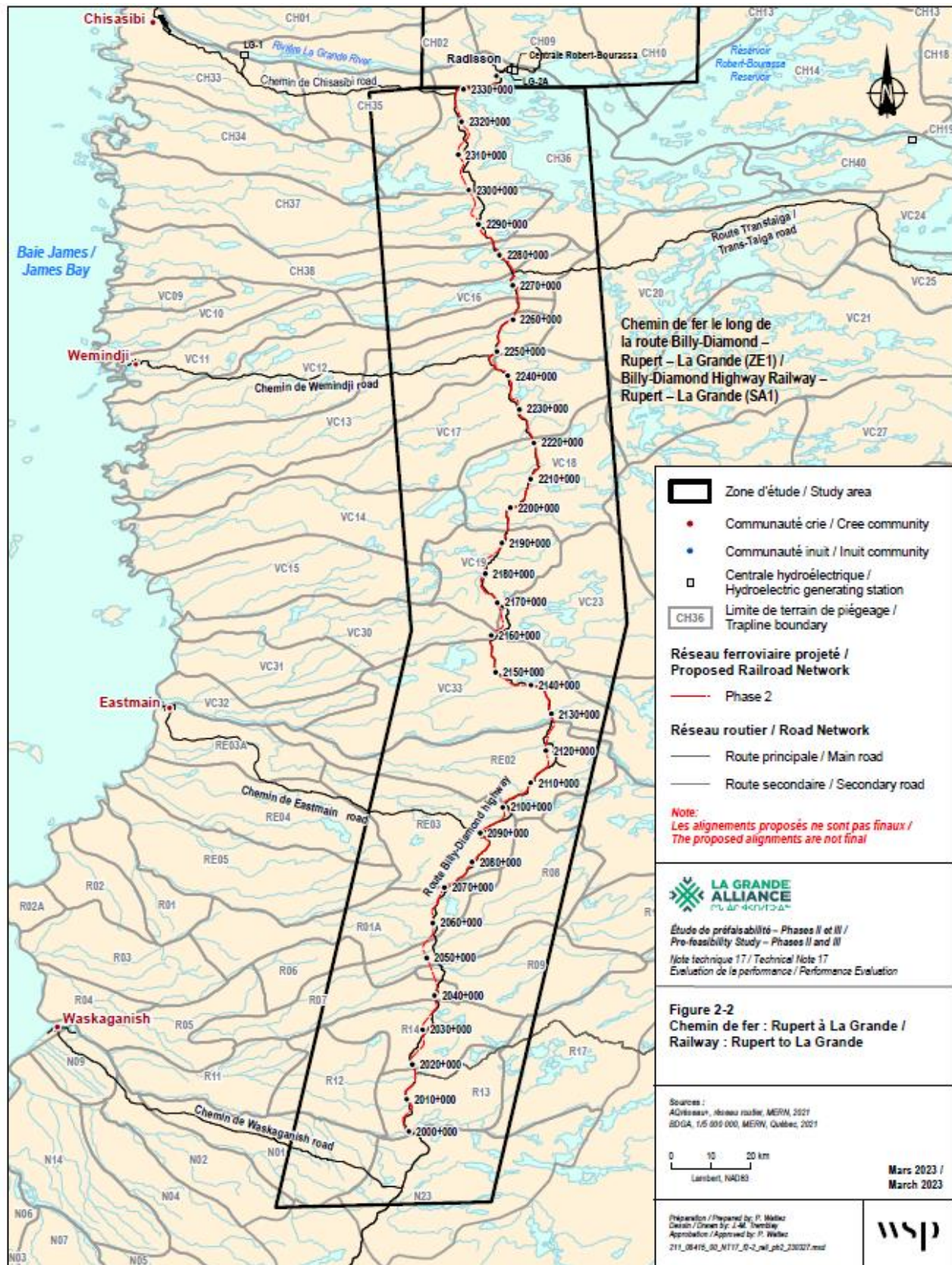


Figure 2-2 Railway: Rupert to La Grande

2.2.1 GENERAL CONSIDERATIONS

Four interviewed users of traplines (out of 25) are opposed to the proposed alignment, even though one of them did not see the alignment as directly affecting his trapline, and six others proposed some optimizations measures and revisions (R01A, R09, R13, R14, RE02, RE3, VC33, VC17, VC03/CH35, VC04/CH36). Three tallymen indicated that the ground was not stable enough to support the railroad or one of its alternatives (VC16, VC23, VC04/CH36).

Some indicated the need for more information to have a better picture of the potential impacts, others were not against the proposed infrastructure, although they expressed some concerns for wildlife, water, their harvesting activities, and their health. They would be more likely to be in favor of the proposed infrastructure if there were tangible benefits (lower cost of goods transportation and passenger train).

Users of three traplines (VC14, VC23, VC02/CH34) indicated that a road along the coast would be better to serve the communities.

2.2.2 SUMMARY OF INTERVIEWS IN WASKAGANISH SECTOR

R01A

The tallyman indicated that the railroad should generally be as close to the road as possible to avoid impacts, especially on moose feeding areas. However, to avoid impact on a significant beaver trapping area, the proposed alignment should be moved away from the road at that location.

R06

The tallyman believes that the Crees and the animals will adapt to the railroad after a period of change and impact. He is not particularly concerned about the proposed infrastructure.

R07

The tallyman does not have a clear idea of the impacts that the railroad could cause, but he believes that the Crees will adapt, just as they adapted to the construction of the Waskaganish road and its impacts. However, he indicates that animals must be able to cross the tracks safely, at least with corridors.

He estimates that the train should pass at a distance of 1 km from his parents' camps that is along the proposed alignment, as they live there year-round.

R08

The tallyman is satisfied with the proposed alignment, although:

- it crosses a staging area for migratory birds;
- it runs one kilometer from a potential woodland caribou range (no tracks have been seen since the forest fire 10 years ago);
- it runs within 3.5 km of an area where the subterranean river system flows eastward (watershed) and has been identified as a protected sensitive area.

R09

The tallyman proposed an alternative alignment to run further from his goose hunting area. He indicated that his proposed alignment, slightly further west of the Billy-Diamond Highway, would cross the Pontax River in a more suitable location because of the more solid ground, and that this suggestion would also avoid crossing a quarry that is likely to be converted into a goose hunting pond in the future.

R12

The camps and main harvesting areas are located along the Rupert River and to the north of the trapline (reachable by snowmobile from the Billy-Diamond Highway). The proposed alignment is located about ten kilometers from these main harvesting areas, although harvesting may be closer (up to 4 km).

The tallyman believes that the train could be useful if it provided a passenger service, which could reduce travel costs.

R13

The proposed alignment runs directly over a highly valued drinking water source used by both Waskaganish and Nemaska residents. The tallyman also feels that the alignment runs too close to a goose hunting site. He believes that a reasonable distance would be a minimum of 2 kilometers. For this reason, he proposed a realignment that would avoid the drinking water source and his goose hunting area. However, he stated that if the alignment could not be modified to avoid the access road, the goose hunting site could be relocated by developing a new one as part of the mitigation measures. He also considers the locations where the alignment crosses an access road to be a source of danger; in addition to this busy access road leading to a goose hunting pond, the current alignment crosses the Route –du Nord, which is problematic. The tallyman considers that the alignment should pass west of the Billy-Diamond Highway in this area.

R14

According to the users interviewed, it would be less disturbing if the alignment was done in areas that have suffered from forest fires, i.e., west of the road and Lake Nistam Esachistuwach, which is considered a protected area. Although this proposed alignment may encounter obstacles (mountains, rivers, streams, marshes), this area is less valued by users and the tallyman states that it is also less mountainous than the eastern area. The proposed alignment encroaches on the valued area that includes the segment east of the Billy-Diamond Highway and runs much too close to the lake where one of the main camps is located. The tallyman feels that the alignment should be moved at least 500 metres east at this location. The alignment also runs close to another valued area, this time to the west of the road, but the distance from the main lake to this area is considered adequate. It also crosses two old winter trails and runs close to three camps located along the road. The tallyman therefore proposes to modify the alignment so that it runs west of the road and thus avoiding their main harvesting areas.

2.2.3 SUMMARY OF INTERVIEWS IN EASTMAIN SECTOR

RE02

On trapline RE02, the alignment crosses or borders several harvesting areas and valued areas and runs close to their main camp located at km 371.5 east of the Billy-Diamond Highway. They are therefore concerned about being disturbed by train noise while at their camp. Along the road, the alignment crosses the users' main harvesting areas (goose hunting, trapping, fishing and berry picking) and a snowmobile trail. Preservation of streams is very important, particularly for beavers, including the branch connecting Nistam Siyachistawach Lakes and the lake where their camp is located, which flows under the Billy-Diamond Highway, north of km 372. The alignment also crosses over a sturgeon spawning ground, a very sensitive area, which is of great importance to the family and users who fish on the Eastmain River. For all these reasons, the users of RE02 would prefer that the railroad avoid their trapline altogether and instead run east of it.

RE03

The tallyman would like to avoid crossing the railroad tracks to get to his trapline from the Billy-Diamond Highway; therefore, he indicates that the railroad tracks should run east of this road. In fact, he would prefer that a second road be built parallel to the Billy-Diamond Highway, for trucks only, rather than a railway.

Currently, the proposed alignment is west of the Billy-Diamond Highway (see Technical Note 12). It runs along the harvesting areas on both sides of the road (beaver trapping).

VC30

This trapline is crossed by a small section of the alignment of about 2.5 km long. This area has been used for several years by a user of trapline VC23 from Wemindji who has a campsite with two cabins in a gravel pit. The proposed alignment runs one kilometer from the existing camp and crosses the area planned for future harvesting of the tallyman, who plans to build a camp on a site located about 600 m from the proposed alignment. The users interviewed have a hard time getting a clear picture of the impacts without more information on the proposed infrastructure.

VC33

Users are concerned about impacts from railroad construction and operation, but feel that impacts on wildlife, land and harvesting could be less if the alignment went to the east of the land rather than the west, at least 2 km away from the highway. Their concern about having the railway passing too close to the road is that people could get off the train and break into their camps or poaching on their land. Also, there is less topography (mountains and hills) on the east side and therefore less blasting would be required. They are concerned that the blasting associated with the work would have a significant impact on wildlife and streams. The proposed alignment crosses several streams where there are beaver lodges. It also crosses the Opinaca and Eastmain rivers, which are to be protected, and on which users fish and hunt moose and bear, among other things.

The land users proposed a new alignment passing out of the trapline towards east and crossing the Opinaca River at a narrow point, as they say there is no space for a second bridge at the actual crossing of this river.

2.2.4 SUMMARY OF INTERVIEWS IN WEMINDJI SECTOR

VC12

On the portion that affects the trapline, the proposed alignment is located to the east of the road and does not affect any of the listed harvesting areas, since they are located west of the road. However, the tallyman has various concerns with this proposed infrastructure.

VC13

The alignment does not cross any harvesting areas but does run close to two large berry picking areas and a fishing area. The tallyman has various concerns with this proposed infrastructure.

VC14

Wetland areas must be protected, and particular attention must be paid to the choice of materials used to build bridges or culverts to cross major rivers such as the Vieux-Comptoir River.

If the railroad is built, the tallyman would like to see a passenger service to facilitate users' access to their land. He also indicates that a road should be built along the coast to better serve the communities.

VC16

The alignment crosses various harvesting areas (hunting, trapping, gathering), including a valued area, and runs near fishing areas.

The tallyman indicates that the ground is not stable enough for a railroad since it consists of swamps.

He is particularly concerned about the construction of a railroad parallel to the Billy-Diamond Highway because of an important spawning ground that is located near the highway. This spawning ground and the fish had already been impacted by the road construction, mainly because of the culverts, according to him.

He does not agree with the proposed infrastructure.

VC17

The users of trapline VC17 were interviewed for the first time in August 2022. For the users of this trapline, alternative #1 would be preferred since alternative #2, which runs east of the Billy-Diamond Highway, encroaches on three main camps located at km 496, km 504 and km 510. The alignment also encroaches on three highly valued drinking water sources located at km 496, km 511 and km 515 on the east side of the road. A camp occupied by a non-native is also located on the same alternative alignment, at km 507 of the Billy-Diamond Highway. It should be noted that an old camp site is located on the shores of a lake west of the Billy-Diamond Highway, at kilometer 503; variant #1 encroaches on this old camp site.

VC18

The proposed alignment runs within 500 m of a camp area, as well as two water sources. The alignment also crosses snowmobile trails and a navigation road. The road surroundings are used for some harvesting, including goose and bear hunting. However, they believe that the alignment should be kept as close to the road as possible to avoid affecting too much territory. Users were not in favour of the proposed railroad at first glance, but felt that they would need more information, including about potential impacts, to better understand it.

VC19

The proposed alignment runs near a camp area, a fishing and moose hunting area, and approximately 250 m from a lake used as a drinking water source. In addition, it crosses a few goose hunting areas and black bear areas. The tallyman sees both positive and negative aspects to this proposed rail line.

VC23

The tallyman does not see the point of a railroad on his land. He does not want rails on his trapline, which would mainly benefit the natural resources companies. He believes that it would be more relevant for a train to run along the coast and connect Chisasibi to Whapmagoostui, since the communities would also benefit from it.

The tallyman also indicates that there are many natural obstacles (rivers, lakes, swamps) to the construction of a railroad, and that the ground would not be stable enough to support it. He also sees many negative impacts to the construction and operation of the railroad, including impacts on waterways and wildlife (including fish).

The proposed alignment crosses the westernmost part of the trapline on about 5 km, and no harvesting has been identified in the vicinity. It should be noted, however, that the alignment runs about 1.3 km from the tallyman's main family camp, which has been used since the 1980s.

2.2.5 SUMMARY OF INTERVIEWS IN CHISASIBI SECTOR

VC02/CH34

Only a very small portion of this trapline is affected by the study area, but it contains a protected area (source of the watershed), which is nearly 20 km west of the suggested alignment. Users are concerned about contamination of the watershed in the event of a leak or derailment. They are also concerned about large wildlife being hit by the trains, and that the railroad will alter the caribou migration path.

The interviewed users do not support this proposed infrastructure, which, according to them, will only benefit the mining companies. However, they mention that a road from the community to their camps along the bay would be useful for them to continue their harvesting in a context of climate change since snowmobile travel on the bay becomes dangerous in the spring.

VC03/CH35

The interviewed users are concerned that caribou may use the proposed rail corridor. They are also concerned about the additional noise pollution generated by the train. It should be noted that the proposed alignment runs almost 20 km from a valued area, and about 12 km from the nearest camp. They feel that the rail line is an unnecessary infrastructure. But the tallyman is happy to see that the proposed alignment avoids his trapline.

VC04/CH36

Commenting on the two proposed alignment alternatives for crossing the La Grande River (on the LG2 dam or by building a bridge downstream from the dam), the tallyman is of the opinion that the second option would be more appropriate since the road over the dam is very narrow and steep.

The tallyman also suggests building overpasses at the intersections of the railroad with the road so that motorists do not have to wait at crossings.

The tallyman favours alternative #2 of the alignment which runs east of the Billy-Diamond Highway since the west side is notably very marshy. This alternative also allows for less encroachment on commercial mushroom picking areas, although some of these picking areas are still sacrificed by either alternative, as well as avoiding his camp at kilometer 599.

However, both proposed alternatives encroach on either of the two highly valued drinking water sources used by many members of the community that are located respectively at km 580 on the east side and km 592.5 on the west side of the Billy-Diamond Highway. They also run close to two fishing areas identified near the road corridor, on the east side at kilometer 586 and on the west side at kilometer 591.

VC05/CH37

The proposed alignment runs close to several camp sites (about 8) on either side of the Billy-Diamond Highway. To be noted that a new cabin is under construction at km 561 on the west side of BDH, directly on the proposed alignment for the railway.

The users interviewed were concerned about increased noise pollution from the train and suggested reducing the frequency of train travel during the spring goose hunt as a mitigation measure. However, they are in favour of the proposed infrastructure if it provides goods for future generations at a lower cost (gas, equipment, food).

VC06/CH38

Since the tallyman's mobility is reduced and he cannot move as much as he used to over the entire area, more accessible camps are important, especially one that can be reached from the Billy-Diamond Highway. This camp, which includes several cabins used by different family members, is located at the end of a road starting at km 550 of the Billy-Diamond Highway and must be protected, as must the surrounding area. The proposed alignment would be located 2 km from this area, which is also the location of an old camp with a burial site. The tallyman is not in favor of building a railway.

2.2.6 TITLES AND SERVITUDES

The proposed alignment does not cross any Category IA, IB or II lands.

In the Waskaganish territory, the protected area reserve is in the vicinity (0.45 km) of the proposed rail alignment. In addition, the alignment (both alternatives) crosses a proposed biodiversity reserve (km 260-266 of the Billy-Diamond Highway). Further north, on the territory of Wemindji, the boundaries of the proposed Paakumshumwaau-Maatuskaau Biodiversity Reserve closely border (less than 100 meters) the two alternatives of the railway alignment at some locations.

Several resort leases are located in the vicinity of the alignments along the segment from km 550 to 554 of the Billy-Diamond Highway.

Lastly, two non-exclusive outfitters operate in areas near the alignment. In addition, several groups of claims (i.e. titles held by the same Company) are directly crossed by the proposed rail corridor (see Technical Note 3).

2.3 ROAD AND RAILWAY EXTENSION: LA GRANDE TO WHAPMAGOOSTUI/KUUIJUAPIK

Refer to Figures 2-3 and 2-4 for Proposed Alignment and Traplines identification.

TECHNICAL NOTE 17 – PERFORMANCE EVALUATION

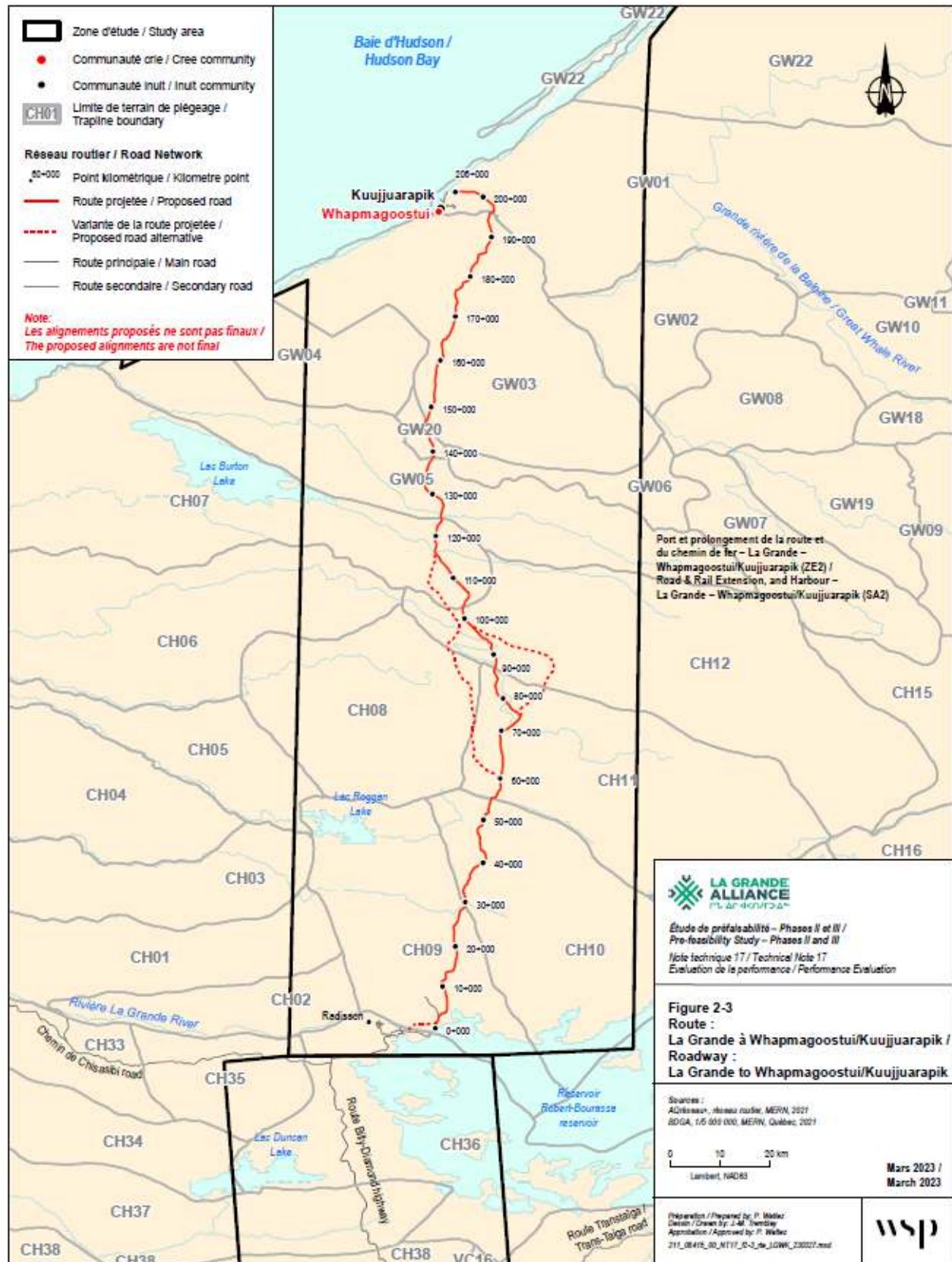


Figure 2-3 Roadway: La Grande to Whapmagoostui/Kuujuarapik

TECHNICAL NOTE 17 – PERFORMANCE EVALUATION

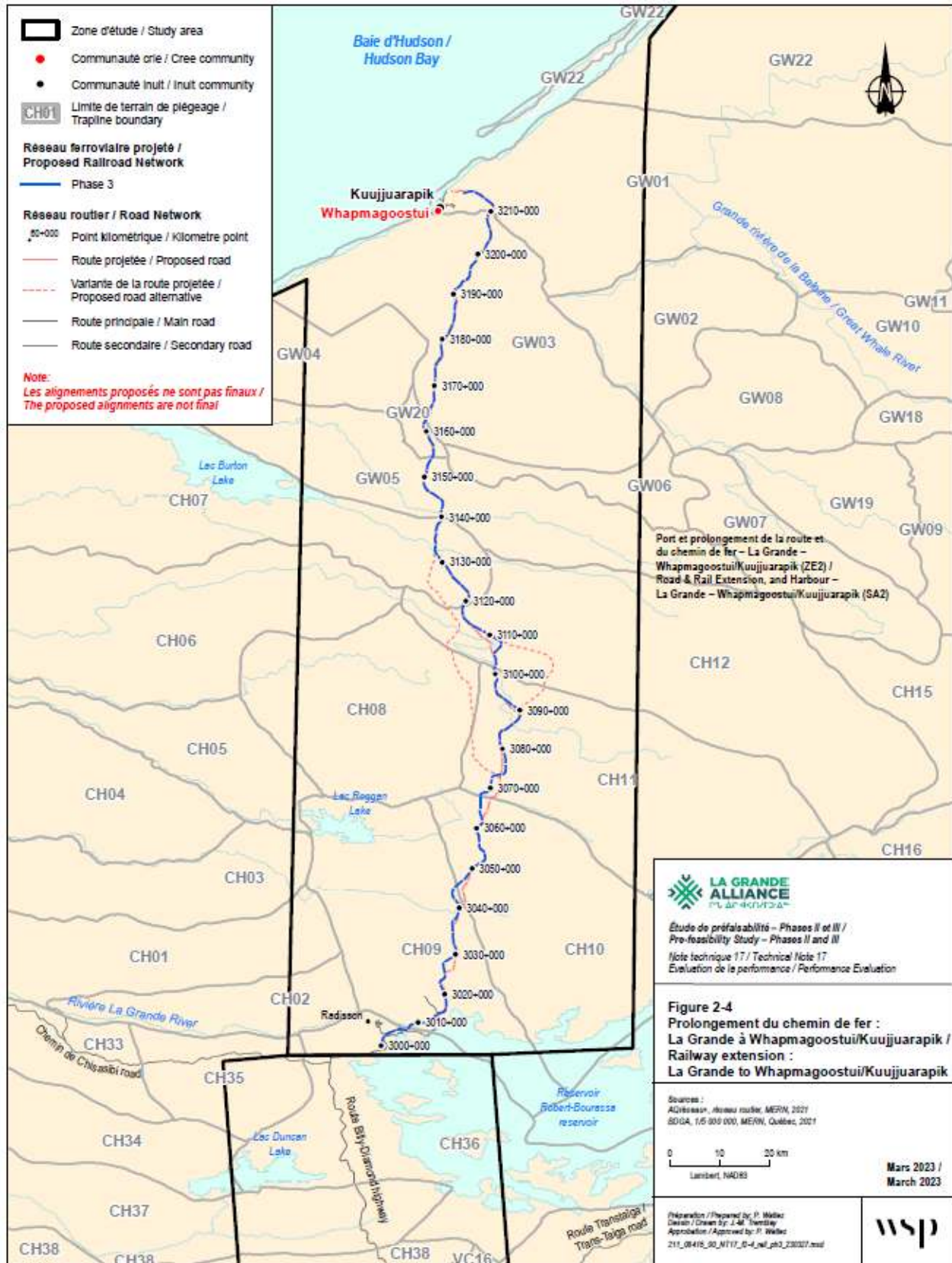


Figure 2-4 Railway extension: La Grande to Whapmagoostui/Kuujuarapik

2.3.1 GENERAL CONSIDERATIONS

The interviewed users of the Whapmagoostui traplines were in favour of the proposed infrastructures, although some concerns were noted. On the other hand, some indicated physical specificities to be considered, such as landslides and permafrost (see also Technical Note 3) and were not against the use of quarries on their land.

As for the users of the Chisasibi traplines, the results are mixed, four of them suggested certain alternatives (FG08/CH08, FG09/CH09, FG10/CH10 and FG12/CH12), and some said they were against the proposed infrastructures (FG05/CH05, FG06/CH06, FG07/CH07) or against the alternative starting from La Grande-1 (FG01/CH01 and FG02/CH02).

2.3.2 SUMMARY OF INTERVIEWS IN CHISASIBI SECTOR

FG01/CH01

Trapline users are not at all in favour of the proposed alignment alternative through LG1. None of them expressed interest in having a road that would cross their trapline and run through an area that is valued in various ways. They are concerned about the pollution it would cause, the access to all and the waste left on their land¹.

FG02/CH02

The tallyman is not at all in favour of the proposed alignment alternative through LG1. The tallyman does not want this proposed infrastructure (road and rail) to be carried out on his trapline because it would bring in other users and increase pressure on the wildlife².

FG03/CH03

Users indicate that there may be interest in the proposed rail infrastructure if it were also planned for passengers. Unlike many of the other users interviewed, they are less concerned about the proposed rail than about the proposed road. They would, however, support the proposed road if the community were to vote in favor of it, but do not wish to have a road on their land.

FG05/CH05

At the meeting held in Chisasibi in August 2022 with the tallymen concerned by the road/rail corridor linking La Grande to Whapmagoostui/Kuujuarapik, the tallyman flatly rejected the proposed infrastructure, citing the risks of contamination of the water bodies flowing into James Bay, particularly from Roggan Lake, and which crosses his trapline.

FG06/CH06

Users are concerned that the proposed infrastructures (road and rail) will contaminate the Roggan River and the lakes on their traplines, especially if a mine is built as a result of these proposed infrastructures.

They do not wish to see these proposed infrastructures near their trapline which is entirely within a protected area. The tallyman does not like the western option as it is too close to his trapline. The main alignment proposed is better.

¹ At the time of consultation, the road option from La Grande-1 to the north of Radisson was not under study and is partially outside the SA2. This option crosses trapline FG01/CH01. However, users were consulted on this subject during the validation round.

² At the time of consultation, the road option from La Grande-1 to the north of Radisson was not under study, and is partially outside the SA2. This option crosses the trapline FG02/CH02. However, users were consulted on this subject during the validation round.

FG07/CH07

At the validation interview, the users of trapline FG07/ CH07 clearly stated their refusal to have a road crossing their trapline. They stated that their entire land base had originally been declared a protected area, but that the boundaries of the protected area have been changed to allow the road to run through their land, without their knowledge or consultation. Two potential borrow pits have been identified on their land, also within what they consider to be the original protected area, and they are opposed to their development.

FG08/CH08

The tallyman of this trapline believes that ideally, the alignment should run west of Julian Lake, to protect this lake and avoid any risk of spills flowing into it. This area is a protected HSA. It should be noted that the entire portion of trapline FG08/CH08 included in the study area is in a protected area, including Julian Lake. The suggested alignment runs east of Julian Lake. It should be noted that an alternative alignment studied that runs through FG08/CH08 crosses a protected area and will therefore probably not be retained. However, the tallyman would prefer this variant to the main one retained since he would have better access to his trapline as this route passes near some of his camps.

He also advises to use aluminium instead of steel for the culverts as he considers steel more harmful for watercourses.

FG09/CH09

The proposed alignment is acceptable to the tallyman. However, the tallyman has no objection to the redesign of the alignment by running along the eastern boundary of his trapline, in order to avoid the very sensitive area and the lake where the harvesting of users of neighbouring trapline FG10/CH10 are concentrated.

The tallyman proposes mitigation measures in the event that a road is built on his trapline, i.e., to improve access to his main camp and to build a ramp to facilitate the launching of boats near this camp.

FG10/CH10

The users reiterated their request to try to move the alignment to the west of their trapline, in order to avoid their main harvesting area of Lake Pamigamachi, even if it means encroaching on the boundary of the protected area. In the event that this request cannot be met, they propose a realignment to the west, at the northern boundary of their trapline, in order to avoid the road crossing the outlet (which is actually fairly wide) of a highly valued lake. They claim that their proposed alternative alignment would cross fewer water bodies and would also run through the potential quarry shown on the map. According to their calculations, this detour would represent less than one additional kilometer of road compared to the current proposed alignment.

FG11/CH11

The road alignment must avoid sensitive areas and should ideally run at the western end of the trapline (which is the proposed alignment). They do not have a preference between the proposed alternatives. They don't mind the road going through their land because they know that the people of Whapmagoostui need it. A road would also facilitate their own access to the trapline.

FG12/CH12

The users of trapline FG12/CH12 were interviewed for the first time during the validation round. It appears that alternative #2 of the alignment runs along the lake where their main camp and their main area of harvesting is located. Alternative #1 would therefore be recommended to run west of this lake, which is considered a sensitive area. However, the users recommend, if the proposed infrastructure is implemented, that mitigation measures be put in place so that people travelling on the road would not be able to fish in this lake.

Two spawning areas for lake trout have also been identified in rapids around this same lake and both alternative #1 and alternative #2 of the alignment run directly over these spawning grounds.

For the tallyman, whatever decision will be adopted concerning this proposed infrastructure, the important thing is that it be adopted in full knowledge of the facts by the Crees and for the Crees.

2.3.3 SUMMARY OF INTERVIEWS IN WHAPMAGOOSTUI SECTOR

GW01

For all phases of the proposed infrastructure, the construction period is seen as particularly disruptive for land users who will be inconvenienced by it. The tallyman, however, does not see any problem with using the potential quarries and borrow pits that have been identified on his trapline during construction.

GW02

The tallyman feels that the road could have a positive effect if access to the south is facilitated, and the price of food and equipment is reduced.

According to the tallyman, the train could have a positive impact if passenger service is considered.

GW03

The tallyman is in favour of the road construction which would reduce the cost of living (food, materials, and other goods) and would facilitate travel, especially to reach the trapline, as well as for the travel of members of all communities, year-round. He would like the road to be accessible in winter as well. However, the presence of the road could have an impact on wildlife, through collisions with vehicles, but also through abusive and disrespectful hunting of animals. Garbage could also be found along the road. The tallyman is concerned that this could increase drug and alcohol trafficking and feels that a checkpoint should be set up to monitor what is entering the community.

The alignment crosses a VTT trail, a snowmobile trail, and a navigation road with a portage. Where the road alignment crosses the navigation road, a bridge would have to be built at this location since the watercourse is quite wide, making it possible to pass under it by boat.

The bridge across the Great Whale River should be built as close to the community as possible to allow easier access to the south side of the river for community members throughout the year.

Permafrost is changeable and this must be taken into consideration. The tallyman reminds us that the harshness of the environment, the need for blasting and the need to build several bridges will have to be considered during the construction of the various proposed infrastructures. The best season for construction would be after freeze-up.

The railroad would provide access to cheaper materials and could be used for cargo and passenger transportation. However, the tallyman is concerned that drug and alcohol trafficking would be amplified in the community.

He also states that the railroad should not be built near rivers because of the risk of landslides.

The tallyman does not object to the potential quarries and borrow pits identified on his land being used for construction.

GW04

The construction of a road could facilitate travel and reduce the cost of food, equipment, and other goods. However, it could reduce hunting areas. In addition, the noise could scare away birds and other animals.

The tallyman indicates that a train with passenger service is a good travel alternative in the territory. However, he foresees negative impacts on wildlife due to noise and vibrations.

GW05

A new camp is planned to be built on the shores of a lake that borders the proposed road. This camp would be located approximately 3.5 km from the proposed road. The tallyman does not foresee any problem with this since it would be less expensive for him to access the camp than by airplane and proposes to build an access road to his future camp from the road as a mitigation measure. He may even decide to build his new camp even closer to the proposed road.

The tallyman does not object to the operation of the potential quarry identified on his land.

The tallyman is particularly concerned about melting permafrost, which can lead to ground instability, and imply dangers for infrastructure construction. Landslides are becoming more and more frequent.

The tallyman fears that the opening of the territory will lead to the establishment of a new non-native community in the area.

GW06

The tallyman would have liked the proposed alignment of the road to be closer to his harvesting area. However, he feels that a snowmobile trail could be built from the road to access his harvesting area, as a mitigation measure, which would allow him to reach this area in one hour.

The tallyman does not believe that the proposed infrastructure would bring negative impacts related to non-natives, but he does suggest that a checkpoint be set up to reduce the risk of drug and alcohol trafficking.

The road would allow for easier access to the south and to harvesting areas, however, it would create traffic and noise, especially during construction.

The tallyman does not object to the railroad and would appreciate a passenger service.

GW20

The tallyman believes that the road construction could have a major impact on wildlife that is sensitive to noise, such as beavers, unlike caribou, which are not affected by noise. The change in animal behaviour due to noise could affect traditional harvesting such as hunting.

The tallyman believes that the railway infrastructure could have a major impact on wildlife, including fish, which could be affected by noise and vibration. Hibernating bears could be disturbed in their sleep and consequently weakened. However, he believes that the proposed rail would have a lesser negative impact on wildlife than a road.

The positive aspect of the proposed rail would be the availability of a passenger service that would facilitate travel between the traplines and the community.

Although from a personal point of view, the tallyman sees positive impacts to the construction of the infrastructures, he is strongly concerned for the future and for future generations. He mentions that this opening up of the area will lead to changes in the territory and the dynamics of the region.

As for the opening up of the territory, the tallyman is concerned about the possibility that non-natives will settle illegally in the territory and that the greater accessibility of the North will lead to the increase of conflicts.

The tallyman does not object to the operation of potential quarries and borrow pits identified on his land for the construction of infrastructure, provided that these sites are rehabilitated after the work is completed.

If the road is built, the tallyman plans to build a camp along it.

GW22

The road could be beneficial to the community and its impacts are less significant than those of other developments.

The tallyman feels that it could be very convenient if the train could transport passengers and cargo. He believes that the animals will adapt to the noise and vibrations.

2.3.4 TITLES AND SERVITUDES

The proposed alignment crosses Category II lands on nearly 100 km of the Chisasibi territory, and 30 km of the Whapmagoostui territory. On the approach to Whapmagoostui/Kuujjuarapik, it also crosses Category IA lands (for about 15 km).

Two (2) protected area reserves are in the vicinity of the alignment, between 0.14 km and 5 km away from the alignment. One alternative alignment crosses the *Réserve de territoire aux fins d'aire protégée du Lac-Burton-Rivière-Rogan-et-la-Pointe-Louis-XIV*.

No leases have been identified near the proposed access road to the communities of Whapmagoostui and Kuujjuarapik. However, the harvesting area of an outfitter (without exclusive rights) is crossed by the proposed road alternative, to the south of it.

Lastly, the proposed alternative crosses a single claim and runs in proximity (0.15 km) to another claim.

2.4 HARBOUR IN WHAPMAGOOSTUI/KUUJJUARAPIK

The proposed site for the harbour is located approximately 5 km northeast of the communities of Whapmagoostui/Kuujjuarapik, at the northern end of the SA2. As shown on Figure-2-5, four different locations were studied for this proposed infrastructure.

The technical preferred location for a seasonal Harbour that could eventually be converted into a Deep-Water Port is just North-East of the Maver Islands (junction of areas C and D). Comments gathered from the land users and documented in the next sections refer to this figure and its different colored polygons.

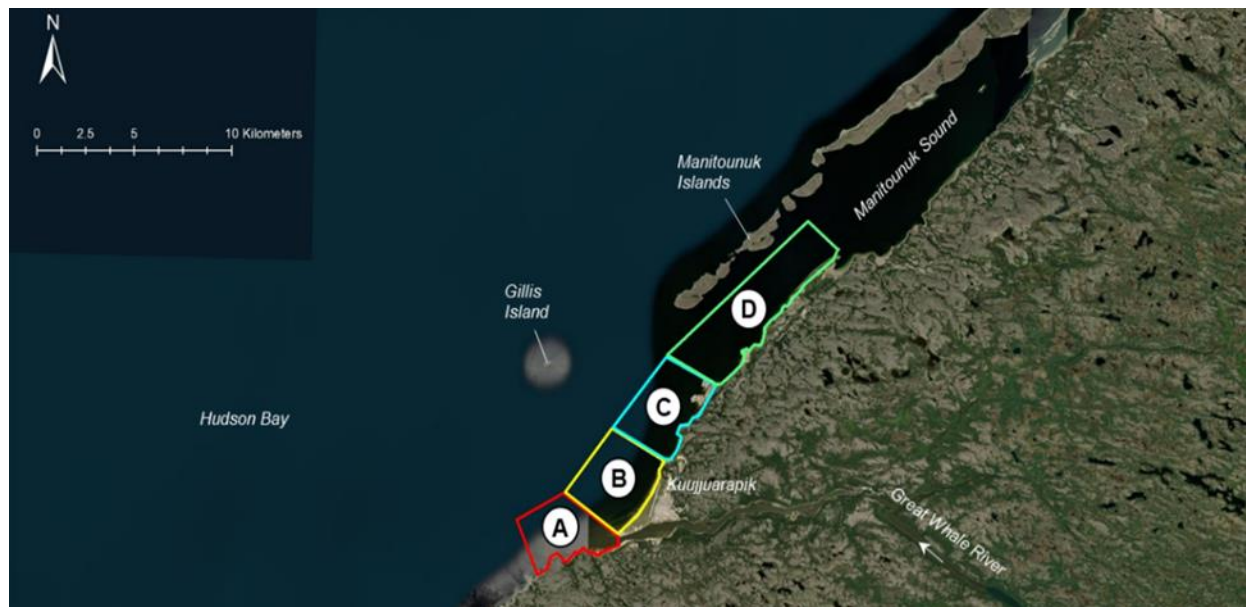


Figure-2-5 Study Zones A, B, C, and D on the Whapmagoostui/Kuujjuarapik Coastline

2.4.1 GENERAL CONSIDERATIONS

The preferred option for the harbour (between area C (blue) and D (green) in Figure-2-5) was defined following validation interviews with land users. However, during the engagement activities, it emerged that the most northerly options (the green area on the map, followed by the blue area) seem to be the most appropriate for most of the users interviewed, although goose hunting and other harvesting, such as fishing, are practised there in the spring and fall by many community members. Additional consultations with the Crees and Inuit will allow a better definition of the harvesting and specificities of this sector.

2.4.2 SUMMARY OF INTERVIEWS IN WHAPMAGOOSTUI

GW01

The ground is unstable along the coast, where there are always more landslides and subsidence. The tallyman reminds us that these phenomena must be taken into consideration in the construction of infrastructures, for the safety of all.

He indicated that the proposed harbour should not be built near the community (where the yellow and blue sections are) because of its harvesting and the best option, in his opinion, would be the northernmost (green) section.

GW02

The tallyman feels that the best option would be the northernmost section (green), and that the options near the community and to the south (yellow and red) would be the worst since the water level in these areas is low.

GW03

In the perspective of developing economic opportunities such as the creation of a business that would offer tourist boat trips, the tallyman believes that the harbour could be beneficial to the community.

He feels that the harbour construction could affect the avifauna (birds, ducks, geese). In his opinion, the best options are those to the north of the community (the blue and the green). The yellow option, in front of the community, is not desirable because the area is used by many families, as is the red option further south, where there is an abundance of fish.

GW04

He believes that a summer harbour would be preferable to a year-round harbour that would affect hunting activities along the coast, since users cross the Great Whale River by snowmobile and if a channel were to remain open during the winter, it would compromise traditional harvesting.

On the other hand, he feels that the harbour's construction could disturb birds, fish and even caribous, which have recently tended to migrate along the coast rather than inland.

The tallyman feels that the harbour should not be built facing the community or to the south of it, since many members use these areas and hunt at the mouth of the river. It would be preferable for the harbour to be located away from the village; in his opinion, the northern option (the green one) would be the most optimal, followed by the blue one.

GW05

The tallyman is particularly concerned about melting permafrost which can lead to ground instability and imply dangers for infrastructure construction.

The use of an icebreaker would have a negative impact on community members (Cree and Inuit), who use several snowmobile trails along the bay. In addition, there are already many boats in the summer, and the harbour could increase traffic in the bay. An annually operating harbour would impact the air, vegetation, and animals, including partridges and hares. Thus, he does not see any positive effects associated with the harbour construction. The anticipated negative effects are noise, dust, and pollution, including the risk of spills that could affect wildlife, including migratory birds and fish.

The tallyman believes that the harbour should not be built in the northern section (green) because of the wide range of harvesting taking place there. In his opinion, the best option would be the one at the mouth of the Great Whale River (red), although this option would also imply significant impacts on marine wildlife. The second most desirable option would be the one located north of the community (blue). He indicated that whales used to come near the mouth of the Great Whale River, but they no longer do so because of the noise.

GW06

According to the tallyman, the area south of the community (red) is the worst option for building a harbour, since the waves are strong at the mouth of the Great Whale River and many harvesting are practiced there in winter (hunting and sliding for children). The most northern option (green) seems the most adequate according to him and there are few waves.

GW20

The tallyman is concerned that the harbour construction will restrict rights or access to the coast and harvesting areas for users. This could restrict hunting on the coast for community members. Harbour construction could also impact marine mammals (seal, beluga) and fish (cod).

The tallyman believes that the harbour should not be built near the community (yellow option), nor in the northern section (green), since these areas are heavily used for goose hunting in spring and fall. The northern part of the community (blue option) is also used for various harvesting by all members. The best option according to him remains the south of the community (red option), and if a bridge were built over the Great Whale River, it would provide easier access to his land.

He indicates that if a harbour is built and that this allows the development of a tourist pole, this domain should be exploited by the Crees.

GW22

For the tallyman, it is difficult at this stage to anticipate the impacts of the proposed harbour. However, he believes that the worst option for the harbour construction is the one opposite the community (yellow), and the best one would be the northernmost one (green), followed by the option north of the community (blue).

2.4.3 TITLES AND SERVITUDES

The preferred harbour option touches on Category II lands and is located in close proximity to Category IA lands. In addition, the affected maritime territory is covered by a Nunavik Inuit and Cree land claim agreement, as well as a protected area that represents an ecological interest area, which runs along the entire coast of Hudson Bay over a width of approximately 10 km in the maritime zone (see Technical Note 3).

3 CONSTRAINTS & RECOMMENDATIONS RELATED TO THE NATURAL ENVIRONMENT

3.1 CONTEXT

The constraints related to the natural environment were first identified during the winter of 2022 using various sources of general information. These constraints are detailed in two technical notes pertaining to the terrestrial environment (Technical Note 6) and the marine environment (Technical Note 7) respectively. These were drafted in March 2022. However, as the information gathered on the receiving environment made it possible to identify potential constraints, this information was shared with the teams working on the development of preliminary scenarios for the location of the planned infrastructures. This information sharing aimed to optimize the proposed infrastructure throughout its development. In addition, Technical Notes 6 and 7 identify the main gaps in the available information and include recommendations to clarify certain constraints during the next phases of the proposed infrastructures study.

In addition, consultations with land users also allowed to identify several constraints, some of which are directly related to the value that local communities place on the natural environment. These constraints are described in Technical Note 3 and are discussed in the second chapter of this technical note.

In addition, a photointerpretation of the natural environment and a 10-day field campaign were carried out in the summer of 2022 along the area targeted by the proposed extension roadway towards the communities of Whapmagoostui and Kuujjuarapik, in the context where this portion of the proposed infrastructure is at the feasibility stage. The information gathered provides a more accurate picture of the natural environment crossed.

This chapter first highlights how the constraints associated with the natural environment identified in the pre-feasibility study were considered in the development of the proposed infrastructures. Secondly, recommendations for further optimization of the proposed infrastructures in the next stages of the study are presented. These recommendations also consider the more precise information on the receiving environment obtained in the summer of 2022 for the SA2.

3.2 CONSIDERATION OF CONSTRAINTS IDENTIFIED AT THE PRE-FEASIBILITY STAGE

In general, it should be noted that the various studied options for linear infrastructures considered the presence of aquatic habitats and wetlands which are ecologically sensitive habitats in addition to constituting physical obstacles. In addition, the major physical constraints related to topography and geomorphological characteristics, as well as the presence of proposed protected areas, were also considered from the outset with the available information.

As far as aquatic habitats are concerned, the various proposed alignments avoid lakes almost systematically, while the number of watercourse crossings has been minimized as much as possible, for both technical and environmental reasons. In addition, the preliminary sites chosen for the watercourse crossings consider the width of the watercourses, in order to minimize the length of the required structures.

As with the lakes, an effort was also made to minimize encroachment into the wetlands. These ecologically valued sites also represent a technical constraint given the low bearing capacity of the soils that often characterize wetlands, particularly peat bogs, which are particularly abundant in the proposed infrastructure area. Nevertheless, due to their considerable abundance in northern Quebec, it is impossible to completely avoid wetlands.

The following sections provide additional details on how the design of each of the proposed infrastructure components has taken into account constraints related to the natural environment.

3.2.1 ROAD 167: UPGRADE & EXTENSION TO TRANS-TAIGA

The extension of Route 167 to the Trans-Taiga Road is the easternmost component of the proposed infrastructure (SA3). Due to its location near the geographic center of Quebec, this area is located near the headwaters of the watersheds. Thus, the watercourses are generally smaller than in SA1 and SA2, which are located much closer to the downstream end of the major watersheds crossed. Lakes are, however, very abundant, although large lakes are rare. Although water bodies are generally smaller than in the other two study areas, the relative area occupied by water bodies is greatest in SA3. On the other hand, wetlands are much less abundant than in the study areas located closer to James Bay and Hudson Bay (SA1 and SA2). The great sinuosity of the preliminary study alignment for the northward extension of Route 167 therefore reflects the efforts devoted to avoiding the many lakes in the area.

Other identified constraints include the presence of a proposed biodiversity reserve and two protected area land reserves, one of which is subdivided into three separate sections. The preliminary alignment not only avoids these areas, but also has the advantage of running west of the Aawitakuch Protected Area Reserve, thus avoiding the future road running between two separate sections of this reserve.

Lastly, SA3 is occupied by both migratory caribou and woodland caribou, both of which are valued by the Cree communities. However, from an ecological point of view, woodland caribous are particularly sensitive to the proposed infrastructure since they are a species with a precarious status that occupies the study area during critical stages of its life cycle. The data provided by the MFFP during the pre-feasibility study indicate that the three woodland caribou herds present in the SA3 (Caniapiscou, Reconnaissance and Témiscamie herds) mainly use the southernmost part of SA3, as well as the eastern half of it. It was therefore recommended that the proposed road alignment be located as much as possible in the western half of the area to minimize the impact on this species, which is the case.

3.2.2 RAILWAY: RUPERT TO LA GRANDE

The proposed railroad extension from km 257 to La Grande is located within SA1. This area is highlighted by the presence of the Billy-Diamond Highway, which crosses SA1 from south to north, approximately 100 km east of James Bay. It is preferable from both a practical and environmental point of view that the future railroad be located near the existing road. This is especially important since SA1 is characterized by the presence of several large rivers and it is therefore often advantageous to locate the river crossing sites near the Billy-Diamond Highway crossing sites, which are a priori located on optimal sites from a technical point of view. The presence of the Billy-Diamond Highway therefore had a great influence on the proposed preliminary alignment of the railroad.

In terms of water environments, the SA1 has very different characteristics from the SA3. In fact, SA1 is marked by the presence of several large rivers, but lakes are generally less abundant and water bodies generally occupy a relatively smaller area than in the other two study areas. The avoidance of lakes is therefore generally less restrictive. In addition, a few particularly sensitive aquatic habitats were identified in SA1 during the pre-feasibility stage. A major walleye spawning ground was identified in the upstream portion of Yasinski Lake, just off the Billy-Diamond Highway culvert (west side). As a result, the preliminary railroad alignment was modified at this location to run east of the Billy-Diamond Highway rather than west as originally envisioned. Nevertheless, the Billy-Diamond Highway is located between two closely spaced lakes at this site, making it a particularly sensitive area for the addition of the proposed transportation infrastructure. An important sturgeon spawning ground has also been identified on the Eastmain River about 500 m upstream (east) of the Billy-Diamond Highway bridge. In this area, however, the preliminary site of the future railway bridge is located just downstream of the spawning ground. The bridge location could likely be optimized during the next steps, in order to minimize the impacts on this spawning ground, notably during the construction phase.

With respect to wetlands, they are abundant in SA1 and often considerable in size. Thus, although the rail alignment seeks to avoid these environments, it is impossible to avoid them completely. This is particularly the case for a segment about 30 km long just south of the Eastmain River, where wetlands occupy large areas.

Of the three study areas, SA1 has the greatest number of protected areas, three of which are near or crossed by the Billy-Diamond Highway. In this context, some of the protected areas in SA1 have the potential to conflict with the proposed railroad alignment.

- In the southern portion of SA1, the Billy-Diamond Highway crosses the eastern end of the proposed Waskaganish Biodiversity Reserve in three locations (approximately 15 km in total), while it closely borders the Waskaganish Protected Area Reserve, as it is 500 m east of this reserve in two locations. As for the existing road, the proposed railway alignment also crosses the proposed Waskaganish Biodiversity Reserve for short distances. However, as the proposed alignment is on the east side of the Billy-Diamond Highway, it avoids any encroachment on the Waskaganish Biodiversity Reserve for protected area purposes.
- Further north, the Billy-Diamond Highway runs through or along the proposed Paakumshumwaau-Maatuskaau Biodiversity Reserve for almost 70 km but since it's located within a 1 km wide corridor that is excluded from the reserve, the road is considered to have no impact on protected areas. However, since the railway design criteria do not allow the railway to follow all the highway curves, the proposed railroad alignment cannot remain within that same 1 km wide corridor, therefore small occasional encroachments on the reserve protected areas are unavoidable

With respect to caribou, MFFP data indicate that migratory caribous are mainly present in the northern portion of SA1, while three woodland caribou herds (Assinica, Nottaway and Reconnaissance herds) frequent the southern portion of the study area or its immediate surroundings. It should be noted that caribous are very sensitive to the presence of transportation infrastructure. The quality of caribou habitat throughout the area along the Billy-Diamond Highway is therefore relatively low and the location of the proposed railroad adjacent to the highway will not significantly affect habitat quality. It would be much more detrimental to caribous if the proposed railroad was located away from the existing road, as this would decrease the potential for better quality habitat for the species.

3.2.3 ROAD AND RAILWAY EXTENSION: LA GRANDE TO WHAPMAGOOSTUI/KUUJJUARAPIK

The extension of the Billy-Diamond Highway and a railroad to the communities of Whapmagoostui and Kuujjuarapik crosses the entire land portion of SA2, from south to north.

With respect to water environments, the SA2 has intermediate characteristics between the SA1 and SA3. There are many lakes and a few major rivers, mainly at the two extremities of the study area (La Grande River to the south and Great Whale River to the north). The presence of several very elongated lakes that generally run east-west, i.e., perpendicular to the proposed infrastructures, is also a particularity of the SA2. These lakes may require significant detours to bypass them or, if they are narrow enough, long structures to cross them, as in the case of a large river. These constraints make the proposed road alignment relatively winding, especially in its central part where lakes are more abundant.

For wetlands, the general information sources considered in the pre-feasibility stage indicated that wetlands were much less abundant in the SA2 compared to SA1. However, as mentioned in Section 3.3, the photointerpretation conducted as part of the feasibility study for the road infrastructure indicates that wetlands are much more abundant than anticipated in the SA2. Thus, although the proposed road alignment is intended to avoid these environments as much as possible, many encroachments are unavoidable.

As described in Technical Note 11, the current proposed road alignment, shown on Figure 1-1, is very similar to the concept from 2013 proposed inland, 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 *Rivière-Kanaaupscow-et-Lac-Kukamaw* as it avoids it completely. 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.

Regarding caribou, only migratory caribous, which are less vulnerable to the proposed infrastructure than woodland caribous, inhabit SA2 according to the data provided by the MFFP. The presence of this species is therefore less of an issue for this portion of the proposed infrastructure. Nevertheless, as mentioned for SA1, it would be beneficial if the two transportation infrastructures (road and railroad) were located close to each other.

3.2.4 HARBOUR IN WHAPMAGOOSTUI/KUUJJUARAPIK

The main environmental constraints identified for this proposed infrastructure is the increased marine traffic which will increase the risk of collisions with marine mammals, the increased risk of water and sediment contamination and the increased risk of introducing invasive alien species (refer to Technical Note 7 for more details).

The general technical criteria that were used to identify the most optimal location (ice impacts, sediments accumulation, accesses, etc.) also have a positive effect on the environment, i.e., it reduced the risks of pollution and contamination and reduced the frequency of dredging operations. In addition, the selected site will allow for a potential conversion to a deep-water port, which would reduce the impacts of building a second facility to replace the harbour. In addition, it should be noted that the proposed site is located south of the entrance to Manitounuk Passage. According to available information, this site is outside of important areas for beluga whales, polar bears, and migratory birds. Furthermore, no conservation or protected areas are in the vicinity of the proposed site.

On the other hand, a flat foreshore, which seems to be essentially composed of bare sand, would be located at this site. For the terrestrial portion, an ombrotrophic peat bog could be located near the planned harbour site. Finally, this area is located near a general area of use by the peregrine falcon and the golden eagle. Despite the presence of these few valued natural components, the selected site seems to offer several advantages from a technical and environmental point of view.

3.3 ENVIRONMENTAL RECOMMENDATIONS

3.3.1 LINEAR INFRASTRUCTURES (ROADS AND RAILWAYS)

As mentioned previously, the photointerpretation carried out in the summer of 2022 in the SA2 as part of the feasibility study for the roadway infrastructure made it possible to determine the location of the wetlands along the proposed road to Whapmagoostui/Kuujuarapik. It turns out that wetlands are much more abundant than anticipated. Thus, although it is not possible to completely avoid these areas, the proposed alignments (roadway and railway) should be locally optimized to minimize encroachment into these sensitive habitats. For the two remaining study areas (SA1 and SA3), a photointerpretation should also be undertaken to determine the location of wetlands and to optimize the proposed alignments in this regard. A maximum of wetlands should be avoided, while encroachment into unavoidable wetlands should be minimized as much as possible. The proposed infrastructures will still involve some encroachments into wetlands, primarily in SA1 and SA2. In this regard, it is recommended to meet with the responsible authorities (MELCC) in advance to clarify their requirements in relation to compensation for the loss of wetlands in the context where the compensation regime for the loss of wetlands and water bodies does not apply to the James Bay territory under the *Regulation respecting compensation for adverse effects on wetlands and bodies of water*.

With respect to water environments, although the proposed alignments generally avoid lakes, some specific optimizations will be required on each alignment to avoid them completely whenever possible. In the case of Yasinski Lake located in SA1, it is also recommended that an alternative alignment be developed, that would pass further away from the Billy-Diamond Highway, in order to avoid a particularly sensitive site where the Billy-Diamond Highway runs between two lakes located very close to each other and where there is a significant walleye spawning ground. In addition, for all proposed watercourse crossings, a detailed characterization of the watercourses will be required on both sides of crossing sites to characterize the crossed aquatic habitats. This information will help optimize the location of the crossing sites from an environmental perspective and guide the detailed design of the crossing structures, particularly with respect to the need to maintain free fish passage on small streams. Since the proposed infrastructures will inevitably result in some encroachment into fish habitat, compensation will be required. During the next stages of the proposed infrastructures study, it is recommended that the anticipated impacts be presented in advance to the responsible authorities (DFO and MFFP) and that compensation options be explored in collaboration with them.

In terms of protected areas, discussions will be recommended in the short term with government authorities to ensure that the various components of the proposed infrastructures are compatible with the proposed protected areas, particularly for SA1, where several potential conflicts have been identified (encroachments caused by the rail line or closures within 500 m). In addition, during these discussions, the potential for new protected areas to be created should also be discussed, to ensure that the proposed infrastructures will be considered where appropriate.

For caribou, the relevance of conducting aerial inventories to validate the presence of woodland caribou wintering areas within a 10-km zone on either side of the proposed alignments could be evaluated during the next stages of the proposed infrastructures study. Such data would make it possible to specify the impacts of the proposed infrastructures on woodland caribous during the winter period.

The change in land category (from II to III) caused by the presence of transportation infrastructures should be considered under the regime applicable to Category II and III lands:

- The proposed railway alignment from Rupert to La Grande, located in the SA1 is entirely on Category III lands;
- The proposed Route 167 extension, located in the SA1 is entirely on Category III lands;
- The proposed railway and roadway extension from La Grande to Whapmagoostui/Kuujuarapik, located in SA2 is partly located on Category III lands (33.6%), on Chisasibi Category II lands (47 %) and a fewer portion on Whapmagoostui Category II lands (14 %) and Category I lands (5,4 %). For this corridor, discussions with the respective administrators on the assessment of potential impacts if the infrastructures are accepted will be very important, including the possibility of replacing affected Category II lands;
- The proposed harbour in Whapmagoostui/Kuujuarapik, located in SA2 is entirely on Category III lands.

Lastly, although the summer 2022 field campaign did not identify any terrestrial habitats of particular interest in the SA2, the field inventories that will be carried out during the impact study phase will have to focus on the possible presence of such habitats. In this regard, the area along Hudson Bay at the northern end of the SA2 will again require special attention, as it has some potential for plant species of precarious status.

3.3.2 HARBOUR INFRASTRUCTURE

In the next stages of the proposed infrastructure study, additional studies will be required to confirm that the area targeted for harbour construction is not an important habitat, for example for capelin reproduction (a sensitive element), given that the majority of the available information is over 20 years old. The studies to be carried out will also have to ensure that the proposed infrastructure does not cause significant changes in a valued habitat located nearby. As such, the area surrounding the selected site should be surveyed to locate any significant seagrass or coastal habitat. A detailed vegetation inventory should also be conducted, as the entire area along Hudson Bay is considered suitable for some species of flora of special concern. Finally, if the presence of a shoreline peatland is confirmed, it should be avoided if possible or encroachment into it should be minimized. However, shoreline bogs are common in the Hudson Bay area.

4 CONSTRAINTS & RECOMMENDATIONS RELATED TO THE ARCHAEOLOGICAL SITES

4.1 CONTEXT

Archaeology and cultural heritage were assessed for La Grande Alliance Phases II and III in Technical Note 4. At the prefeasibility stage, baseline information regarding all known heritage sites was collected.

Following the identification of proposed alignments for each of La Grande Alliance proposed infrastructures, the archaeological impacts were evaluated. This effort aimed at planning impact mitigation over heritage sites for future steps of La Grande Alliance study. Recommendations are ultimately proposed to support an exemplary practice of sustainable management for heritage sites.

Cultural heritage sites of all sorts and periods were considered. Archaeological sites, funerary sites, birthplaces, spiritual or ritual sites, harvesting areas, portages or any other place of historical significance were thus included in both terrestrial and marine environments. Consulted sources comprise written sources, such as archives, government databases and published documents, but oral sources were also considered through ongoing engagement activities and interviews with local Cree land users. The Cree Nation Government and subsidiary services offered ongoing support in securing access to various local data sources. In addition, a five-day field surface inspection helped identifying additional sites and validating proposed zones of archaeological potential.

4.2 HERITAGE SITES AND AREAS OF HERITAGE INTEREST

A brief history of the natural environment and human occupation in Eeyou Istchee provide a general context for the presentation of the results. Paleoenvironmental sources suggest that human occupation of this vast territory began sometime after 8000 before present (BP), but most probably after 6000 BP. However, current archaeological data imply that Paleoindian and Inuit occupied the northern end of Eeyou Istchee, in SA2, since about 4500 BP. For the Crees and their ancestors, archaeological data establish their presence in southern Eeyou Istchee since at least 4200 BP. This group eventually occupied the totality of the territory starting from about 2000 BP when the environment reached conditions close to the current. Non-Indigenous presence in Eeyou Istchee officially begins with the arrival of Henry Hudson in AD 1611.

A total of 221 archaeological and other heritage sites are recorded throughout the three study areas and relate to the three cultural groups presented above. All known sites are located on land, but maritime and underwater sites may also be present in coastal, riverine, and lacustrine environments. This resource can be described very succinctly as highly valuable, but poorly investigated.

The sites concentrate in ten Areas of Heritage Interest (AHI), which highlight the most sensitive sections of Eeyou Istchee. The AHI concentrate near Whapmagoostui (SA2) and inland from Wemindji (SA1). Most AHI near Whapmagoostui also hold human burials, which are the most sensitive of all cultural sites. This is also where the proposed infrastructure presents a higher risk of impact. However, the extent of research is uneven across this vast territory. Research thus remains insufficient to accurately define the limits of the sensitive areas and more accurate data may help to propose more specific recommendations.

Also, absence of sites or of AHIs in parts of the study area may not necessarily mean that it has low or no heritage value. This apparent void may simply be the consequence of a lack of data. That is particularly striking in the marine and estuarine environments of the Hudson Bay coast, where traffic may have been notable during the fur trade era. Additional research may thus help to refine current AHIs, as well as to define other sites and AHIs. Such effort will especially be important over impacted areas of La Grande Alliance study, to accurately assess the risk of impact and propose specific avoidance, mitigation, and compensation strategies.

The following sections provide additional details on the results regarding known heritage sites and AHI. There are based on the three zones that comprises the Study Areas namely:

- Study Area 1 (SA1): Railway along the Billy-Diamond Highway—Rupert—La Grande;
- Study Area 2 (SA2): Road & Rail Extension, and Harbour—La Grande—Whapmagoostui/Kuujuarapik;
- Study Area 3 (SA3): Route 167—Renard Mine—Trans-Taiga Road.

4.2.1 STUDY AREA 1 (SA1): RAILWAY ALONG THE BILLY-DIAMOND HIGHWAY—RUPERT—LA GRANDE

The railway corridor proposed for phase II of La Grande Alliance SA1 includes 35 of the heritage sites, out of which 28 have moderate to high value. All sites are affiliated to the Crees and their ancestors. They are located on Wemindji hunting grounds, at the exception of three sites pertaining to Eastmain, Waskaganish, and Nemaska territories.

Four AHI of small superficies have been defined within SA1. All are associated to Wemindji hunting territories.

- WEM01 covers 26 km² of land on the eastern edge of the Robert-Bourassa Reservoir. It relates to a concentration of 20th century occupations and to the end of the Eeyouch nomadic way of life. It is considered as high priority in terms of avoidance, mitigation, and compensation.
- WEM02 has a surface of 10.3 km² where late paleohistorical sites concentrate. It is considered as moderate priority.
- WEM03, with 115.4 km², should be considered of the highest priority because sites of this area attest to the transition between paleohistorical and colonial (post AD 1611) eras. One of these sites is also one of the rare paleohistoric stone quarries so far registered within Eeyou Istchee.
- WEM04 attests of the ongoing occupation from early paleohistory through the colonial period over a surface of 12.8 km².

4.2.2 STUDY AREA 2 (SA2): ROAD & RAIL EXTENSION, AND HARBOUR—LA GRANDE—WHAPMAGOOSTUI/KUUJJUARAPIK

The railway and roadway extension corridors proposed for phase III of La Grande Alliance SA2 are heritage-rich, with 102 sites out of which 87 have moderate to high heritage value. All sites attest to the Indigenous occupation of the territory, including Inuit, Paleoinduit, Crees and their ancestors. Many sites have only been cursorily investigated so that their exact cultural affiliation remains uncertain. Sixty-six are located within Whapmagoostui hunting territories and 36 on Chisasibi hunting grounds.

Six AHI have been defined within SA2. CHI01 is the only one within the Chisasibi territory, with two neighbouring paleohistorical sites (0.1 km²). The other five are in Whapmagoostui territory.

- WHA01 is by far the largest and most important of all, with 80 sites scattered over a 555.6 km² area, encompassing the totality of the village of Whapmagoostui/Kuujuarapik, a large section of the coast, and the estuary of the Great Whale River. It holds multi-millennial gathering sites of the Inuit, Paleoinduit, Crees and their ancestors, as well as Europeans who established trade posts at some of these locations. Two burials are

also identified within WHA01. A very high avoidance, mitigation and compensation priority should thus be considered for this AHI in further phases of the study if the proposed infrastructures affect it;

- WHA02, which covers 28.7 km² and holds at least 30 Indigenous burials in six distinct sites. A unique site attesting of the forced deportation and sedentarization of the Lake Tasiujaq Inuit is also reported. A moderate level of priority is assigned to this AHI;
- WHA03 holds an ensemble of nine sites from the early colonial era where Inuit, Crees and Europeans coexisted and exploited marine mammals, mined copper, and traded, in connection with the Little Whale River trading post (AD 1749–1759; 1787–ca. 1819; ca. 1851–1880; 1882–1890). Europeans based at the trade post also reportedly wintered their ships in strategic areas of the AHI;
- WHA04 holds one burial site, at the mouth of the Second River and WHA05 counts a single site which may be a very old occupation, perhaps linked to the colonization of the Eeyou Istchee by Crees ancestors. These last two AHI have been assigned a moderate level of priority.

It should be noted that, during the Study, the proposed roadway from La Grande to Whapmagoostui/Kuujuarapik was brought up to a feasibility stage and thus led to an assessment of the archaeological potential and the risk of impact over the archaeological heritage. The study area was a 270 km long and 1 km-wide corridor.

Zones of archaeological potential were defined based on all available information synthesized in a cultural-historical file, as well as a geospatial database. Attributes used in the analysis corresponded to criteria commonly used in Québec archaeology. Selected attributes helped determine if conditions of occupation were suitable or unsuitable, thus suggesting the potential presence of campsites, portages, permanent settlements, industries, transportation, communication networks and other types of heritage sites, beyond strictly archaeological sites.

A total of 1,422 zones of archaeological potential have been identified within the planned road corridor. Most of the areas, however, have nil to low potential, due to extensive disturbances, other unfavourable attributes, or few favourable attributes. The rest comprises 550 zones with moderate and 218 with high archaeological potential. These zones are sensitive because they could hold traces of past Indigenous occupation, including the Inuit, Paleoindian, Crees and their ancestors. Traces of non-Indigenous activity may also be found in this northernmost portion of the study area due to the proximity of a former Hudson's Bay Company trading post.

Inspections were then carried out by helicopter, with two archaeologists landing in areas where remains were potentially identified and where observation from the air was limited by dense tree cover. Landing was, however, reduced to a minimum due to a helicopter breakdown, taking almost three entire days out of the five days planned for on-site validation. Nevertheless, this validation process helped refining the proposed limits of zones and their level of archaeological potential.

From a general perspective, the study area of the feasibility study bears considerable interest regarding Indigenous occupation, with the Crees and their ancestors living throughout the study area, and the Inuit and Paleoindian living at the northern end. Traces of their presence may concentrate along main rivers and lakes, close to travelling routes and resources that could sustain their way of life, such as game, fish, plants, minerals, and stones.

The northern extremity of the study area is encompassed by WHA01. This AHI is particularly sensitive for its archaeological and heritage, encompasses 40 archaeological potential zones, and should be the object of greater efforts regarding avoidance, mitigation and compensation strategies. Available historical data have shown nil to low potential for non-Indigenous occupation, except for the northern portion of the study area, near Great Whale River.

Available data regarding possible maritime heritage are scant. Maritime heritage sites can be expected near areas of higher traffic where two major trade posts were established and where human groups gathered, for example at the Great Whale and Little Whale rivers estuaries. Special care for documenting possible underwater and maritime heritage should thus be taken there if the development of the proposed harbour is deemed valuable by the communities.

In context of road construction, any kind of ground-level work or site layout within a moderate or high potential zone is at risk of impacting heritage sites. This is because most sites lay at very low depth into the ground and are thus vulnerable to any kind of site layout, even the most superficial.

4.2.3 STUDY AREA 3 (SA3): ROUTE 167—RENARD MINE—TRANS-TAIGA ROAD

Six heritage sites are reported for SA3, on Chisasibi hunting grounds. They are limited to its north-western corner, on lac Des Voeux, 6 km north of the Trans-Taiga Road. All date back to the 20th century. This territory has been the object of very limited research, hence this low number of sites.

No AHI is identified within SA3 for this reason.

4.3 ARCHAEOLOGICAL RECOMMENDATIONS

If the proposed infrastructures (all or separately) are deemed valuable by the communities, there is still a lot of work to be carried out regarding the preventive management of heritage sites, particularly when planning the future steps of La Grande Alliance proposed infrastructures.

4.3.1 DATA LIMITATIONS

Future stages of the proposed infrastructure development may include further work to highlight additional information regarding inventoried sites of the study area. This work should provide authorities and project proponents with a more complete archaeological database, including valued sites within the 40 km-wide corridors over the proposed alignments. Distinguishing Inuit/Paleo Inuit from First Nation sites was not always possible due to limited data. Any site survey or excavation should attempt to provide this distinction if data become sufficient to allow such an exercise.

Although no marine heritage site was identified, the Great Whale and Little Whale rivers estuaries stand out for their potential marine heritage. Any proposed infrastructure within their vicinity will require further investigation. Engagement of local community members and authorities is strongly recommended as part of such an exercise.

4.3.2 AVOIDANCE AND MITIGATION

The following elements will help generate quality archaeological potential studies and field surveys, which will be necessary for developing reliable avoidance and mitigation strategies:

- 1 State-of-the-art methodologies integrating recent and past research in Eeyou Istchee, integrating both land and underwater environments.
- 2 Specialized analyses of material culture, animal bones, soil samples or charcoal samples.
- 3 Complementary ethnographic interviews with land users documenting all locations with potential heritage value and events, including field visits.
- 4 Archival research focused on potential land and underwater sites, notably trade posts journals.
- 5 High definition and recent lidar and satellite imagery because it is currently only partially available for the study area.
- 6 Remote sensing, including sidescan, multibeam sonar, and possibly magnetometer in impacted underwater areas with higher potential (e.g., Little Whale River and Great Whale River estuaries and the coast in their vicinity).
- 7 On-site validation of selected zones of archaeological potential, including land and underwater locations.

Avoidance should be considered for sites with moderate or high heritage value. If this is not possible, excavation may be required. When relevant, the following should also be considered to help interpret the excavated sites and guide the next phases of the proposed infrastructure development.

- 1 Paleoenvironmental site reconstruction through, mainly, geomorphology, palynology, dendrochronology and/or macrofloral remains.
- 2 On-site ethnographic interviews with their occupants and/or descendants exploring themes of specific interest for each site.
- 3 Laboratory interviews joining the occupants and artifacts, exploring themes connected to recent material culture (e.g., technology, autonomy, skills, learning, wellbeing).
- 4 Archival research about the historical context of the excavated sites (e.g., fur trade, cohabitation with other cultural groups, experience of colonialism and forced sedentarization).
- 5 Specialized analyses of material culture, animal bones, soil samples, charcoal samples, etc.

WHA01 is most sensitive to development considering that it has rich archaeological heritage and potential. Impact could be established if the road itself or any other associated infrastructure would crosscut moderate or high potential zones. It is consequently recommended that zones of moderate and high archaeological potential within WHA01 be avoided. If avoidance is not possible, impacted zones of this AHI should be the object of further mitigation. In these situations, mitigation should begin with an archaeological survey entailing visual inspection and test pits, with spacing of no more than 10 m, and 5 m to 3 m in the vicinity of archaeological sites (<100 m). This methodology will provide data required to properly assess site presence, concentrations, and peripheral limits. It will also help to determine if further mitigation is necessary. The scale of the effort required for further mitigation could also be established in the process.

Outside WHA01, zones with moderate and high archaeological potential should also be the object of further mitigation if the planned road (or railway) impacts them. In this case, an archaeological survey with visual inspection and test pits is recommended. Spacing between test pits should ideally be the same as within WHA01.

In zones of low to nil potential, impact risk on the archaeological heritage is considered insufficient to recommend any further mitigation. However, an archaeologist should be consulted if the planned road (or railway) and associated infrastructure should deviate outside of the study area.

4.3.3 COMPENSATION

Compensation should be considered for impacted sites with higher heritage value, but also outside of the identified impacted zone, i.e., beyond the 40 km-wide corridor over the proposed alignment and AHI, where places of significant heritage value may already be identified. These measures are expected to help generate support towards La Grande Alliance study and possibly facilitate acceptability for other aspects of the proposed infrastructures by responding to local needs.

- 1 Select and design specific compensation measures with community stakeholders.
- 2 Develop an integrated strategy of community engagement with other disciplines involved in La Grande Alliance study, for the design and execution of mitigation work.
- 3 Favour in-community expenditures such as hiring local workers and rent locally available equipment.
- 4 Burial site monitoring and stabilization of areas at risk.
- 5 Commemoration at burial sites (e.g., ceremony and commemorative plaque).
- 6 Awareness, promotion, and development of heritage sites supporting the culture, health, economy and tourism of concerned communities (e.g., awareness activities promoting community bonds, healing and shared history, exhibitions, tourist circuits and excursions, interpretation panels, as well as research and publications supporting local development).

5 RECOMMENDATIONS SUMMARY

If the proposed infrastructures (all or separately) are deemed valuable by the communities, it would be important to:

- 1 Engage with the Inuit to consult their stakeholders and review the existing documentation regarding them;
- 2 Maintain a Cree liaison team made of the CIO of each Cree community and a Cree liaison officer within the consultant team, and other local Cree associate(s). This format guaranties that the engagement activities of the Cree are led by Crees, meaning that the interviews are conducted in Cree and translated in English to the consultant's anthropologist, for note taking;
- 3 Promote, as much as possible, the ownership of the proposed infrastructures (construction and operation) by the Crees, and to a lesser extent the other First Nations and the Inuit;
- 4 Carry out a Health Impact Assessment [HIA] to determine mitigation and improvement measures specific to the health of the communities with a gender-differentiated, intersectional analysis approach (GDA+) to understand the differentiated impact on different groups such as youth, women, hunter-trappers, workers, etc.;
- 5 Continue to engage with the Cree land users and both Cree and Jamesian stakeholders to identify detailed localized mitigations measures that could be implemented to protect as much as possible the integrity of the harvesting areas and the Highly Sensitive Areas (HSAs) and to alleviate the impacts on the territory;
- 6 Further environmental studies are required to:
 - a Validate the presence of woodland caribou wintering areas;
 - b Determine more precisely the location of wetlands for the pre-feasibility infrastructures components;
- 7 It is recommended to meet with the authorities concerned (MELCC) to clarify their requirements in relation to compensation for the loss of wetlands in the context where the compensation regime for the loss of wetlands and water bodies does not apply to the James Bay territory under the *Regulation respecting compensation for adverse effects on wetlands and bodies of water*;
- 8 In terms of protected areas, discussions will be recommended in the short term with government authorities to ensure that the various components of the proposed infrastructures are compatible with the proposed protected areas;
- 9 The change in land category (from II to III) caused by the presence of transportation infrastructure should be considered;
- 10 Further archaeological studies and field surveys are required considering that the extent of research is uneven across this vast territory. Research thus remains insufficient to accurately define the limits of the sensitive areas and more accurate data may help propose more specific recommendations;
- 11 Harbour:
 - a Special care for documenting possible underwater and maritime heritage should be taken in the Great Whale and Little Whale rivers estuaries, if the development of the proposed harbour is deemed valuable by the communities;
 - b Given that most of the available information is over 20 years old, additional field environmental studies will be required to confirm if the proposed location is an important habitat, for example for capelin reproduction (a sensitive element) or if the proposed infrastructure does not cause significant changes in a valued habitat located nearby such as seagrass, shoreline peatland, flora species or coastal habitat.

TECHNICAL NOTE 17 – PERFORMANCE EVALUATION

It is recommended to take into consideration, in the detailed engineering, the mitigations and localized optimizations listed in the table below:

Table 5-1 Potential Mitigation Measures

POTENTIAL IMPACTS	MITIGATION MEASURES AND OPPORTUNITIES
Safety	<ul style="list-style-type: none"> Adjustments to answer the specificity of the proposed infrastructures, being of remote northern location and sparsely populated area with long distances and low traffic volume.
Highly sensitive area	<ul style="list-style-type: none"> Alignment optimization and/or localized adjustments Specific accommodations
Protected Area	<ul style="list-style-type: none"> Alignment optimization and/or localized adjustments
Archaeology site	<ul style="list-style-type: none"> Alignment optimization and/or localized adjustments Conduct the required study/investigation of the site before construction Specific accommodations
Caribou migration corridor	<ul style="list-style-type: none"> Alignment optimization and/or localized adjustments Specific accommodations for animal crossing (fences, wildlife crossings) Specific laws and regulations for endangered species: <i>Act Respecting Threatened or Vulnerable Species</i> [Québec] <i>Species at Risk Act</i> [Canada] Protection measures (Predator control, fencing, etc.) Compensatory measures Developing a conservation plan in partnership with the MFFP and Nature Québec
Important bird area (IBA – ZICO)	<ul style="list-style-type: none"> Specific laws and regulations for bird conservation Developing a conservation plan in partnership with Birds Canada, Nature Canada and Nature Québec Protection measures Field surveys to identify and preserve bird habitat
Habitats (Moose, caribou, bear or other)	<ul style="list-style-type: none"> Alignment optimization and/or localized adjustments Specific accommodations for animal crossing (fences, wildlife crossings) Animal Warning System (rail transport)
Hunting or trapping area	<ul style="list-style-type: none"> Alignment optimization and/or localized adjustments Parking lot out of sight of the motorists Appropriate road signs according to land category (I, II or III) Specific accommodations for animal crossing (fences, wildlife crossings) Animal Warning System (rail transport)
Fishing activity	<ul style="list-style-type: none"> Alignment optimization and/or localized adjustments Parking lot out of sight of the motorists Appropriate road signs according to land category (I, II or III) Boat ramp
Navigation by boat	<ul style="list-style-type: none"> Alignment optimization and/or localized adjustments Parking lot out of sight of the motorists Appropriate road signs according to land category (I, II or III) Boat ramp Specific accommodations for portage Specific accommodations for the passage of boats

TECHNICAL NOTE 17 – PERFORMANCE EVALUATION

POTENTIAL IMPACTS	MITIGATION MEASURES AND OPPORTUNITIES
Snowmobile or ATV trails	<ul style="list-style-type: none"> — Alignment optimization and/or localized adjustments — Specific accommodations for the passage of snowmobiles
Mining right claim	<ul style="list-style-type: none"> — Alignment optimization and/or localized adjustments — Determine the projected activities and the possible coexistence with the title owner
Use of the Route de l'Évacuateur	<ul style="list-style-type: none"> — Proposed road parallel to the existing one — Coordination with HQ — Moose hunting is permitted to non-natives along the road — Appropriate Road signs according to the allowed activities and land category (I, II or III) — Cree cultural site — Specific accommodations (for example a parking lot out of sight of the motorists)

6 ADDITIONAL CONSIDERATIONS: CREE CULTURE PRESERVATION

Although this study was conducted without the formal express mandate to analyze the impact of future infrastructure development on Cree cultural preservation or cultural heritage, this topic was frequently brought up during community engagement sessions. So, for WSP and Maamuu, this concern could not be ignored and left out of the La Grande Alliance analysis. Our study tracked 221 Areas of Heritage Interest (AHI) in the three infrastructure corridors under analysis (see Technical Note 4), but we understand that cultural preservation involves more than AHIs.

6.1 DEFINITION AND EXAMPLES

UNESCO defines the conservation of cultural heritage as the measures taken to extend the life of cultural heritage while strengthening transmission of its significant heritage messages and values. In the domain of cultural property, the aim of conservation is to maintain the physical and cultural characteristics of the object to ensure that its value is not diminished and that it will outlive our limited time span. An alternative definition emphasizes the use of deliberate and well-designed approaches to maintaining the cultural heritage of the past for the benefit of present and future generations.

In practice, the Crees view cultural preservation as preserving the Cree way of life for future generations by honoring the past, living it in the present and transferring it to the youth. When Crees speak about the Cree way of life, ‘the land’ is at the centre. Its wildlife, Cree identity (language, the culture), values, ceremonies, traditional ways of healing, and more, all have the land in common. Culture is manifested by speaking in Cree, living on the land during cultural leaves, on weekends or permanently. Hunting, harvesting, feasting, customs, life cycle and rites of passage ceremonies (such as the first kill, the Walking Out ceremony), pow wows, Cree traditional knowledge about wildlife, healing, etc., are all concepts that reflect life how Cree live in deep connection to the land.

Preserving the land is then vital to sustaining the Crees’ cultural heritage and way of life. Protected areas are coherent with cultural preservation since these are “lands and waters that are recognized, dedicated and managed, in law or through other effective means, to ensure the long-term protection and maintenance of natural and cultural values”. Protected areas have criteria of cultural and ecological value associated with the land. Currently near nearly 25% or 100 000 km² of land is protected in Eeyou Istchee. This area is equivalent to the size of Iceland. It is expected that, by 2035, about 50% of the territory will be set aside for non-industrial purposes, protection of the environment, and the safeguarding of biodiversity. A decision will also be made in early 2023 on whether to increase the current protected area by 30% using additional conservation mechanisms that are being explored.

Protected areas are places where no industrial development is allowed. Industrial development means commercial forestry, mining, hydroelectricity, roads, heavy infrastructure, etc. In Eeyou Istchee, protected areas consist mainly of provincial parks and biodiversity reserves in which the Cree traditional way of harvesting, hunting, and fishing is allowed. In that sense, protected areas are usually preferred to maintain Cree way of life. Infrastructure development is not allowed in protected areas.

6.2 CULTURAL PRESERVATION IN EEYOU ISTCHEE

The Cree Nation Government has a Social and Cultural Development Department, which plays an important role in protection, promotion and expression of Cree culture and language. The Department manages various programs and services to revitalize Cree culture and empower Crees, locally and regionally. Similarly, there is the Environment and Remedial Work Department which count with a team working on the Protected Areas.

Aanischaaukamikw represents the vision of elders who have, over several decades, promoted the idea of a centralized place for the protection of “the ways”. The *Aanischaaukamikw* Cree Cultural Institute is in Ouje-Bougoumou, which is the primary location serving heritage preservation. This protection effort includes documents, media, artifacts, and objects designed for Cree knowledge preservation, conservation, and knowledge transfer. *Aanischaaukamikw* is the expression and expectation that Cree culture and language must be kept, maintained, shared, celebrated, and practiced.

The Chisasibi Cultural Heritage Center (CCHC) has a similar mission to protect, preserve, collect, research, and exhibit the history, heritage, culture, language, oral traditional teachings, customs, and values of the *Iyiyiyyuuch* and the Inuit of Chisasibi.

Each Cree community usually has a Cultural Coordinator to facilitate cultural programs and activities in the community.

6.3 CREE CULTURE PRESERVATION ACCORDING TO INTERVIEW PARTICIPANTS

Many participants view development projects as potentially inviting a repeat of past impacts on the land and on the Cree way of life. Elders emphasize that “the land is [Cree] culture; what we do when we go on the land is Cree culture.” Elders emphasize that “quality of life implies more than just the economy.”

Hydro-Quebec and forestry companies operating on Cree territory do not respect “our Cree way of life, land, and wildlife, and neither does the government.” Further, “there cannot be loss of language”. There must be “care for the land, and we need to do it collectively.”

Infrastructure development opens the territory to the exploitation of natural resources. New infrastructure development is changing the names of rivers and lakes that are now named either in French or in English, and “Cree names are erased.” Development generates ongoing impacts: Hydro flooding land around Chisasibi, mining around Otish Mountains area has destroyed a lake that cannot be used and where fish can no longer be harvested.

Greater access to the territory increases the risk for drugs and alcohol bootlegging, thereby ruining the lives of children and youth, and damaging the social fabric of communities, impacting the Cree way of life. Children and youth already do not “go to the land” as much as they should.

Cree knowledge must be acknowledged not only by the non-Cree but also by Cree leadership and organizations, who still under-acknowledge and under-utilize it. Cree knowledge is key to cultural preservation.

Development happened very fast. The great speed at which development interventions were carried out broadsided the Cree way of life. There has been little time to digest it and adapt to it.

The impacts on wildlife of Infrastructures, such as roads and railways, must be mitigated by not impacting their crossings. This is particularly true in the case of caribou and moose. Protecting wildlife will help to mitigate the impact of development projects on the Cree way of life.

6.4 RECOMMENDATIONS FOR CULTURE PRESERVATION

Conduct engagement sessions with the Cree public, and mostly with key informants who are specialized in Cree culture. Engaging Cree experts and key informants will help to better define what cultural preservation means, and what are the various dimensions that must be understood by development project proponents. Key informants could include staff from *Aanischaaukamikw*, CCHC, Cree trappers' association, Elders, cultural coordinators, academics, etc.

Carry out rigorous multidisciplinary research about the cumulative effects of past and current projects on Cree cultural preservation and the Cree way of life. This research must have a conceptual framework that can isolate the impacts of development projects from the overall social change affecting the Cree population. For example, the fact that people do not go out on the land on a regular basis is a consequence of “development” (new technologies, infrastructure projects in Eeyou Ischtee, etc.).

Planning must strengthen its focus on Cree knowledge. So far, archeological sites and artefacts' protection is helpful. But purposeful attention to Cree knowledge, such as medicine from the land, stories, legends, language, ways of life, elders' teachings, ways of the past, is lacking. Building an encyclopedia of Cree Knowledge, such as UNESCO's intangible heritage, could be a good start. The proposed infrastructure could combine ongoing research to gather, archive, develop and display Cree knowledge in an accessible format. This is important since the loss of every Elder is a blow to the preservation of Cree knowledge.