CREE DEVELOPMENT CORPORATION

LA GRANDE ALLIANCE

LA GRANDE ALLIANCE

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

TECHNICAL NOTE 5

IMPACTS ON THE COMMUNITIES IN THE STUDY AREA

FINAL VERSION

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EXECUTIVE SUMMARY

The objective of this technical note is to identify various impacts that La Grande Alliance proposed infrastructures could have on the Cree or Jamesian communities, other than those related to land use, which are addressed in Techincal Note 3. It addresses noise, water quality, air quality, health and social, employment and waste management impacts.

Construction activities will possibly be perceptible from a great distance depending on the topography and the presence of waterways having an influence on the sound propagation. During the operational period, the noise levels will vary greatly with the passage of vehicles and trains. The main sensitive areas identified regarding noise impacts are the communities of Kuujjuarapik/Whapmagoostui and Radisson. However, dwellings, camps, and other sensitive receptors will have to be further identified once the alignment and the construction and operation activities under study are defined.

The quality of drinking water could also be affected by the proposed infrastructures. All nine Cree communities in Eeyou Istchee - James Bay have drinking water systems. Pollutants associated with the construction and operation activities of roads and railways are primarily fine particles and other substances capable of affecting water turbidity. The potential for the quality of water bodies used as a source of drinking water to be affected is influenced by the distance between the activity site (including the operating roads) and a water body. Good construction practices and design techniques can mitigate or avoid these impacts.

Air quality would be affected in some areas due to the various air pollutants emitted during the construction and operation phases of the proposed infrastructures. Motorized machinery (land, marine or rail), the use of explosives, and traffic on unpaved roads are sources of air emissions that are likely to alter air quality over time. The storage and handling of petroleum products can also be a source of volatile organic compound emissions. GHGs and global warming potentials (GWPs) are also considered in this assessment.

The health and social component could otherwise be affected by La Grande Alliance infrastructures. The literature on comparable infrastructures has identified nine impact categories, with both positive and negative effects for the Crees and Jamesians. Among these are opening of the territory and increased mobility, destabilization of local traditions and culture, and tensions in social and family relations. Actions or follow-ups related to these impacts in order to mitigate, avoid or improve them have been identified. The engagement sessions carried out in Cree and Jamesian communities, within the framework of La Grande Alliance study, have made it possible to complete this table, both for the anticipated impacts and the actions or follow-ups to be considered.

La Grande Alliance infrastructures are also likely to lead to job or contract opportunities for the Crees. However, in order to maximize the benefits, a preliminary effort must be made to provide adequate training, in particular through the creation of a training committee involving local organizations.

Finally, as these proposed infrastructures would generate significant residual waste in a northern context, optimal management is recommended, such as integrating waste management considerations at the design stage through eco-design practices; appointing a waste management manager responsible for results to ensure that objectives are met, and installing clearly identified containers for the different types of waste generated on site. In fact, the waste management hierarchy, the waste segregation, the Envision certification and the leading practices will reduce the impact of waste on the land.

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1 IMPACTS IN BUILT-UP AREAS WITHIN STUDY AREA

1.1 NOISE IMPACT

The purpose of this section is to introduce the methodology of the noise impact study for La Grande Alliance study. It includes a list of the main equipment and activities that could generate noise during the construction and operation of the projected infrastructures. This section also identifies sensitive receptor areas (elements of the surrounding) that could be affected.

La Grande Alliance proposed transportation infrastructures components are presented in Table 1-1.

Table 1-1 La Grande Alliance proposed Infrastructures Overview

PHASE	ACTIVITY
Phase II	A 207 km road extension from La Grande to Whapmagoostui/Kuujjuarapik
	A 340 km railway from Rupert to La Grande
	A 376 km upgrade & extension of Route 167 to the Trans-Taiga Road
Phase III	A 219 km rail extension from La Grande to Whapmagoostui/Kuujjuarapik
	A Deepwater Port in Whapmagoostui/Kuujjuarapik (which was further redefined to a Small Craft Harbour (SCH), refer to Technical Note 13A)

1.1.1 METHODOLOGY

The following methodology was adopted:

- Identification of guidelines and standards to be followed during the study process;
- Identification of noise-sensitive areas in the vicinity of the infrastructures;
- Identification of significant potential noise sources based on the study descriptive and technical documents.

Table 1-2 Definition of acoustical units and terms used in this study

TERM OR UNIT	DEFINITION
dB	Decibels: relative unit of sound measurement on a logarithmic scale; a difference of 3 dB between two sound levels implies that the higher sound level is two times louder than the lowest.
dBA	Unit of sound weighted to take into consideration variation in human perception of some frequencies (A-weight correction).
dBAI	The A-Weighted sound level of a sound that exhibits impulsive characteristics.
dBZ	Unit of sound weighted to represent the direct noise level, unmodified by frequency.

TERM OR UNIT	DEFINITION
LAr	Sound level corrected with A-weight and expressed in dBA.
Ldn	Equivalent noise level over a 24-hour period with a penalty of 10 dB(A) for noise during the hours of 23:00-07:00, also known as the day-night indicator.
Leq	Equivalent continuous sound levels: sound levels in decibels, having the same total sound energy as the fluctuating level measured.
LLM	Sound level expressed as a Logarithmic Mean covering noise that include impulses.
Lmax	The maximum sound level, during a measurement period or a noise event.

1.1.2 NOISE CRITERIA

Regulations and guidelines have been identified for each component of the infrastrcuture under study for the construction and operation phases. The table below outlines these regulations and guidelines, which are further discussed in the following sections.

Table 1-3 Overview of Regulations Relevant to La Grande Alliance Study

REGULATION	CONSTRUCTION			OPERATION		
APPLICATION TO THE PROJECT	HARBOUR	ROADS	RAILS	HARBOUR	ROADS	RAILS
Provincial						
Noise-Level Guidelines for Industrial Construction Sites (MELCC, 2015) *(Lignes directrices relativement aux niveaux sonores provenant d'un chantier de construction industriel (MELCC, 2015))*	✓	✓	✓	X	X	X
Policy on road noise (MTQ, 1998) (*Politique sur le bruit routier (MTQ, 1998)*)	X	X	X	X	✓	X
Instruction Note 98-01 (MELCC, 2006) (*Note d'instructions 98-01 (MELCC, 2006)*)	X	X	X	✓	X	X
Federal						
Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise (Health Canada, 2017)	✓	✓	✓	✓	✓	✓
Road and rail noise: effects on housing (CMHC, 1981)	X	X	X	X	✓	✓
Land use planning around rail corridors: railway proximity guidelines (RAC/FCM, 2013)	X	X	X	X	X	✓
Canadian Transportation Agency Documents	X	X	X	X	X	✓

1.1.3 PROVINCIAL REGULATIONS

NOISE LEVEL GUIDELINES FOR INDUSTRIAL CONSTRUCTION SITES (MELCC, 2015) (*LIGNES DIRECTRICES RELATIVEMENT AUX NIVEAUX SONORES PROVENANT D'UN CHANTIER DE CONSTRUCTION INDUSTRIEL (MELCC, 2015)*)

Application: Road, harbour and railway construction

The MELCC (MELCC, 2015) has guidelines regarding noise levels from a construction site. Therefore, noise levels from the construction phases of the road infrastructure will be compared to this policy.

During the daytime period between 7:00 a.m. and 7:00 p.m., it is the MELCC's policy that all reasonable and practicable measures must be taken by the contractor to ensure that the assessment noise level (LAr, 12:00 p.m.) from the construction site is equal to or less than the highest level between 55 dB or the initial noise level if higher than 55 dB. This limit shall apply at any receiving point (human presence) where the occupation is residential or equivalent (hospital, institution, school).

However, there are situations where the constraints are such that a contractor cannot perform the work within these limits. In such cases, the contractor is required to:

- Plan ahead for these situations, identify their potential of occurrence and limit them as much as possible;
- Specify the nature of the work and the noise sources involved;
- Justify the construction methods used with respect to possible alternatives;
- Show that all reasonable and feasible steps are taken to minimize the magnitude and duration of exceedances;
- Estimate the magnitude and duration of anticipated exceedances;
- Plan follow-up actions to assess the true impact of these situations and undertake any necessary corrective actions.

During the evening (7:00 p.m. to 10:00 p.m.) and night (10:00 p.m. to 7:00 a.m.) periods, any one-hour assessment noise level (LAr, 1h) from a construction site must be equal to or less than the greater of 45 dB or the initial noise level if it is greater than 45 dB. This limit applies at any receiving point where the occupancy is residential or equivalent (hospital, institution, school).

At night (10:00 p.m. to 7:00 a.m.), to avoid disturbing sleep, no deviation from these limits can be considered acceptable (except in cases of emergency or absolute necessity). For the three evening hours, however (7:00 p.m. to 10:00 p.m.), when justified, the LAr, 3h assessment noise level may be as high as 55 dB regardless of the initial level, provided that such exceedances are justified in accordance with requirements described above.

The working hours have not yet been established for the study components . The guide values corresponding to each period of the day are therefore of 55 dBA (Leq, 12h) between 7 a.m. and 7 p.m., 45 dBA Leq, 1h between 7 p.m. and 7 a.m., and 55 dBA Leq, 1h between 7 p.m. and 10 p.m. when justified. As an example, 55 dB is the typical noise level of a residential street or a normal conversion between 2 persons.

POLICY ON ROAD NOISE (MTQ, 1998) (*POLITIQUE SUR LE BRUIT ROUTIER (MTQ, 1998)*)

Application: Road operation

The MTQ has adopted the *Policy on Road Noise* dated March 1998, which outlines the Ministry's position on road noise. This policy promotes two approaches to road noise mitigation: a remedial approach, which aims to correct the main noise pollution problems, and an integrated planning approach, which consists in taking the necessary measures to prevent noise pollution problems caused by road traffic.

In this case, the noise impact generated by the operations of the potential infrastructures will be compared with the integrated planning approach of the *Policy on Road Noise*. A noise impact is considered significant when the variation between the current noise level without the projected infrastructures and the projected noise level (10-year horizon) with the project will have a medium or strong noise impact according to the evaluation grid inserted in the MTQ's *Road Noise Policy*.

When the noise impact of new road construction or road reconstruction resulting in an increase in capacity or a change in use is deemed significant (medium or high noise impact), mitigation measures must be analyzed.

Where appropriate, mitigation measures will be required to reduce projected noise levels to as close to 55 dBA over a 24-hour period as possible. The 55 dBA Leq, 24-hour noise criterion is generally applicable for sensitive areas, i.e., residential, institutional and recreational areas.

INSTRUCTION NOTE 98-01 (MELCC, 2006) (*NOTE D'INSTRUCTIONS 98-01 (MELCC, 2006)*)

Application: Fixed sources. Harbour operation.

Section 20 of the *Environment Quality Act* states in the first paragraph that "n*o one may release...allow the release...into the environment of a contaminant in a quantity or concentration greater...determined in accordance with this Act*". Only projects involving quarries, sand pits and asphalt concrete plants are subject to specific provincial noise regulations.

In the absence of regulations or in the case of acquired rights, the ministère de l'Environnement et de la Lutte contre les Changements Climatiques (MELCC) applies the second paragraph of section 20 to be able to make a judgment on an environmental noise impact. This one stipulates that "T*he same prohibition applies to the release... of any contaminant, whose presence in the environment... is likely to adversely affect...life, health, safety, welfare, or comfort of human beings...*".

In order to assess the extent to which a noise may affect well-being, operating rules were approved by the Industrial Sector Table on January 28 and 29, 1998 (*Note d'instructions 98-01*, revised on June 9, 2006).

The *Noise instruction note NI 98-01* specifies the maximum noise level for stationary sources. The following excerpt determines a stationary source as defined by the MELCC NI 98-01:

*"**A stationary source** is defined as an industry, factory, power generating plant, power line, electrical transformer station, landfill site, firing range, and any business that operates a process. A stationary source is spatially bounded by the perimeter of the land it occupies and may consist of one or more units or components (handling, manufacturing or purification equipment, machinery, fan, motor vehicle, etc.), the sum of whose individual noises constitutes the total contribution attributable to the source. Noise from the movement of vehicles or mobile equipment on the property of a stationary source is attributable to the source. However, this noise is part of road noise as soon as the traffic is outside the boundaries of the stationary source".*

This instruction is applied during normal operation of the stationary noise generating source. It provides that the maximum noise level generated by the covered activities shall be less than or equal to the greater of the following noise levels:

- Average hourly noise levels ($L_{Aeq,\ 1h}$) for the daytime and nighttime periods based on the uses permitted by the municipality's zoning rules assigned to the presented land, or;
- The residual noise level (ambient noise without the activities of the stationary source in question).

Table 1-4 Maximum Permitted Noise Levels According to Use

AREA	NOISE LIMITS ($L_{EQ, 1H}$ DBA – REF. 2×10^{-5} PA) [A]	
	NIGHT (7:00 PM TO 7:00 AM)	DAY (7 AM TO 7 PM)
I	40	45
II	45	50
III	55 (50 if housing)	55
IV	70 (50 if housing)	70 (55 if housing)

Note:[A] Hourly average of the noise emitted by the industrial activity in question, excluding ambient noise.

Sensitive areas:

Area I: Land intended for single or semi-detached dwellings, schools, hospitals or other educational, health or convalescent service facilities. Land for an existing dwelling in an agricultural zone.

Area II: Land intended for multi-unit dwellings, mobile home parks, institutions or campgrounds.

Area III: Land intended for commercial uses or recreational parks. However, the nighttime noise level of 50 dBA applies only within the property lines of facilities used for residential purposes. In all other cases, the maximum daytime noise level shall also apply at night.

Non-sensitive area:

Area IV: Land zoned for industrial or agricultural purposes. However, on the grounds of an existing dwelling in an industrial zone and established in accordance with the municipal rules in effect at the time of its construction, the criteria is 50 dBA at night and 55 dBA during the day.

The zone categories described above are established in accordance with the uses permitted by the municipal zoning rules. Where the zoning status of an area or portion of an area has not been determined by a municipality, it is the actual uses that determine the applicable category.

Thus, where the residual noise level without the activities in question is greater than the values in Table 1-4, this residual noise level becomes the permitted limit. In addition, corrective terms may be applicable for certain types of noise (impact noise, noise with tonal character, noise with verbal elements, etc.).

1.1.4 FEDERAL REGULATIONS

GUIDANCE FOR EVALUATING HUMAN HEALTH IMPACTS IN ENVIRONMENTAL ASSESSMENT: NOISE (HEALTH CANADA, 2017)

Health Canada aims to provide general guidance for anticipating the health risks of changes in noise levels in environmental impact assessments. This document describes a method for assessing the health impacts of noise, and provides recommended noise limits for the following categories of noise: noise-induced hearing loss, noise-induced sleep disturbance, interference with speech comprehension, complaints, and severe long-term annoyance. The proposed limits are consistent with those given by the World Health Organization (WHO) in the document *Guidelines for community noise*.

Application: Project Construction

For construction noise, Health Canada provides a method for determining construction-related noise impacts based on the duration of construction activities.

For short-term exposure to construction noise (< 1 year), Health Canada suggests **noise attenuation thresholds** (NATs) and adjustments for various types of communities to determine if adverse effects are likely to occur. For a quiet suburban or rural community, the category most applicable to the project, the suggested noise attenuation thresholds for construction noise are presented in Table 1-5.

Table 1-5 Calculation of the suggested noise attenuation threshold (NAT) for construction noise (Health Canada, 2017)

COMMUNITY DESCRIPTION	SUGGESTED NAT (L_{dn}, dBA)
Calm suburban or rural community	47 [a]
Additional Conditions *If applicable, apply one or more of the following corrections:*	
Construction less than two months	+10 dB
Winter (when the windows are always closed)	+5 dB
Negligible tonal or impulse noise [b]	+ 5 dB

Notes: [a] Due to back-up horns and the slamming of flip-up panels, among other things, construction noise normally contains a tonal and impulsive component. For the suggested baseline NAT, a reasonable worst-case scenario is assumed and all construction noise is deemed to be attributable to tonal and/or impulsive noise.

[b] When the contribution of tonal or impulsive noise is negligible, +5 dB may be added to the suggested reference NAT. Health Canada prefers that a justification be provided when such an adjustment is made.

To account for potential noise impacts on sleep, a limit of 30 dBA L_{max} is suggested inside bedrooms. Assuming a transmission loss from outside to inside of 15 dB, the equivalent levels outside should be 45 dBA to 60 dBA.

For long-term (≥ 1 year) construction noise exposure, Health Canada recommends an assessment based on the percentage change in the severely annoyed population (HA%). The calculated HA% provides information on how an average community responds to a noise level. This index is calculated from the L_{dn} indicator (Day-night average sound level) to which noise weights are applicable depending on the type of noise (tonal, impact noise, etc.). Although individual response varies widely, the reported change in HA% among an average community in response to certain noise levels has been shown to be consistent (Michaud et al. 2008).

For blasting noise during short construction periods (< 1 year), Health Canada prefers that the US EPA ballistic detonation criterion be used as the NAT when blasting lasts less than one year. These mitigation thresholds are presented in Table 1-6.

Table 1-6 Noise Attenuation Thresholds Related to the Number of Explosions (Health Canada, 2017)

NUMBER OF EXPLOSIONS PER DAY	NAT dBZ
10	115
25	111
50	108
100	105

Application: Infrastructures Operations

As with long-term construction noise, Health Canada considers high noise annoyance during the operational phase of the proposed infrastructures to be a reliable indicator of human health effects. If the change in HA% exceeds 6.5% or the stated target values, Health Canada suggests mitigation measures targeting the source of the noise, the propagation from the source to the receptor or the receptor itself.

These measures include:

- Reduction of noise sources, such as the use of quieter machinery were technically and economically feasible;
- The installation of physical barriers, including noise walls, embankments (man-made ridges or embankments) and windows with a high soundproofing capacity;
- In some cases, changes to the infrastructure design (e.g., changing the proposed location of an access road).

In general, the implementation of noise mitigation measures is encouraged.

ROAD AND RAIL NOISE: EFFECTS ON HOUSING (CMHC, 1981)

Application: Road and railway operation

Canada Mortgage and Housing Corporation (CMHC) has prepared the document *Road and Rail Noise: Effects on Housing* to specifically address new developments that may be adversely affected by road and railway traffic noise.

CMHC allows a maximum noise level generated by road and railway traffic at residential dwellings of 55 dBA Leq, 24 h in outdoor yards. The document states that "…*This noise measure has been extensively tested in numerous social surveys. Of the commonly used noise descriptors, it is among the easiest to measure or to predict accurately, and no other descriptor has been shown to provide a significantly better prediction of the community response to noise*."

The following course of action has been adopted by CMHC:

- In the upper zone where the noise level exceeds 75 dBA, housing construction is not recommended;
- In the intermediate zone, between 55 dBA and 75 dBA, housing construction is only possible with adequate soundproofing;
- In the lower zone, where the noise level is below 55 dBA, residential construction will be sufficiently soundproofed.

Maximum acceptable levels of road and railway traffic noise in residential and outdoor entertainment areas are also recommended. These limits are presented in Table 1-7.

Table 1-7 Maximum Acceptable Levels of Road and Railway Traffic Noise in Residential and Outdoor Entertainment Areas (CMHC, 1981)

SPACE TYPE	MAXIMUM NOISE LEVEL $L_{eq,\ 24h}$ (dBA)
Bedrooms	35
Living, dining and entertainment rooms	40
Kitchens, bathrooms, lobbies, storage rooms	45
Outdoor entertainment areas	55

LAND USE PLANNING AROUND RAIL CORRIDORS: RAILWAY PROXIMITY GUIDELINES (RAC AND FCM, 2013)

Application: Railway Operation

The guidelines presented in this document are a collaborative effort between the Railway Association of Canada (RAC) and the Federation of Canadian Municipalities (FCM) to assist municipal governments and railways in reviewing and defining general planning policies when developing lands near railway facilities.

Minimum influence zones are recommended for noise impact studies along rail corridors. These are presented in Table 1-8.

Table 1-8 Recommended Minimum Noise Influence Zones (RAC/FCM, 2013)

TYPE OF RAIL CORRIDOR	RECOMMENDED MINIMUM NOISE INFLUENCE ZONE (M)
Rail Yard	1 000
First class main line	300
Second class main line	250
First class secondary line	150
Second class secondary line	75
Junction	75

The document describes the noise mitigation measures, including the location of noise barriers, as well as the location, orientation and room layout of buildings close to the tracks. Noise criteria are presented based on the type of track under consideration. The tracks will take both freight and passenger trains: the relevant criteria are presented in Table 1-9 and Table 1-10.

Table 1-9 Recommended Noise Criteria for New Residential Development or Other Sensitive Land Uses Near Rail (Freight) Corridors

SPACE TYPE	PERIOD	MAXIMUM NOISE LEVEL L_{eq} [a] (dBA) Rail [b]	MAXIMUM OUTDOOR NOISE LEVEL, L_{eq} [a] (dBA)
Bedrooms	11 p.m. to 7 a.m.	35	50
Living/dining rooms	7 a.m. to 11 p.m.	40	55
Outdoor living areas	7 a.m. to 11 p.m.	55 [c]	N/A

Notes: a. Applicable to transport noise only;
b. Maximum interior noise levels are used only to determine requirements for architectural elements. Exterior façade noise levels are used to determine requirements for air conditioning;
c. Mitigation measures are recommended if noise levels are between 55 and 60 dBA; if they are 60 dBA or greater, mitigation measures should be implemented to reduce the noise to as close to 55 dBA as possible.

Table 1-10 Recommended Noise Criteria for Residential Development or Other Sensitive Land Uses in the Vicinity of Rail Yards (Freight)

PERIOD	$L_{eq, 1\ h}$ (dBA) or LLM (dBAI)	
	CATEGORY 1 AREA	CATEGORY 2 AREA
7 a.m. to 7 p.m.	50	50
7 p.m. to 11 p.m.	47	45
11 p.m. to 7 a.m.	45	45

Notes: These criteria are applicable to any usable portion of the lot or unit.
Category 1 and 2 areas refer to the typical acoustic environment that can be expected to be found in the development area. Category 1 areas are areas with a typical acoustic environment of a major urban centre where the background noise is dominated by the hum of the city, and Category 2 areas are those with an acoustic environment that has characteristics of both Category 1 and 3 areas (which are rural). For more information, please refer to Section 2 of the Ontario Ministry of the Environment LU Guidelines.

A minimum mitigation set is also recommended in order to reduce future problems such as effects associated with railway operations such as noise, vibration and safety hazards. It is ideal that the full set of mitigation measures be applied, as they allow for mutualization of materials and compatibility of mitigation effects. From an acoustic perspective, the mitigation measures are:

- Clearances: A clearance from a rail corridor or rail yard is preferred. The recommended minimum distance is 30 metres from a main line and 300 metres from a rail yard;
- Acoustical Barriers: Acoustical barriers can effectively reduce exterior rail noise by 5 to 15 dBA; however, the greatest noise reductions are difficult to achieve without the installation of very high barriers. Minimum noise barrier heights vary depending on the classification of the track in the vicinity of sensitive receptors.

CANADIAN TRANSPORTATION AGENCY

Application: Railway Operations

The Canadian Transportation Agency has published two documents relevant to railway noise: the first, *Guidelines for the Resolution of Complaints Over Railway Noise and Vibration* (2008), sets out the cooperative measures that parties must follow before the Agency will investigate a complaint.

The second document, *Railway Noise Measurement and Reporting Methodology* (2011) (Methodology), was developed as a supplement to the guidelines to guide railway companies, citizens and municipalities in the assessment of railway noise as part of a noise complaint to the Agency. The methodology identifies three assessment methods that are tailored to the complexity of the railway noise that is the subject of the dispute. The purpose of these methods is to:

- Identify sensitive receptors (human-occupied locations);
- Describe the noise environment (i.e., already existent ambient noise not associated with the disputed rail operations);
- Determine the noise impact of railway activities through measurements and/or calculations.

The assessment report should include noise level measurements with unusual events. Based on the measured and calculated hourly Leq values, a daily profile of results should be developed for the following levels: Daytime Leq (7:00 a.m. to 10:00 p.m.) and Nighttime Leq (10:00 p.m. to 7:00 a.m.), Ldn, 24-hour Leq, and Lmax. Note that the daytime and nighttime hours defined in the CTA documents are different from those specified in the RAC-FCM guidelines.

1.1.5 SUMMARY OF NOISE CRITERIA

A summary of the noise criteria described in Section1.1.2 is presented in Table below.

Table 1-11 Summary of Noise Criteria

<table>
<tr><th>REGULATION</th><th>REGULATION SUMMARY</th></tr>
<tr><td colspan="2">Provincial</td></tr>
<tr><td>Noise-Level Guidelines for Industrial Construction Sites (MELCC, 2015) (Lignes directrices relativement aux niveaux sonores provenant d'un chantier de construction industriel (MELCC, 2015))</td><td>Application: Construction (Port, roads, railways).
Daytime (7 a.m. to 7 p.m.): 55 dBA $L_{eq,\ 12h}$
Evening (7:00 p.m. to 10:00 p.m.): 45 dBA $L_{eq,\ 12h}$ (or 55 dBA where warranted)
Night (7 p.m. to 7 a.m.): 45 dBA $L_{eq,\ 12h}$</td></tr>
<tr><td>Policy on road noise (MTQ, 1998) (Politique sur le bruit routier (MTQ, 1998))</td><td>Application: Operation (Roads).
55 dBA $L_{eq,\ 24h}$</td></tr>
<tr><td>Instruction Note 98-01 (MELCC, 2006) (Note d'instructions 98-01 (MELCC, 2006))</td><td>Application: Operation (Harbour).
Maximum noise level generated by the activities shall be less than or equal to the higher of the indicated average hourly noise levels or the residual noise level.
<table>
<tr><th rowspan="2">Area</th><th colspan="2">Noise Limits ($L_{eq,\ 1h}$ dBA – Ref. 2×10-5 Pa)</th></tr>
<tr><th>Night (7p.m. to 7 a.m.)</th><th>Day (7 a.m. to 7 p.m.)</th></tr>
<tr><td>I</td><td>40</td><td>45</td></tr>
<tr><td>II</td><td>45</td><td>50</td></tr>
<tr><td>III</td><td>55 (50 if housing)</td><td>55</td></tr>
<tr><td>IV</td><td>70 (50 if housing)</td><td>70 (55 if housing)</td></tr>
</table></td></tr>
<tr><td colspan="2">Federal</td></tr>
<tr><td>Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise (Health Canada, 2017)</td><td>Application: Construction (Harbour, roads, railways).
Suggested noise attenuation thresholds (NATs) for communities exposed to construction noise over a period of less than one year are shown in the table below:
<table>
<tr><th>Community Description</th><th>Suggested NAT (Ldn, dBA)</th></tr>
<tr><td>Calm suburban or rural community</td><td>47 [a]</td></tr>
<tr><td colspan="2">Additional conditions If applicable, apply one or more of the following corrections:</td></tr>
<tr><td>Construction less than two months</td><td>+10 dB</td></tr>
<tr><td>Winter (when the windows are always closed)</td><td>+5 dB</td></tr>
<tr><td>Negligible tonal or impulse noise [b]</td><td>+ 5 dB</td></tr>
</table>
For long-term (≥ 1 year) construction noise exposure, evaluate the impact based on the change in the percentage of the population significantly annoyed (HA%).
Noise attenuation thresholds related to the number of blasts for blasting noise during short construction periods.
<table>
<tr><th>Number of explosions per day</th><th>NAT , dBZ</th></tr>
<tr><td>10</td><td>115</td></tr>
<tr><td>1</td><td>25</td></tr>
<tr><td>2</td><td>50</td></tr>
<tr><td>3</td><td>100</td></tr>
</table>
Application: Operation (Harbour, roads, railways).
Implement mitigation measures if the change in HA% exceeds 6.5% or the target values listed in the noise mitigation threshold table.</td></tr>
</table>

<table>
<tr><th>REGULATION</th><th>REGULATION SUMMARY</th></tr>
<tr><td>Road and rail noise: effects on housing (CMHC, 1981)</td><td>Application: Operation (Roads and railways).
Maximum acceptable levels of road and rail noise in residential and outdoor entertainment areas:
<table>
<tr><th>Space type</th><th>Maximum noise level, $L_{eq, 24h}$ (dBA)</th></tr>
<tr><td>Bedrooms</td><td>35</td></tr>
<tr><td>Living, dining and entertainment rooms</td><td>40</td></tr>
<tr><td>Kitchens, bathrooms, lobbies, etc.</td><td>45</td></tr>
<tr><td>Outdoor entertainment areas</td><td>55</td></tr>
</table></td></tr>
<tr><td>Land use planning around rail corridors: railway proximity guidelines (RAC/FCM, 2013)</td><td>Application: Operation (railways).
Minimum areas of influence for noise impact studies are recommended.
New residential developments or other sensitive land uses near rail corridors (freight):
<table>
<tr><th>Space type</th><th>Period</th><th>Maximum noise level L_{eq} [a] (dBA) Rail [b]</th><th>Maximum outdoor noise level, L_{eq} [a] (dBA)</th></tr>
<tr><td>Bedrooms</td><td>11 p.m. to 7 a.m.</td><td>35 $L_{eq, 8h}$</td><td>50 $L_{eq, 8h}$</td></tr>
<tr><td>Living/dining rooms</td><td>7 a.m. to 11 p.m.</td><td>40 $L_{eq, 16h}$</td><td>55 $L_{eq, 16h}$</td></tr>
<tr><td>Outdoor living areas</td><td>7 a.m. to 11 p.m.</td><td>55 $L_{eq, 16h}$</td><td>N/A</td></tr>
</table>
Residential developments or other sensitive land uses in the vicinity of rail yards (freight):
<table>
<tr><th rowspan="2">Period</th><th colspan="2">$L_{eq, 1h}$ (dBA) or LLM (dBAI)</th></tr>
<tr><th>Category 1 area</th><th>Category 2 area</th></tr>
<tr><td>7 a.m. to 7 p.m.</td><td>50 $L_{eq, 12h}$</td><td>50 $L_{eq, 12h}$</td></tr>
<tr><td>7 a.m. to 11 p.m.</td><td>47 $L_{eq, 3h}$</td><td>45 $L_{eq, 3h}$</td></tr>
<tr><td>11 p.m. to 7 a.m.</td><td>45 $L_{eq, 9h}$</td><td>45 $L_{eq, 9h}$</td></tr>
</table></td></tr>
<tr><td>Canadian Transportation Agency Documents</td><td>Measurement and reporting methodology for railway noise.
Guidelines for the Resolution of Complaints Over Railway Noise and Vibration</td></tr>
</table>

1.1.6 SENSITIVE AREAS

A preliminary assessment was conducted to identify areas that may be sensitive to noise from the construction and operation of the potential infrastructure.

The sensitive areas identified in the vicinity of each study phase are the municipalities of Whapmagoostui/Kuujjuarapik and Radisson. Dwellings, camps, and other sensitive receptors can be further identified when the proposed infrastructure alignment and main activities are known. So far, 18 main camps, 2 secondary camps, a cultural camp, a planned camp and 4 old camps have been identified one kilometre on either side of the proposed alignments. Most of them (24 structures) are located along the Billy-Diamond Highway.

1.1.7 CONSTRUCTION PHASE

CONSIDERED NOISE SOURCES

The noise climate will be affected during the construction phase by noise from motorized machinery as well as some piling activities and the use of explosives. The equipment and activities that could impact the noise climate during the construction phase are described in Table 1-12.

Table 1-12 List of Likely Sources of Construction Noise

ACTIVITIES AND NOISE SOURCES
Mechanical equipment
Articulated trucks Transport trucks Hydraulic excavator Compactor Grader Paving machine Forklift truck Asphalt plant Bulldozer Loader Water truck Asphalt Milling Machine Ballast tamping machine Clamp loader Crane Drilling/plowing
Other noise sources
Blasting Material transportation (road trucks, airplanes, helicopters) Mechanical equipment related to ventilation, stationary combustion or electricity transmission and distribution

PRELIMINARY NOISE STUDY AREA DURING CONSTRUCTION PHASE

The great majority of the study component are located in a low-noise environment since the population density is low and industrial activities are sparse and intermittent. The construction activities will possibly be perceptible from a great distance depending on the topography and the presence of waterways having an influence on the sound propagation.

A predictive noise assessment should be conducted along the road and rail corridor, particularly where human activities occur. For example, at the level of a hunting camp and at the approach to the municipalities of Whapmagoostui/Kuujjuarapik and Radisson. An assessment of the number of hunting camps is presented in the Technical Note 3. It will need to be refined in future studies.

A predictive noise assessment is also planned for the construction of the harbour in the municipality of Whapmagoostui/Kuujjuarapik.

As a preliminary step, a noise study area covering approximately 1 kilometre on either side of the road and rail corridor is to be anticipated.

The construction phase noise study area can be better projected once the infrastructure alignment and construction program are established.

1.1.8 OPERATION PHASE

CONSIDERED NOISE SOURCES

During the operational phase, land-based motorized machinery (including off-road and on-road vehicles), as well as boat and train operations in the area of interest, are sources of noise that could impact the noise climate over the course of the infrastructures' operational life. The sensitive receptors identified in the vicinity of each component under study, as well as the noise sources that could impact them, are presented in Table 1-13.

Table 1-13 List of Impacts of the Project During the Operation Phase

OPERATION PHASE	ACTIVITY	NOISE SOURCES	SENSITIVE RECEPTOR AREAS
Phase II	A proposed 207 km road extension from La Grande to Whapmagoostui/Kuujjuarapik	Road noise	Radisson Whapmagoostui/Kuujjuarapik *Dwellings, camps and other sensitive receptors near the road corridor*
	A proposed 340 km railway from Rupert to La Grande	Railway noise	Radisson *Dwellings, camps and other sensitive receptors near the rail corridor*
	A proposed 376 km upgrade & extension of Route 167 to the Trans-Taiga Road	Road noise	Mistissini *Dwellings, camps and other sensitive receptors near the road corridor*
Phase III	A proposed 219 km rail extension from La Grande to Whapmagoostui/Kuujjuarapik	Railway noise	Radisson Whapmagoostui/ Kuujjuarapik *Dwellings, camps and other sensitive receptors near the rail corridor*
	A proposed Deepwater Port in Whapmagoostui/Kuujjuarapik (which was further redefined to a Small Crafts Harbour, refer to Technical Note 13A)	Noise from port activities: Boat operation Operation of land-based machinery (road and off-road vehicles) for harbour support	Whapmagoostui/ Kuujjuarapik *Dwellings, camps and other sensitive receptors near the harbour*

PRELIMINARY NOISE STUDY AREA DURING THE OPERATION PHASE

In order to quantify noise impacts, it is necessary to identify the types and frequency of expected vehicles in each infrastructure area (trains, vehicles, boats), as well as the location of fixed infrastructure that could generate noise during the operation period.

The noise impact of road and rail traffic will be greater if a significant increase in traffic is anticipated. The lower the current noise level, the greater the impact.

For the great majority of the proposed infrastructure, noise sources will be intermittent (e.g., passing vehicles). The noise environment will vary greatly with the amount of passing road or rail vehicles. However, the average daily noise level will depend on the frequency of the passage of these vehicles.

A predictive noise assessment should be conducted along the road and rail corridor, particularly where human activities occur. For example, at the level of a hunting camp and at the approach to the municipalities of Kuujjuarapik/Whapmagoostui and Radisson.

A predictive noise assessment is also planned for the operation of the harbour in the municipality of Kuujjuarapik/Whapmagoostui.

As a preliminary step, a noise study area covering approximately 500 metres on either side of the road and rail corridor is to be anticipated.

1.1.9 CONCLUSION

This preliminary noise assessment was based on the premise that the impacted zone was, during construction, 1 km-wide on either side of the proposed infrastructure and, during operation, 500 m-wide on either side of the proposed infrastructure.

If the proposed infrastructures (all or separately) are deemed valuable by the communities, then a predictive noise study should be planned in the vicinity of the municipalities of Kuujjuarapik, Whapmagoostui and Radisson and along the rail and road proposed corridors during both the construction and operation phases.

1.2 QUALITY OF DRINKING WATER

This section presents the potential source of the impact of the proposed infrastructures on the quality of drinking water available in the zone where the construction would take place.

1.2.1 METHODOLOGY

The following methodology has been used to evaluate the potential impact of the proposed infrastructure on drinking water quality:

- Assessment of the projected activities according to available technical and descriptive documentation;
- Identification of potential sources of impact on drinking water quality.

1.2.2 CONSTRUCTION AND OPERATION ACTIVITIES

The proposed infrastructure would imply the following construction activities:

- A proposed 340 km railway corridor alongside the Billy-Diamond Highway, from Rupert to La Grande;
- A proposed road corridor between La Grande and Whapmagoostui/Kuujjuarapik, over an approximate distance of 207 km;
- Extension of Road 167 to the North toward the junction to the Trans-Taiga Road, over an approximate distance of 172 km;
- A proposed railway corridor between La Grande and Whapmagoostui/Kuujjuarapik, over an approximate distance of 219 km;
- A proposed seasonal Harbor in Whapmagoostui/Kuujjuarapik.

These works include the following activities:

- Usage of diesel-powered machinery;
- Diesel storage and resupply;
- Handling and storage of various products and fluids;
- Handling and storage of granular materials;
- Usage of dust-control products;
- Embankment/excavation.

In operation, the new infrastructures would imply the following activities:

- Vehicles and train traffic;
- Removal of snow, including the removal of snow contaminated with substances present on the roads;
- Road de-icing.

1.2.3 SENSIBLE ELEMENTS / DRINKING WATER SUPPLY

NORTH OF THE 55TH PARALLEL

According to the MELCC (MELCC, 2022), the supply of drinking water to all Nordic villages and settlements is done through collection in surface water (rivers, streams or lakes). Many villages use, as a precaution measure, two different water sources according to several factors: source freezing in winter, low water flow/level in summer, increased salinity and turbidity in certain periods and contamination potential.

The implementation of underground water distribution piping to the residents is practically impossible because of the presence of permafrost. Water is therefore distributed to the dwelling by a tanker truck that itself draw water from a body of water or at a storage tank located in the village. Only Kuujjuarapik has a watermain belonging to the Société immobilière du Québec; it is located near the 55th parallel.

SOUTH OF THE 55TH PARALLEL

The nine Cree communities of the Eeyou-Istchee - James Bay territory are all equipped with a potable water distribution system. Four of these communities are supplied through surface water source (totalling 7 514 residents supplied) while five are supplied through underground sources (3351 residents supplied).

The cities of Chapais, Chibougamau, Lebel-sur-Quévillon, Matagami and Radisson have a water supply system taking water from a surface water body.

1.2.4 SOURCES OF IMPACTS

The runoff of surface water can carry pollutants present on the ground toward neighbouring bodies of water. The pollutants associated with construction and operation of the roadway and railways are mainly fine particles and other substances capable of impacting on the turbidity of water (APEL, 2014).

The usage of dust-control products to mitigate the emissions of particles to the atmosphere can also generate water contamination by chloride-related substances. The good practice is to avoid using non-water dust control products near bodies of water (HQ, 2014).

The stockpiling and handling of construction material must be done considering the objective of reduction of the runoff potential of these materials toward bodies of water. The good practice, economically and environmentally, is

to reuse as much as possible locally excavated material to perform embankments. This reduces the need for long-term stockpiling of excavated material.

The transfer, storage and handling of chemicals and consumables required by the machinery (diesel, oils, hydraulics, etc.) are a potential source of chemical contamination of neighbouring bodies of water.

De-icing salt used to manage winter road conditions can generate a flux of chlorine to neighbouring bodies of water, including those used as a source of drinking water (MTQ, 1999). The chlorine can migrate to the water table by the infiltration of brine water runoff at the time of application or later on at the thawing of the snowbanks in Spring. The good practice to minimize this source of impact is the reduction through optimization of the quantity of salt used.

Civil roadwork and infrastructure construction could result in increased sensibility of ditches to erosion, the increase of the potential of pipe clogging and generate increased pollutants loads reaching lakes and other water bodies. Construction techniques have been developed to mitigate this problem (RAPPEL, 2012).

The potential for a given construction or operation activity to impact the quality of water bodies used as sources of drinking water for both human and wildlife use is influenced by the distance between the activity site (including road usage in operation) and the water body.

1.3 AIR QUALITY

In this section, we discuss the air quality study methods for La Grande Alliance proposed infrastructures. This study includes the various air pollutants emitted during the construction activities and during the operation phase. It also includes the study of greenhouse gas (GHG) emissions during the projected work of the road extension from La Grande to Whapamgoostui/Kuujjuarapik, of the 167 Road upgrade and extension to Trans-Taiga Road and of the proposed railway from Rupert to Whapamgoostui/Kuujjuarapik.

This is a review of the estimation methods and calculations that are to be used when figures become available.

This Technical Note is in accordance with the guide of the *Clean Air Regulation* (CAR) as well as the *Guide de quantification des émissions de gaz à effet de serre* of the Ministère de l'Environnement et de la Lutte contre les Changements Climatiques (MELCC).

1.3.1 METHODOLOGY

The following methodology was followed:

- Analysis of the proposed infrastructure elements and activities based on descriptive and technical documents;
- Identification of the proposed infrastructure significant GHG sources.

1.3.2 CONSIDERED AIR POLLUTANTS

Air quality will be affected during both the construction and operational phases. During the construction phase, motorized machinery (including off-road, road and marine vehicles) as well as certain activities such as traffic on unpaved roads and the use of explosives are sources of air pollutant emissions that have the potential to alter air quality over the duration of the work. In the operation phase, land-based motorized machinery (including off-road and on-road vehicles) and the operation of boats and trains in the area of interest are sources of air emissions that have the potential to affect air quality over time. Other sources of mechanical equipment related to ventilation or stationary combustion are also likely to affect air quality in the area surrounding this equipment. These activities are documented sources of Total suspended particles (TSP) breathable particles (PM_{10}) and fine particles ($PM_{2.5}$), metals, carbon monoxide (CO), nitrogen oxides (NOx) and sulphur dioxide (SO_2).

The storage and handling of petroleum products can also be a source of volatile organic compound emissions.

The table below outlines the air pollutants emitted by the various construction and operation activities.

Table 1-14 Air Pollutants Emitted by Different Construction and Operation Activities

PROJECT PHASE	PHASE	ACTIVITY	SOURCE	TYPE OF AIR POLLUTANTS							
				TSP	PM_{10}	$PM_{2.5}$	CO	NO_x	SO_2	Metals[1]	VOC
II and III	Construction	Construction activities	Fossil fuel combustion by mobile equipment	✓·	✓·	✓·	✓·	✓·	✓·		
		Transportation by truck, train and boat	Fossil fuel combustion by mobile equipment	✓·	✓·	✓·	✓·	✓·	✓·		
		Transportation	Dust on the roads	✓·	✓·	✓·				✓·	
		Blasting	Explosive detonation	✓·	✓·	✓·	✓·	✓·	✓·	✓·	
		Electricity	Diesel Generator	✓·	✓·	✓·	✓·	✓·	✓·		✓·
		Heating	Natural gas equipment	✓·	✓·	✓·	✓·	✓·	✓·		✓·
		Heating	Propane equipment	✓·	✓·	✓·	✓·	✓·			
		Deforestation	Fossil fuel combustion by deforestation machinery	✓·	✓·	✓·	✓·	✓·	✓·		
		Storage	Petroleum product storage and handling	·							✓·
II and III	Operation	Transportation by truck, train and boat	Fossil fuel combustion by mobile equipment	✓·	✓·	✓·	✓·	✓·	✓·		
		Transportation	Dust on the roads	✓·	✓·	✓·				✓·	
		Electricity	Diesel Generator	✓·	✓·	✓·	✓·	✓·	✓·		✓·
		Heating	Natural gas equipment	✓·	✓·	✓·	✓·	✓·	✓·		✓·
		Heating	Propane equipment	✓·	✓·	✓·	✓·	✓·			
		Storage	Petroleum product storage and handling								✓·

[1] Metal emissions are primarily coming from metals contained in the dust raised by transport and from blasted rocks.

STANDARDS

The Government of Quebec's *Clean Air Regulation* establishes air quality standards in relation to the pollutants potentially emitted by the construction and operation activities. The standards are found in Appendix K of the regulation. The MELCC has also established criteria for other substances in its online document *Atmospheric quality standards and criteria*[1]. The following table details the standards for pollutants typically associated with infrastructure works.

Table 1-15 Atmospheric Quality Standards for Primary Pollutants from Road Works

SUBSTANCES	STANDARD PERIOD	ATMOSPHERIC QUALITY STANDARDS (µg/m^3)
Total particles	24 hours	120
Fine particles $PM_{2.5}$	24 hours	30
Nitrogen oxides (NO_2)	1 year	103
	24 hours	207
	1 hour	414
Carbon monoxide (CO)	8 hours	12 700
	1 hour	34 000
Sulphur dioxide (SO_2)	1 year	52
	24 hours	288
	4 minutes	1050

The CAR also specifies in Section 12 that particle emissions from the transfer, dropping or handling of materials shall not be visible more than 2 m from the point of emission.

QUANTIFICATION METHOD

Metal emissions mainly come from the metals in the dust raised by transport and exploded rocks. It is important to know the concentration of the different metals in the soil in order to estimate the amount released to the atmosphere from the dust.

Quantification methods are available to estimate more precisely the contaminant emissions for the different activities according to the machinery use scenario and the cut and fill storage scenarios. However, in the absence of more precise data, it is not possible to quantify contaminant emissions at this stage.

[1] https://www.environnement.gouv.qc.ca/air/criteres/index-en.htm

IMPACTS AND SENSITIVE AREAS

The areas that may be most impacted are the populated areas along the route. The sensitive areas identified in the vicinity of each proposed infrastructure are the municipalities of Kuujjuarapik/Whapmagoostui and Radisson. Residences and other sensitive receptors can be further identified when the infrastructure alignment and main activities are known.

The construction work impacts are the emissions of contaminants as indicated above, especially fine particles ($PM_{2.5}$) and nitrogen oxides (NOx) that are harmful to human health.

1.3.3 GREENHOUSE GASES

The GHGs and global warming potentials (GWPs) taken into account in this assessment are presented in the table below. Global warming potential is the heat absorbed by any greenhouse gas in the atmosphere, as a multiple of the heat that would be absorbed by the same mass of carbon dioxide (CO_2). As an example, a ton of methane (CH4) as a global warming potential that is 25 times higher than a ton of CO_2. The considered potentials are the updated GWPs according to the Intergovernmental Panel on Climate Change AR4 report (IPCC 2007).

Table 1-16 Global Warming Potentials of the Considered Greenhouse Gases

GREENHOUSE GASES	GLOBAL WARMING POTENTIA L (GWP)
Carbon dioxide (CO_2)	1
Methane (CH_4)	25
Nitrous oxide (N_2O)	298

DEFINITIONS OF EMISSION TYPES

Direct greenhouse gas emissions

The direct emissions come from sources belonging to or under the operational control of the person in charge of the dredging works during the entire construction period. Thus, these emissions include those from activities that can be subcontracted on site. These are essentially emissions from the combustion of fossil energy sources such as the use of fuels in vehicles and machinery operated on the site.

Indirect greenhouse gas emissions

Indirect emissions are emissions that are indirectly generated by activities related to the construction or the operation of the infrastructures. They are essentially emissions from logistical activities, typically under the operational control of another entity. Examples of indirect emissions are emissions associated with transportation of material and personnel to the site of construction.

IDENTIFICATION OF GREENHOUSE GAS SOURCES AND SINKS

The ISO 14064-1 norm specifies that:

- a GHG source is a physical unit or process releasing a GHG into the atmosphere;
- a GHG sink is a physical unit or process that removes a GHG from the atmosphere.

The following table identifies GHG sources and sinks by activity.

Table 1-17 Greenhouse Gas Sources and Sinks by Activity

ACTIVITY	SOURCE	SINKS	TYPE OF GREENHOUSE GAS						
			CO_2	CH_4	N_2O	HFC	PFC	SF_6	NF_3
Construction activities	Combustion of fossil fuel by mobile equipment	No sink identified	✓	✓	✓				
Transport by train and boat	Combustion of fossil fuel by mobile equipment	No sink identified	✓	✓	✓				
Blasting	Explosive detonation	No sink identified	✓	✓					
Electricity	Electricity consumption (provided by Hydro-Québec)	No sink identified	✓						
Deforestation	Release of CO2 captured by vegetation, including roots	No sink identified	✓						

LEGEND: CO_2: CARBON DIOXIDE; HFC: SULPHUR HEXAFLUORIDE; NF_3: NITROGEN TRIFLORIDE; CH_4: METHANE; PFC: PERFLUOROCARBON; SF_6: SULPHUR HEXAFLUORIDE; N_2O: NITROUS OXIDE

QUANTIFICATION METHOD

At this study stage, it is not possible to accurately estimate the GHG emissions for the different activities due to the lack of data.

It is, however, possible to estimate GHG emissions based on construction costs using the US-EPA's 2009 guide *Potential for Reducing Greenhouse Gas Emissions in the Construction Sector*. This guide provides an average GHG emission rate per US dollar of construction cost:

GHG = 0.49 ton CO_2eq/kUSD$2002

This rate is valid for 2002. Using a conversion and adjustment for inflation, we obtain:

GHG = 0.22 ton CO_2eq/kCDN$2021

For example, for a construction cost of $1M CDN, the estimated GHG emissions would be 220 tons CO_2eq.

It will be possible to use other more precise methods of calculating GHGs when other data is available, specifically the machinery use scenario detailing, among other things, the number and type of vehicles and machinery involved by activity, or directly the amount of diesel consumed. The logistics scenario (detailing the number and distance of transportation by mode) will allow for the estimation of indirect GHG emissions from the construction.

1.3.4 CONCLUSIONS

Contaminant emissions during the construction and operation phases of La Grande Alliance proposed infrastructures will generate several types of contaminants, mainly particles from road dust and explosions.

For GHGs, the emissions will come from the consumption of fuels such as diesel, gasoline or natural gas.

Without more precise data, it is not possible to use conventional quantification methods. However, with respect to GHGs, it is possible to obtain an order of magnitude of emissions by using the factor of 0.14 tonnes of CO_2eq per thousand Canadian dollars of construction cost.

2 OTHER POTENTIAL HEALTH AND SOCIAL IMPACTS

The objective of this section is to describe the type of social and health impacts on the communities as well as possible mitigation measures and good practices that could be implemented in terms of consultation. The impacts are presented according to each component of La Grande Alliance, i.e., the proposed road and rail transportation network extension and the proposed construction of a port. They are evaluated in relation to comparable infrastructure projects. In addition to relying on a database of comparable projects created as part of the present mandate, the impact analysis is then based on the results of information meetings and interviews with stakeholders from the social and health sectors in the Cree communities (refert to TN 3, Appendix B) and the Jamesian municipalities (refer to TN 3, Appendix C) concerned, as well as with the tallymen met during the land use engagement activities. Finally, recommendations are issued for adequate consideration of communities in the assessment, mitigation or enhancement of impacts related to the infrastructures under study. This aspect is also addressed in TN 17.

Comparable projects

The six comparable road and rail projects identified in Technical Note 1 are located primarily in Canada, on First Nations and Inuit community lands, and are at various stages of development. The road projects include the Inuvik-Tuktoyaktuk Highway (Northwest Territories), the Northern Link Road - Marten Falls (Ontario), the Route 167 Extension to the Otish Mountains (Quebec), and the Radisson-Whapmagoostui/Kuujjuarapik Access Road (Quebec). As for the railway projects, they are the Tshiuetin Rail Transportation (Quebec) and the Alaska-Alberta Railway (Canada-United States).

For the port infrastructure project, a list of 29 comparable existing projects around the world, mainly in the Nordic region, which may have different vocations, has been established:

- Deception Bay Port (Northern Quebec)
- Voisey's Bay Mine Wharf (Newfoundland and Labrador)
- Milne Inlet Ore Dock (Nunavut)
- Steensby Bay (proposed) (Nunavut)
- Yamal LNG (Sabetta Seaport, Russia)
- Arctic LNG 2 (2023) (Russia)
- Varandey (Russia)
- Ikerasaarsuk Wharf (Greenland)
- Hay River Wharf (Northwest Territories)
- Moraine Bay Wharf (Northwest Territories)
- Simpson Islands (Northwest Territories)
- Pond Inlet (Nunavut)
- Pangnirtung Wharf (Northwest Territories)
- Salluit (proposed) (Nunavik)
- Port of Churchill (Manitoba)
- Port of Murmansk (Russia)
- Nuuk Port and Harbour (Greenland)
- Port of Ilulissat (Greenland)
- Pevek (Russia)
- Tiksi (Russia)
- Igarka (Russia)
- Dudinka (Russia)
- Seaport of Vitino (Russia)
- Port of Arkhangelsk (Russia)
- Novy Port (Russia)
- Port of Tuktoyaktuk (proposed) (Northwest Territories)
- Iqaluit Port (2022) (Nunavut)
- Port of Kirkenes (Norway)
- Nanisivik Naval Facility (Nunavut)

Engagement Process

In the case of the engagement process, the analysis was based on interviews or focus groups conducted with key stakeholders in health and social services and any other stakeholder in the Cree communities. In addition, interviews were conducted with Cree tallymen to document their concerns and use of the territory. The Eeyou Planning Commission reports entitled "Report on community input on land use planning goals", published in 2017 for each of the communities, were also taken into account. The following communities are represented:

Crees: [2]

- Chisasibi
- Eastmain
- Waskaganish
- Nemaska
- Mistissini
- Wemindji
- Whapmagoostui

[2] It should be noted that the information collected from the Public Health Department of the Cree Board of Health and Social Services of James Bay covered all Cree communities. However, the present study components do not directly concern the following three communities: Ouje-Bougoumou, Waswanipi and Washaw Sibi.

2.1 HEALTH AND SOCIAL IMPACTS OF COMPARABLE PROJECTS

2.1.1 IMPACTS RELATED TO THE ROAD PROJECTS

This subsection first outlines a description of comparable road projects followed by an analysis of the community and health impacts of these projects and the identification of a series of associated mitigation measures. Finally, a list of good consultation practices is provided.

DESCRIPTION OF COMPARABLE ROAD PROJECTS

Road between Inuvik and Tuktoyaktuk

The road between Inuvik and Tuktoyaktuk, located in Canada's Northwest Territories, is a joint project between the Hamlet of Tuktoyaktuk, the Town of Inuvik and the Government of the Northwest Territories. The road was completed in 2017. This 140 km road construction, operation and maintenance project represents the first Canadian highway to reach the Arctic Ocean. The road is accessible at all times during all four seasons (International Association for Impact Assessment Conference, 2021; Oceans North, 2022; Government of the Northwest Territories, 2017; EIRB, 2010; Bennett, 2018).

Northern Link Road Project - Marten Falls

The Northern Link Road Project is a 120 km corridor that would connect the proposed Marten Falls Community Access Road to the proposed Webequie First Nation Supply Road in the McFaulds Lake area of northwestern Ontario, Canada. The proposed project would provide First Nations with access to the Ring of Fire mine development area and the provincial road network. It will consist of a two-lane, all-weather gravel access road with stream crossings, built to accommodate recreational and commercial vehicles. The environmental impact assessment began in May 2021 and is being conducted by Marten Falls and Webequie First Nations (Press release, 2021; MFFN, 2021; Rock to Road, 2021; TBNEWSWATCH, 2021).

Extension of Route 167 to the Otish Mountains

The Route 167 Extension from Lake Albanel to the Otish Mountains is located in northern Quebec, Canada. The road extension, completed in 2013, is accessible during all four seasons and extends over 240 km. The road connects to the logging road leading to the Stornoway mine site. This project is part of the Plan Nord[3] initiated in 2011 (Canadian Environmental Assessment Agency, 2012; Conférence régionale des élus de la Baie-James, 2012).

[3] The Plan Nord is an economic development program for Quebec's northern regions proposed by the Charest government in 2011. It is a sustainable development plan that initially included the opening of mines, the development of renewable energy projects and the construction of transportation infrastructure. The Société du Plan Nord is still in existence with a 2020-2023 plan. It includes orientations defined by the Quebec government in consultation with representatives of the regions and Indigenous nations.

Previous Studies: La Grande to Whapmagoostui/Kuujjuarapik Access road

The same Billy Diamond Highway extension from between La Grande to Whapmagoostui/Kuujjuarapik that is part of La Grande Alliance proposed infrastructures has already been studied in the past. These previous studies were based on a 175 km access road between La Grande and Whapmagoostui/Kuujjuarapik in the Nord-du-Québec administrative region of Canada. This proposed road would allow Kuujjuarapik to become the first Inuit community and Whapmagoostui to be the last Cree community to be connected with the Quebec road network (GENIVAR, 2010).

ROAD PROJECTS: POTENTIAL COMMUNITY IMPACTS AND MITIGATION MEASURES

In all the road projects analyzed, the most obvious impacts are related to the opening up of previously isolated communities. Increased mobility of residents and temporary workers is an obvious consequence of opening up. Road access facilitates access to the territory, to hunting areas and camps, and to other communities connected by road. It also allows for a better supply of food, building materials and other goods at reduced cost, and better access to educational, social and health services. However, this opening up favours the arrival of "outsiders" and the culture of the "South", which can destabilize the current social dynamics, transform traditional values and lifestyles and exacerbate already existing social problems.

A review of comparable projects shows that there are many benefits to a road project in terms of community development and improved health. Community members have greater freedom of movement, better access to essential services, health and social services, education, sports and recreation. They also have the opportunity to build social relationships with neighbouring communities more easily, as well as a better chance to maintain social and family ties with people who have left the community. They also have new employment and economic development opportunities that can contribute to the regional influence of First Nations and their cultures. The reduced cost of goods and services favours, among other things, a more diversified and less expensive food consumption, access to more diversified infrastructures in terms of housing and telecommunications, notably access to the Internet. In short, such road projects bring a better quality of life and a greater possibility of individual and collective empowerment for First Nations members, as well as greater opportunities for individuals, particularly for youth.

However, as highlighted earlier, this transformation accelerated by a road project also brings obstacles. Tensions in social and family relations and a loss of reference points in terms of local traditions and culture must be anticipated. For example, easier access to the territory means that members of neighbouring communities or tourists come to hunt on the newly accessible territory, especially along the roads. This challenges the authority of tallymen and the land management system. This new trend also makes it easier to overexploit resources, which is a fear of local populations expressed in the various studied projects. In addition, it is anticipated that young people will benefit most from increased mobility, which may make it more difficult to transmit traditional knowledge and maintain intergenerational ties. Similarly, if specific actions are not taken, it is possible that jobs will not benefit the local population, that there will be a gap in training for access to employment, that there will be indebtedness of families due to the purchase of vehicles or the purchase of an increased amount of goods and services. There may be nuisances during the construction phase, but also during the operation phase of the road, or an increase in the sense of insecurity in the communities, especially in relation to road accidents and the increase in violence against women and girls related to the arrival of workers, tourists, etc.

With respect to broader social and health issues, there is a significant concern among local communities that these will be exacerbated by a road project. Increased income from project employment and opening up could potentially contribute to increased family difficulties and issues such as alcohol and drug use (increased availability), domestic violence, child neglect, and vehicle debt, and put pressure on health and social services. Yet, on the other hand, increased individual income and overall community wealth could lead to a decrease in social and health problems by providing opportunities, options and, therefore, choices to individuals. This improves self-esteem, self-worth, and self-sufficiency, and can help reduce the social and health issues present in communities. Finally, while all of the benefits of a road project have the potential to reduce social and health inequalities, particularly the gaps that exist between non-Indigenous and Indigenous communities, it is possible that new social and health inequalities could be

formed within communities. These new gaps would be explained by the fact that the social structure traditionally based on the "collective" is being transformed into a social structure in the "South" based on the "individual", a system criticized for creating strong social inequalities.

Several mitigation measures were identified in the studied road projects. Among the most significant are the mechanisms put in place for the empowerment and active participation of local communities in the project:

- The involvement of First Nations and Inuit in the decision-making process and consultations with, among other things, the establishment of a local knowledge platform;
- The implementation of hiring programs - including flexibility in the use of customary languages and schedules to facilitate hunting and other traditional activities - and training, such as a training site (see section 3-3);
- A community-based monitorindg program (led by local residents) established to monitor the effects, protect and conserve local fisheries, related community uses and cultural activities in the vicinity of the highway, as well as for gathering and wildlife. The program also includes an educational and outreach component.

Table 2-1 outlines the community and health impacts in eleven categories. For each category, the nature of the impacts is detailed, and then actions or follow-ups are identified where appropriate. This overview provides a summary of the anticipated impacts and the actions or follow-ups implemented in other projects.

Table 2-1 Comparable Road Projects - Potential Impacts on Communities, Nature of Impacts, Actions and Follow-Ups

IMPACTS	NATURE OF IMPACT	PLANNED ACTIONS AND FOLLOW-UPS
Opening up First Nations and increasing mobility	Increased mobility (especially among youth) and better access to the territory; Increased adoption of "southern" cultural values and social practices; Transformation of the traditional way of life, including loss of tallyman authority and the breakdown of the traditional land management system; Intensified weakening of intergenerational ties; Easier access to hunting camps for land users; Facilitated travel that can foster better outward linkages (education, job training, shopping, employment) and intercommunity linkages (more community events, recreational activities and sports tournaments).	Not identified
Destabilization of traditions and local culture	Increased access to the territory for other users (members of other Indigenous communities, visitors and non-Indigenous hunters) and the possibility of overexploitation of resources; Exacerbated tensions between indigenous and non-indigenous hunters due to the difference in hunting practices of each group; Disruption (temporary during the construction phase) of the land and resource use cycle for hunting, fishing and gathering; Decrease in caribou population due to road traffic; Fear of loss of native languages and intergenerational transmission; Change in consumption patterns (purchasing rather than sourcing from local resources - subsistence).	Community monitoring program (led by local residents) to protect and preserve local knowledge and cultural activities taking place at sites adjacent to roads; A program (with full-time employment) of public awareness and education on hunting and fishing and their impacts on wildlife in areas adjacent to roads; Program (with full-time employment) of traditional and scientific data collection in areas adjacent to roads; Communication networks and informing land users and workers of hunting, fishing and trapping regulations in effect during construction, such as the prohibition of hunting within two kilometres of the construction site; Monitoring program to verify the effectiveness of mitigation measures, ensure reforestation-revegetation of disturbed areas, condition of wildlife including fish; Establishment of a First Nation and Inuit traditional knowledge program; Hiring local residents, and flexibility in the use of customary languages and schedules to facilitate hunting and other traditional activities.
Tensions in social and family relationships	Fragility of intergenerational and intrafamily ties; Tensions among local populations regarding various aspects of the project (route, construction method, benefit sharing, hunting and camping areas, etc.); Conflict with non-indigenous people or other indigenous communities.	Not identified
Creation of individual and collective wealth	Job creation (construction and operation phases in addition to new employment opportunities); Regional economic development with activities such as handicrafts, ecotourism or sport hunting, for example; Increased family income and reduction of material poverty; Debt related to the purchase of vehicles and overconsuming; Reduction in the cost of goods, building materials, food, energy, etc.	To achieve sustainable employment benefits, it is recommended that the training provided and the positions obtained increase employability through the acquisition of recognized skills and relevant experience, such as through the establishment of a training site; Creation of a public transportation system to reduce the debt load associated with the purchase of a vehicle, as well as to reduce the negative effects on the environment.
Changes in quality of life	Lower travel and transportation costs; Reduced cost of goods and continuous supply; Increased and diversified consumer products and food; Increased opportunities for social, recreational and sports interaction; Development of telecommunication infrastructures; Nuisance during construction and operation of the road; Short-term housing pressure to accommodate workers during the construction phase.	Mitigation measures for nuisances; Construction of camps to house outside workers.
Exacerbated social and health issues	Fear of increased availability and use of alcohol and drugs; Fear of increased domestic violence; Fear of increased pressure on health and social services.	Establishment of a local monitoring committee for social issues in conjunction with local health institutions.

IMPACTS	NATURE OF IMPACT	PLANNED ACTIONS AND FOLLOW-UPS
Building local capacity	Better access to training and education services; Better development of children and youth through better access to after-school programs, recreational and sports activities and better academic opportunities; Potential for independent development of the First Nations.	Training programs for youth and unemployed people to promote hiring for the construction and operation phases.
Collectivities health condition	Better access to the health services and to the specialists who were remote before the project; Improved access to long-term care; Reduced health service costs and emergency transportation costs; Maintain or improve the motivation and skills of all employees in the health, social and education services network, through increased opportunities for training, family visits, sports and recreational activities, meetings, etc.; Nuisances during road construction and operation (air quality); Increase in violence against women and girls due to the arrival of foreigners during the construction phase, but also due to the destabilization of the family environment.	Establishment of a local monitoring committee for social issues in conjunction with local health institutions.
(In)Security	Improved food security; Improved access to housing: less expensive home construction resulting in improved services and access; Decreased road safety: accident or drunk driving; Loss of sense of security with the arrival of strangers, especially in relation to violence against women and girls or the spread of disease.	Establishment of a local monitoring committee for social issues in conjunction with local health institutions. Ensure safe crossing areas for both animals and people.
Changing dynamics: social and health inequalities	Promotes the reduction of social inequalities between Indigenous and non-Indigenous people; Better access to education, health and social services for First Nations and Inuit members; Increased inequalities within a community.	Not identified
First Nations and Inuit Empowerment	More opportunities for development; More opportunities for independence (individuals and communities); Individual and collective growth (families, communities and nations).	Building good multi-stakeholder relationships; Communication and engagement mechanisms with First Nations and Inuit throughout the project; Involvement of First Nations and Inuit in decision-making and consultations; First Nations and Inuit capacity building (all project phases and mitigation measures).

BEST PRACTICES FOR ROAD PROJECTS CONSULTATION

The following good consultation practices have been identified for comparable road projects:

- First Nations members can provide oral or written comments to local Hunters and Trappers Committees, community groups and Elders Committees. These organizations are responsible for transmitting the information to the appropriate authorities;
- Community conservation plans, marine protection plans, wildlife management and conservation plans, and other similar documents may be part of the information base for government screening and review processes;
- Communication of the environmental assessment process through newspaper advertisements, radio, mailings, social media posts and a website. A timeline that outlines engagement opportunities at different stages of the process is also available at project initiation;
- Integration of traditional knowledge and consultation with First Nations members of all ages, including Elders, women and youth groups in the impact assessment process;
- Community engagement in the form of interviews, group sessions and workshops with First Nations people to discuss the project. This will include, for example, alternative road alignments, sites of cultural, spiritual and environmental significance to the communities, current studies, potential effects including cumulative effects, land claims-based assessments, and mitigation and monitoring measures;
- Consideration of decreased active participation of community members in a pandemic setting (Covid-19);
- Implementation of a First Nation and Inuit traditional knowledge program to collect and share information on the territory, traditions, culture and resource use;
- Conduct a discussion forum focused on four themes: economic development, workforce development, environment, health and road safety. One-on-one interviews can then be conducted to explore certain topics in greater depth;
- First Nations and Inuit consultations with a cross-cultural approach to understanding issues specific to local realities. This includes the translation of documents and information sessions into the language in which First Nations and Inuit are accustomed to speaking as a prerequisite to effective participation and information. However, cross-cultural communication goes beyond the issue of translation. Cultural differences are often sources of misunderstanding and must be taken into account during consultations, which is why it is important to involve specialists in the culture in question in conducting interviews.

2.1.2 IMPACTS RELATED TO THE RAILWAY PROJECTS

This subsection first presents a description of comparable railway projects, followed by an analysis of the impacts on communities and health, including the identification of a series of mitigation measures or follow-ups. Finally, a list of good consultation practices is provided.

DESCRIPTION OF COMPARABLE RAIL PROJECTS

Tshiuetin Rail Transportation

Tshiuetin Rail Transportation is 100% owned by the Naskapi First Nation of Kawawachikamach and the Innu First Nations of Uashat Mak Mani-Utenam and Matimekush-Lac John, and is funded by Transport Canada. The 217 km Canadian rail line connects Emeril, Labrador and Schefferville, Quebec, and then connects to the rail line that runs to Sept-Îles. Transportation operations began in 2005. Approximately 80% of the haulage operations are dedicated to the transportation of ore. Six 16,000-tonne trains are unloaded each week from June to the end of October, totalling approximately 2.6 million tonnes annually. In addition, the train is used for essential services such as the transportation of fuel, foodstuffs and medicines. Annually, 350 cars of fuel are transported, 350 cars of food and 300 cars of freight (heavy machinery, vehicles, etc.). Generally, the train also has four departures per week for passengers, two from Schefferville and two from Sept-Îles. This represents over 15,000 passengers annually (Canada Infrastructure Bank, 2021; Radio-Canada, 2019; Trains.com, 2021; Tshiuetin Rail Transportation Inc., 2022; TVA Nouvelles, 2019).

ALASKA-ALBERTA RAILWAY

The Alaska to Alberta Railway Development Corporation (A2A Rail) was established to build, own and operate a new railway from Delta Junction in Alaska, U.S.A., through the Yukon and Northwest Territories, to Fort McKay in northern Alberta, Canada, a total route of over 2,570 km. It is a joint venture between Alaska Railroad Corporation and Alaska to Alberta Railway Development Corporation, with a 49% share held by the region's Indigenous governments. Currently, the project is in the permitting stage. The plan is to have an operational train in 2026, primarily for freight, but also for passengers (A2A Railway, 2021; CBC News, 2021; Globe and Mail, 2020).

RAILWAY PROJECTS: POTENTIAL IMPACTS ON THE COMMUNITIES AND MITIGATION MEASURES

In the two rail projects analyzed, an important feature is the total (Tshiuetin) or partial (A2A Rail) ownership of the project by local communities, which allows for ownership and social acceptance of the project, in addition to ensuring direct long-term benefits for the population. By being a leader or stakeholder in the project, the local Indigenous communities are able to add value to the project in order to meet their needs and anticipate the effects, in addition to being able to continue to develop rail services over time while preserving their traditions and culture. This increased participation results in a significant impact, which is the empowerment, both economically and socially, of First Nations and Inuit. As one Tshiuetin Rail Transportation worker described it, "We have a company that allows us to work on the territory and that reflects our personality as Innu. Here they allow me to be Innu, to be a worker and to see the territory" (Radio-Canada, 2019).

As with the road projects, the other obvious impact of the railway operation is the opening up of previously isolated indigenous communities and the increase in their mobility and social relations. Rail access allows for better access to the territory, especially to hunting areas and camps, as well as better supply of food, building materials, merchandise and access to education, social and health services at reduced cost. The train line can also initiate a reorganization of the territory and a more efficient management. For example, in one case, it was observed that hunting camps are now mostly positioned along the railway line. As a result, the local population has easier and quicker access to hunting camps than before, making this traditional practice more accessible. In addition to increasing the quality of life of communities, rail projects are perceived by local communities as drivers of sustainable development by reducing greenhouse gases and providing opportunities for the development of a local green economy, such as ecotourism. Finally, such projects provide the possibility of a continuity of development in the present and in the future, especially in relation to access to other infrastructures. For example, one can think of wireless Internet access, the development of adventure tourism, the arrival of banks or other institutions in the communities, or even the design of an application for the management of wildlife such as caribou. On the other hand, it has negative effects such as accelerating the exploitation of natural resources.

Several actions and types of operations were identified in the studied rail projects. Among the most significant are the mechanisms implemented for the empowerment and active participation of First Nations and Inuit in the projects:

- Communication and engagement mechanisms for First Nations and Inuit throughout the project implementation (Tshuietin and A2A);
- Project led by the First Nations and Inuit (Tshuietin);
- First Nations-Corporations Partnerships: First Nations and Inuit community-led project (target 49% First Nations and Inuit ownership), with First Nations and Inuit representation directly on the Board of Directors, and the development of engagement principles and processes in partnership with the communities established along the corridor (A2A);
- Development of commercial partnerships with First Nations and Inuit businesses (Tshuietin and A2A).

Table 2-2 presents the community and health impacts in eight categories. For each category, the nature of the impacts is detailed and then actions and follow-ups are identified where appropriate. This overview provides a summary of the impacts to be anticipated and the actions that have been implemented for other projects.

Table 2-2 Comparable Rail Projects – Potential Community Impacts, Nature of Impacts, Actions and Follow-Ups

IMPACTS	NATURE OF IMPACT	PLANNED ACTIONS AND FOLLOW-UPS
Opening up First Nations and Inuit communities and increasing mobility	The impacts related to the opening up of the region are multiple and represent an important driving force for the transformation of the lifestyle resulting from increased mobility and easier access to the territory, particularly with the passenger transport service; better access to hunting camps and development of hunting areas around the railway line, facilitating the practice of traditional activities.	Lifestyle adapted transportation, e.g., stops are on request and camps are along the rail line.
Destabilization of local traditions and culture	Hunting, fishing and harvesting: the annual cycle of land and resources use will be temporarily affected by the railway construction, wildlife possibly avoiding the area (especially during the construction phase); Change in consumption patterns (purchase, rather than supply from local resources).	First Nations and Inuit ownership of the project (construction and operation) is essential for successful project integration. Formal monitoring program to verify the effectiveness of mitigation measures.
Improved social cohesion	Increased mobility that can foster stronger intercommunity ties, with more opportunities to meet; Easier for families to visit family members who are studying away and easier for students to return home.	Not identified
Creation of individual and collective wealth	Job creation for the local population (construction and operation phases in addition to new employment opportunities); Development of railway activities and services; Regional economic development with industries such as handicrafts or tourism, ecotourism, sport hunting, etc.; Increased family income and reduction of material poverty; Reduction of costs of goods, building materials, food, energy, etc.	In order for the employment benefits to be sustainable, the leading of such a project (construction and operation) by the First Nations and Inuit is essential. Research of economic opportunities (market study), in the interest of First Nations and Inuit. Development of business partnerships with First Nations and Inuit businesses. Active training and employment programs for the local population.
Changes in quality of life	Reduced commodity costs and continuous supply; Increase and diversification of consumer products and food; Decreased travel and transportation costs (e.g., $130 by train vs $1,000 by plane); Increased opportunities for social, recreational and sports interaction; Infrastructure development (access to communication infrastructure, housing construction, road infrastructure, etc.).	Not identified
Healthier communities	Reduced greenhouse gas emissions by reducing the use of cars and airplanes; Improved access to health services and specialists; Reduced costs of health care services.	Not identified
Security	Improved food security; Improved access to housing: less expensive home construction resulting in improved services and access;	Not identified
First Nations and Inuit Empowerment	The opening up of communities allows for community growth and the opening of possibilities for development, creating more independence for people and communities, especially if they are involved in the process.	First Nations and Inuit communication and engagement mechanisms put in place throughout the project. First Nations and Inuit led project. First Nations and Inuit partnerships (49%) and non-Native businesses (51%) (A2A project).

BEST PRACTICES FOR CONSULTATION ON RAILWAY PROJECTS

The following good consultation practices have been identified for comparable rail projects:

- Development of principles and engagement process in conjunction with the communities involved in a First Nations-Non-Indigenous business partnership. First Nations and Inuit co-managed project (target of 49% First Nations and Inuit ownership) with First Nations and Inuit representation directly on the Board of Directors;
- Integration of Traditional Land Use knowledge and Traditional Ecological Knowledge through collaboration with First Nations and Inuit to collect quantitative and qualitative data.

2.1.3 IMPACTS ASSOCIATED WITH PORT CONSTRUCTION

Following conclusions from the market study (refer to report 1) and cargo forecasting study (refer to Technical Note 13A), the projected demand in the near and intermediate future is not sufficient to support an investment in a deepwater port. This infrastructure component was therefore redefined as a seasonal Small Craft Harbour (SCH) for shallow-draft of ~6 m water depth (refer to Technical Note 13B). Considering the recent landslide upstream from the mouth of Great Whale River and the perceived risk of excessive sedimentation, the proposed Harbour is also considered as a mitigation measure providing an alternative to the community if the existing natural beach harbour became non-operational.

We therefore recommend that, in future studies, analyses of impacts associated with port construction be based on the infrastructure of a seasonal SCH.

It should be noted that Inuit communities were not involved at this stage as this remains a Cree initiative that may not be extended beyond this study. However, it is strongly recommended that, if any study components overlapping Inuit territory were to be pursued, engagement with Inuit communities be initiated immediately in subsequent steps.

2.2 ANTICIPATED HEALTH AND SOCIAL IMPACTS RAISED DURING ENGAGEMENT ACTIVITIES

This subsection presents the potential social and health impacts anticipated by the participants in the engagement process as well as the mitigation measures and other proposed types of actions or follow-ups. In addition, their concerns and expectations regarding the proposed infrastructures are listed. It should be noted that this section gathers the comments concerning the various proposed infrastructures, sometimes indiscriminately. See Technical Note 2 for futher consideration of potential mitigation measures according to the categorie land regim and the Study Areas.

2.2.1 ANTICIPATED HEALTH AND SOCIAL IMPACTS AND PROPOSED MITIGATION MEASURES BY CREE COMMUNITIES

Table 2-3 presents the impacts on communities and health in nine categories. For each category, the nature of the impacts is detailed and then mitigation measures or other types of actions or follow-ups are identified where applicable. This overview provides a summary of the anticipated impacts and the actions proposed by the participants in the engagement activities in the Cree communities.

Table 2-3 Engagement with the Cree Communities - Potential Impacts on Communities and Health, Nature of Impacts and Suggested Actions and Follow-ups

IMPACTS	NATURE OF IMPACT	MITIGATION MEASURE
Opening up Cree communities and increasing mobility	Road access to the community could promote travel to the south; Lifestyle transformation, including increased mobility and better access to the territory (passenger train); Fear that infrastructures give the impression that resource exploitation is open and accepted by communities; Possibility to make competition work and lower the prices for the transportation of goods; Easier access to the territory and to cultural activities. Important expenses avoided; More accessible traditional activities due to reduced costs of goods and equipment; Facilitate connection with other communities (e.g., at funerals).	Ensure that new transportation corridors support the transportation of people and goods, not just of natural resources (timber, minerals); Implement inclusive and participatory engagement methods from the beginning of the process to promote social acceptability; Having a thorough knowledge of the impacts of the Moosonee railway, in Ontario (as the project is very similar); Prior to road construction, ensure that driving lessons are available; Implement a driving and machinery operation safety awareness program (for employees).
Exploitation of natural resources	Overexploitation of resources, including overhunting and overfishing; Poaching on traplines with new access; Illegal fishing and hunting, especially by tourists; Disturbances to flora and fauna and their impact on land users and their livelihoods (e.g. caribou migration); Uncertainty as to what is happening on the land, and how it will be left.	Work with affected communities to establish monitoring mechanisms to prevent overexploitation of resources, overhunting and overfishing; Identifying potential corridor options for roads and rail lines with the entire project-affected community; Establish strict site restoration measures; Plan for road control mechanisms (game warden, land guard or toll booth).
Destabilization of local traditions and culture	Changes in land use, especially hunting and fishing patterns, related to disruptions to caribou migration, the creation of new goose ponds, and sport hunting and fishing by non-natives; Modifications to water sources and collection areas for camps; Relocation of cabins and camps; Changes in eating habits; Reduced participation in cultural activities due to increased travel outside the communities; Potential destruction of natural environments and traditional and culturally significant places for local communities. Reduction of the interest to use the territory and the language, linked to the freedom of mobility brought by the road construction; Loss of the community spirit linked to the proximity that exists within the community.	Program aiming to reinforce Cree culture, language and values, with an experiential [not theoretical] approach, particularly with youth and in relation to the use of the territory and traditional practices; Relocation of camps; Development of new goose hunting sites; Development of camp access and boat ramps; Identification of potential corridor options for roads and rail lines with the whole community affected by the project; Education of non-native hunters on Cree hunting traditions; Implement a complaint management system; Preserve names, Cree nomenclature for places; Provide extensive wildlife monitoring. (*see also below; Community Health*)
Exacerbated social and health issues	Increased spread of sexually transmitted diseases; Increased short-term heavy drinking, especially in communities that do not currently have access to alcohol; Increased access to and use of drugs; Increased social problems related to alcohol and drug use such as violence, break-ins and vandalism; Increase in organized crime and drug trafficking; Racism toward Cree employees, firings, and resignations; Racism from foreigners who settle in the territory; Fear of not being respected (dispossession of territory, disrespect of the JBNQA, hunting ban); Theft from camps, especially those near new transportation corridors; Pressure on the availability of quality, affordable housing; Difficulty in paying debts in the case of a vehicle purchase if a road is built.	Provide Cultural awarness programs for employees to promote respect; Employment of a liaison officer to communicate project issues and news; Provide financial education for debt management.
Creation of individual and collective wealth	Business creation opportunities, especially in the tourism industry and sustainable development; The export of the communities' productions would be facilitated; Development opportunities for mining and job creation; Economic development [construction phase].	Develop mitigation measures with the affected community; Training in skilled trades for the Cree population; Assuring contracts to indigenous companies for the execution of construction and maintenance works; Ensure that the new transportation corridors support the movement of people and goods and not only natural resources (wood, ore).
Changes in quality of life	Reduced costs on food; Reduced costs on goods, materials and hunting equipment in particular; Alleviating the housing crisis through more affordable materials; Facilitation of sustainable development (solar panels, recycling); Nuisances during construction and operation of the project, such as air and noise pollution; Visual aesthetic changes to the landscape such as the creation of new wetlands near rail and road infrastructures; If a gravel road is paved: improved air quality (dust reduction), reduced accidents and improved safety, and lower costs for car repairs and tire wear; Disrupted families or broken couples due to outside work (e.g., construction sites).	Create a warehouse in each community to store merchandise. Use of electric trains to reduce noise. Passenger train with the possibility of transporting equipment.

IMPACTS	NATURE OF IMPACT	MITIGATION MEASURE
Community Health	Increased accessibility to good quality food, health improvement; Potential risk of increased availability of junk food [negative impacts on chronic disease rates]; Psychosocial impacts due to changes in the landscape, lifestyle and environment; Increased stress due to fear of health impacts from various projects (e.g., power lines and cancer); Increased risk of spreading diseases or pandemics; Reduced physical activity due to increased car travelling [negative impacts on chronic disease rates]; Increased environmental pollution from construction and infrastructure projects, including waste generation and contamination of soils and waterways (may also result in additional transportation costs to reach drinking water sources); Better roads would allow the acquisition of smaller vehicles; Exacerbation of risks (accidents, derailments) caused by climate change (freezing, thawing, fires, landslides), and impact on the health of populations; Exacerbation of trapline boundary disputes.	Improve access to cultural education, create a cultural centre; Set up community and intercommunity cultural exchange events; Create a cooking show; Create a youth centre; Facilitate youth access to training or assistance for business creation; Address/resolve the issue of trapline boundaries; Increase health and safety staff; Provide for electrical hookups when choosing a corridor; Provide charging stations for electric cars.
Security	Increased road traffic; Increased risk of accidents; Increased risk of hunting accidents as non-native hunters are not familiar with local hunting practices and camps location; Feeling of insecurity with the arrival of foreigners; Decrease heavy truck traffic on road and increase security with the railway.	Implementation of road safety measures, including signage, access to emergency telephones, and railway crossings at the infrastructure planning stage; Educating non-native hunters about Cree hunting traditions; Conduct background checks on visitors; Relocate camps.
Community Empowerment	Increased development opportunities; Increased independence of individuals and communities, especially if they are involved in the process; Increased personal freedom and choice; Decision to be made by the community about its threshold of tolerance (what it is willing to sacrifice). General community development.	Identification of possible corridor options for roads and rail lines with all community stakeholders (community engagement); Implement a Community Action Plan to mitigate impacts; Implement a taxation system (e.g., a toll on the road); Include the Crees in wildlife studies, specifically along the Billy-Diamond Highway; Regarding economic opportunities: promote Cree businesses to be the main suppliers on the territory, and give priority to Cree communities, then to other First Nations, and finally to non-natives.

CONCERNS AND EXPECTATIONS

The main concerns include:

- Ensuring the participation of the entire community in decision-making and engagement while having access to full project information;
- Loss of livelihoods, including hunting;
- Decline in water quality and resources (e.g., aquatic wildlife) leading to disease;
- Exacerbation of social and health issues, including access to and use of alcohol and drugs, domestic violence and chronic health problems;
- Development or increase in organized crime, disrespectful behaviour and disease (e.g., pandemic);
- Dispossession of territory, non-compliance with the JBNQA and racism;
- Cumulative impacts of numerous development and natural resource projects in the region;
- Disrespect for the land and traditional practices;
- Little benefit for the Crees from the potential infrastructures;
- Snow removal planification for infrastructure in the context of climate change.

The main expectations are:

- Reduction in the cost of living and increase in purchasing power;
- Facilitating links with other communities;
- Facilitating the access to the territory and the practice of traditional activities;
- Economic development of the communities;
- Development of business and employment opportunities;
- Promotion of sustainable development opportunities (recycling, solar panels);
- Improved health (food and air quality);
- Cree ownership of the project and capacity building.

To note that it was also recommended to study the impacts of the railway that runs to Moosonee in Ontario, as the project could be similar. In addition, some of the people interviewed suggested that the impacts of mining developments should be considered from the outset, since they are linked to infrastructure projects. Similarly, for the proposed port infrastructures, a risk analysis should be done to avoid environmental disasters, and this analysis should take into account future generations. The subject of young and future generations, and what they will have to provide for themselves, is a concern that has been raised many times.

POTENTIAL HEALTH AND SOCIAL IMPACTS

This subsection presents the highlights of potential health and social impacts on Cree communities, including possible measures or programs to limit the impacts or enhance the benefits of the proposed infrastructures, as well as best practices in terms of engagement activities.

The potential positive and negative community and health impacts that were identified are grouped into four impact categories:

- Changes in local traditions and culture;
- Changes in quality of life;
- Increase of health and social problems;
- Empowerment of communities and reduction of social and health inequalities.

These categories are detailed below.

CHANGES IN LOCAL TRADITIONS AND CULTURE

As territories become accessible, several elements can disrupt local traditions and culture:

- The presence of users other than the tallymen and their families may exacerbate social tensions with outsiders and cause overharvesting, overhunting, and overfishing;
- The disturbance of fauna and flora can prevent the cycle of use of the traditional territory;
- The increased mobility and the adoption of "southern" values and culture can lead to the potential loss of traditional languages and transmission of intergenerational values. Whereas, the possibility of easier access to the territory can facilitate the transmission of traditional knowledge, especially among the youth.

The main measures identified to address issues related to the preservation of traditions and culture are as follows:

- Develop specific mitigation measures with the affected community;
- Hiring local residents, and flexibility in the use of customary languages and schedules to facilitate hunting and other traditional activities;
- Community monitoring program (led by local residents) implemented to monitor the effects, protect and conserve local hunting and fishing, related community uses and cultural activities in the vicinity of new transportation corridors. This includes public education, monitoring of hunting and fishing activities and impacts on wildlife habitat, and collection of traditional and scientific data in areas adjacent to the potential infrastructures;
- Establishment of a First Nation and Inuit traditional knowledge program;
- Identify possible corridor options for roads and rail lines with the entire community affected by the potential infrastructures. This is to respect land use and promote access to the territory;
- Program aimed at strengthening Cree culture, language and values, with an experiential approach [as opposed to a theoretical one], particularly with youth and in relation to land use and traditional practices.

CHANGES IN QUALITY OF LIFE

Positive and negative impacts were identified in terms of quality of life:

- Noise, air, soil, and water pollution during construction and potentially during the operation phase;
- Job creation and economic development opportunities, particularly in tourism;
- Improved access to education, health and social services;
- Reduced costs of services, materials, goods, equipment, etc. and infrastructure development (e.g., housing construction);
- Increased availability of affordable, healthy, good-quality food, improving the health of communities. However, there is a potential risk of increased availability of junk food causing negative impacts on chronic disease rates;
- Increased opportunity to implement sustainable development (e.g., solar panels, recycling, electric charging stations).

The main measures identified to address quality of life issues are as follows:

- To encourage hiring during the construction and operation phase and to ensure that employment benefits are sustainable:
  - Skilled trades training to First Nations and Inuit communities based on the type of employment created;
  - Training programs for youth and unemployed people to encourage hiring for the construction and operation phases;

  - Establishment of a training site;
  - Ensuring the contracting of Indigenous businesses for the construction and maintenance work. Development of commercial partnerships with First Nations and Inuit businesses;
  - Ensure respect for Indigenous culture, including the provision of cultural awareness training, rules, and the hiring of a liaison officer.
- Ensure that the new transportation corridors support the movement of people and goods and not only the transportation of natural resources such as ore, notably to facilitate economic development other than resource extraction, such as tourism;
- Search for economic opportunities (market study), in the interest of First Nations;
- Implement road safety measures, including signage, emergency telephones and rail crossings at the infrastructure planning stage;
- Construction of camps to house contingent workers.

EXACERBATED SOCIAL AND HEALTH PROBLEMS

The increased income, especially from the employment created by new projects, the arrival of workers and the opening up of the territory, could contribute to an increase in family difficulties and conflicts and put pressure on health and social services:

- Alcohol and drug use (increased availability);
- Intra-family violence and child neglect;
- Indebtedness, especially related to the purchase of vehicles and new consumer habits;
- Increased risk of road accidents.

However, increases in individual income and overall community wealth could lead to fewer social and health problems by providing more opportunities, options, and therefore choices for individuals.

In general, there is an increase in violence against women during the implementation of similar projects, especially during the construction phase.

The main measures identified to address the exacerbation of social and health issues are as follows:

- Provide financial education for debt management;
- Implement a Community Action Plan to mitigate impacts;
- Implement a complaint management system;
- Establish a local monitoring committee for social issues in conjunction with local health institutions;
- In addition, it is suggested that in order to determine specific mitigation measures for community health, a Health Impact Assessment [HIA] be conducted with a gender, intersectional approach (GBA+; Gender-based Analysis) to understand the differential impact on different groups such as youth, women, hunter-trappers, workers, etc.

EMPOWERING COMMUNITIES AND REDUCING HEALTH AND SOCIAL INEQUITIES

A project that opens up and accelerates the development of a community allows for economic growth and development opportunities, leading to greater individual and collective independence. However, to achieve this positive impact, it is necessary to empower local communities and ensure that they fully participate in decision-making and take ownership of the project. In this way, the proposed infrastructures, if they go forward, could contribute to reducing social and health inequalities.

The main measures identified to promote community empowerment and reduce social inequalities are the following:

- Ensure that new transportation corridors support the movement of people and goods, not just natural resources such as minerals;
- Involve First Nations in the decision-making process, in studies, and in engagement activities and the establishment of good multi-stakeholder relationships;
- Determine possible corridor options for roads and rail lines with all affected communities through community engagement. This involves not only the leaders and tallymen, but also the community at large, to ensure a democratic and empowering process;
- Implement mechanisms for communication and community engagement throughout the project;
- Reinforce First Nations capacity during the different phases of the project and integrate this aspect in the mitigation measures;
- Ensure that the project would be led by First Nations;
- Establish partnerships between First Nations and non-Native businesses;
- During the Cree engagement activities, some participants also suggested implementing a taxation system (e.g., a toll on roads), and encouraging the hiring of Cree businesses and employees.

RECOMMENDATIONS

One of the best engagement practices identified is to implement an inclusive and democratic approach with First Nations, with an intercultural consideration. Indeed, cultural differences are often sources of misunderstanding and must be taken into account during engagement activities in order to understand the issues specific to the local reality, and to favour the appropriation of the project and social acceptability. An inclusive approach includes:

- Translation of documents and information sessions into the language commonly used by First Nations as a prerequisite to effective participation and information;
- Integration of traditional ecological and land use knowledge through collaboration with First Nations peoples to collect quantitative and qualitative data. This may involve the development of a First Nation traditional knowledge program to collect and share information on land, traditions, culture and resource use;
- Conduction of interviews by experts in the culture of the groups involved;
- Opportunity for First Nations members to provide oral or written comments to their respective Hunters and Trappers Committees, community groups and Elders Committees, who will relay the information to the authorities;
- Consultation with all land users, not just tallymen. Meetings could be set up with the whole family, ideally several meetings, as new ideas and thoughts can come up when the subject is revisited;
- Also consultation with other members of the concerned communities, and actors from different backgrounds (such as economic, health, social). During the engagement activities, it was recommended to:
  - have the necessary time for engagement activities;
  - adjust vocabulary for understanding;
  - give advance notice of engagement sessions;
  - propose more than one engagement session.
- In fact, clear and transparent information throughout the process and the life of the proposed infrastructures is recommended by the Crees, mainly to understand the objectives and stakes of the projects.

Furthermore, it was identified as a good practice to set up a collaborative approach that favours the full participation of First Nations, notably in a co-direction and co-ownership approach. In this case, First Nations representation directly on the Board of Directors is necessary, as well as the development, in collaboration with the communities concerned, of guiding principles and the community engagement process.

2.2.2 ENGAGEMENT ACTIVITIES WITH JAMESIAN MUNICIPALITIES/LOCALITIES

As specified in Technical Note 3, engagement activities with Jamesian municipalities and localities were carried out jointly for phases I, II and III of La Grande Alliance. The municipalities of Chapais, Chibougamau, Lebel-sur-Quévillon, Matagami, as well as the community of Radisson were interviewed between January and September 2022 (Refer to TN 3, Appendix C). It should also be noted that the teams of each consultant (VEI and WSP) divided the analyses of the engagement activities with the Jamesian municipalities and localities into their own mandate. This is why the analyses presented in this TN 5 and in TN 3, concern only the municipalities of Chibougamau and Matagami, as well as the community of Radisson. If Chapais and Lebel-sur-Quévillon are mentioned in the analyses, it is because these two municipalities may have been mentioned by participants from other Jamesian municipalities.

In Matagami, no social and health impacts were mentioned. The main concern is expressed first and foremost in economic terms, notably concerning a regional development strategy that includes Jamesian and Cree stakeholders and decision makers.

In Radisson, health and social impacts were at least as important as economic impacts in discussions with participants at the engagement activities. The main anticipated impact considered is the loss of services that would result from the road extension, considering that these services exist in Radisson because the community is located at the end of the road. This geographical location supports a large part of the economy and services according to its inhabitants. Several services have already closed recently, such as the grocery store and the SAAQ branch, or are about to close, such as the local garage. These impacts are exacerbated, on the one hand, by the very status of Radisson as a locality, which participants described as precarious compared to the status of a municipality, and on the other hand, by the temporary presence of Hydro-Québec workers who benefit from the services available in the Hydro-Québec camps and do not make the services provided by the locals profitable.

In Chibougamau, no social and health impacts were mentioned. As in Matagami, the main concern is expressed first and foremost in economic terms and mainly associated with the extension of Route 167 to the Trans-Taiga Road and the reopening of the railway between Grevet and Chapais. Table 2-4 presents the impacts on communities and health in seven categories. For each category, the nature of the impacts is detailed and then measures are identified where appropriate. This overview provides a summary of the anticipated impacts and the mitigation measures or other types of actions and follow-ups proposed by the participants during these engagement activities.

Table 2-4 Engagement activities with Jamesian Municipalities/Localities - Potential Community and Health Impacts, Nature of Impacts and Suggested Actions and Follow-ups

IMPACTS	NATURE OF IMPACTS	SUGGESTED ACTIONS AND FOLLOW-UPS
Exacerbated social and health issues	Increased access to and use of alcohol and drugs; Increase in prostitution issues; Decrease and loss of services.	Not identified
Creation of individual and collective wealth	Development opportunities in the tourism industry; Economic development opportunities for the mining industry; Job creation, especially during the construction phase of the project; Loss of services and slowing of economic development in Radisson due to the road extension and accessibility to the community further north [Whapmagoostui/Kuujjuarapik].	Involve the Jamésie Tourism Association in the development of the project; Encourage the succession of specialized workers; Promote access to housing and essential services [particularly in Radisson with the support of Hydro-Québec].
Changes in quality of life	Nuisances during construction and operation of the project, such as air and noise pollution, especially for people living near the project area; Reduced costs and increased accessibility to food, goods and materials; Lack of labour and little or no real estate market (no new homes built).	Measures to reduce air and noise pollution [construction and operation].
Community Health	Increased accessibility of healthy and good quality food; Reduced pollution [with a train].	Not identified
Insecurity	An increase in road and rail traffic would increase the risk of accidents.	Not identified
Economic and social benefits to Jamesian municipalities/communities	Potential economic and social benefits through the development of passenger train; Potential economic and social benefits through the development of a regional development strategy with a provincial and even national perspective.	Encourage the involvement of local stakeholders in the project.
Northern Community Relations	Potential to create links between the Cree, Inuit and Jamesian communities around the management of the territory and strategic developments to be developed in a common manner.	Promote exchanges between communities.

CONCERNS RELATED TO THE PROPOSED INFRASTRUCTURES

The concerns are:

- Cost of the potential infrastructures compared to the benefits to the Jamesian community. Ensure sustainability and equity of benefits;
- Development of "sustainable" tourism in the communities;
- Ensure the involvement of the Cree and Inuit communities in the potential infrastructures;
- Loss of services and slowing of economic development in Radisson;
- Preservation of wealth created in Jamesian municipalities/towns in the post-construction period to avoid the decline of small towns after the work is completed.

2.2.3 ENGAGEMENT ACTIVITIES WITH THE INUIT COMMUNITIES

It should be noted that Inuit communities were not involved at this stage as this remains a Cree initiative that may not be extended beyond this study. However, it is strongly recommended that, if any study components overlapping Inuit territory were to be pursued, engagement with Inuit communities be initiated immediately in subsequent steps.

3 TRAINING AND EMPLOYMENT OPPORTUNITIES

3.1 OBJECTIVES AND APPROACH

The purpose of this section is to identify the various training niches to be prioritized during the construction and operation phases of the Phase II and III of La Grande Alliance.

More specifically, the analysis is based on the following two dimensions:

1. A study of training slots directly related to the proposed infrastructures.
2. A focus on "non-traditional[4]" employment slots and the resource-based social economy, especially in relation to the proposed Protected Areas network.

In addition, the time required to provide adequate training is considered, and finally, the process of implementing training is discussed, including Cree input on employment and training opportunities.

3.2 METHODOLOGY

The training opportunities presented in this subsection are based on the results of various activities:

- A literature review[5] and a review of comparable project records (see Section 2.1), to identify good practices in training and employment opportunities;
- An analysis of the focus group minutes and the communication Register to identify employment, training, and preferred sectors;
- A link to the market study (VEI, 2022) where potential partners and existing training opportunities in the territory are listed, in order to establish explicit links to the recommended sectors for the construction and operation phases.

Finally, potential partners for the training niches have been identified and it is recommended that they join a committee to oversee the implementation of the programs.

[4] A non-traditional job is defined here as a job that does not have to be full-time, with fixed hours, predictable pay and with the employer.
[5] Eeyou Planning Commission (2017), Radio-Canada (2021a, 2021b).

3.3 TRAINING NICHES FOR JOBS RELATED TO THE PROPOSED INFRASTRUCTURES

The main employment sectors related to the proposed transportation infrastructures, in both the construction and operation phases are presented first, for the study components themselves and second, for opportunities that may arise once the proposed infrastructures are operationnal.Table 3-1[OBJ]). See the Technical Note 15 for a more detailed analysis of the local workforce opportunities.

3.3.1 INFRASTRUCTURE-RELATED EMPLOYMENT SECTORS

The main types of jobs directly related to the construction of the proposed infrastructures are, below, divided into four sectors that correspond to the project phases. For each of these sectors, managers, coordinators, team leaders, and administrative work (e.g., HR, payroll, secretariat) are required. The types of jobs (non-exhaustive) that will be required to build the infrastructures are listed for each of these sectors:

Preliminary work (in the field, engagement, and training) [6]:

- Field surveys;
- Archaeological excavations;
- Interviewer;
- Trainer.

Worker Camps:

- Maintenance of workers' camps (exterior and interior);
- Driver (shuttle for employees);
- Kitchen.

Infrastructures construction:

- Surveying;
- Construction;
- Labourers;
- Operation of heavy machinery;
- Truck driver;
- Logging;
- Technicians;
- Engineers;
- Liaison officer.

Infrastructures operations:

- Railway safety;
- Railway maintenance;
- Snow removal;
- Operation and maintenance of infrastructures.

[6] This phase of the project refers to non-traditional jobs, which are discussed in Section 3.4.

According to the market study, the main economic sectors that could provide employment opportunities related to the various transportation infrastructures associated with the project, once completed, throughout the communities, are the following:

- Forest industry (forest management, logging - processing and product manufacturing, forest biomass and forest conservation);
- Mining (several minerals, including diamond, gold, lithium spodumene and iron);
- Commercial fishing;
- Electricity (hydroelectric projects with Hydro-Quebec);
- Construction (including carpentry and joinery, electricity, ironwork, heavy equipment, civil engineering and roads);
- Supply of equipment and goods;
- Tourism (discussed in the section 3.4.1).

3.3.2 LIST OF TRAINING NICHES

The following training niches are identified from the major employment sectors related to the proposed infrastructures (directly and indirectly):

- Construction[7]: carpenter, electrician, painter, tinsmith, scrap metal worker, heavy equipment mechanics, heavy equipment operator, welder, etc.;
- Accounting, management, office automation;
- Cook;
- Railway operation, maintenance and safety;
- Transportation logistics;
- Truck driver;
- Forestry: logging, harvesting, processing, surveying, forestry engineer;
- Hydroelectricity technician, engineer;
- Drilling;
- Skilled mining workforce: geologist/geological technician, mining engineer, health and safety advisor, procurement, administrative technician, industrial electronics technician, mining technician/mine foreman, metallurgy technician, water treatment technician, chemical process technician, laboratory technician;
- Teaching (trainer in the above trades and professional fields).

3.3.3 INVENTORY OF TRAINING OPPORTUNITIES FOR JOBS RELATED TO THE PROPOSED INFRASTRUCTURES

Table 3-1 lists the main training opportunities related to the training niches identified in 3.3.2. It should be noted that basic training is available in the Eeyou Istchee region, notably offered by the Cree School Board. More specialized training is generally offered outside this region. In addition, it should be noted that the duration of training varies between 2 months and 3 years and that the training offer generally meets the identified niches without taking into consideration the accessibility issues of the Cree population to the training offer.

[7] Major construction trades jobs according to the CSD Construction Union (2022).

Table 3-1 Training Opportunities for Jobs Related to the Proposed Infrastructures, Based on Institutions, Programs, Training Duration and Location

INSTITUTION	PROGRAM	TRAINING	DURATION	LOCATION
Cree School Board[8]	Vocational training and jobs related to adult education	Surveying and topography	72 weeks (1 800 hours)	Waswanipi
		Accounting	54 weeks (1 350 hours)	Whapmagoostui
		Secretariat	60 weeks (1 485 hours)	Nemaska
		Automotive mechanics; Small vehicle mechanics; Construction equipment mechanics	72 weeks (1 800 hours)	Mistissini; Eeyou Istchee region
		Carpentry	54 weeks (1 350 hours)	Oujé-Bougoumou
		Management of a construction company	18 weeks (450 hours)	Mistissini
		Trucking	8 weeks (210 hours)	Eastmain
		Residential and commercial painter	36 weeks (900 hours)	Eeyou Istchee region
		Operation of metal and ore processing machinery; Operation of heavy machinery	36 weeks (900 hours)	Eeyou Istchee region
		Ore extraction	38 weeks (930 hours)	Eeyou Istchee region
		Welding	72 weeks (1 800 hours)	Eeyou Istchee region
Université du Québec en Abitibi-Témiscamingue (UQAT)	Undergraduate and DEC	Applied hydrology microprogram; mining environment; arctic mines and environments[9]	3 to 6 months (12 to 15 credits)	Eastmain (hydrology only) and distance learning
		DEC-BAC in accounting science[10]	2 years (90 credits)	Rouyn-Noranda and distance
		BAC in mechanical engineering; electromechanical engineering; electrical engineering; mining engineering[11]	3 years (120 credits)	Rouyn-Noranda and Polytechnique Montréal for certain programs
	Graduate	Mining engineering[12]	1 year (45 credits)	Rouyn-Noranda
Cégep de Saint-Félicien[13]	Diploma of Collegial Studies (DEC) and Diploma of Vocational Studies (DEP) - technical	Forest product processing	DEP: 2 months to 1 year (600 to 1 800 hours) DEC: 3 years	Chibougamau
		Accounting and management		
		Tourism		
Développement des compétences Apatisiiwin[14]	Various programs offered for skills development and training	Professional training - preparation and financial assistance	Case by case	Eeyou Istchee region
		Employability program - mentoring, on-the-job learning, company integration		
		Internship for Cree graduates		
Niskamoon corporation[15]	Training programs in collaboration with the Cree School Board and the Centre d'études collégiales in Chibougamau	“Natural Environment Technology (NET) Program”	Not specified	Chibougamau or in the workplace
Centre de formation professionnelle Baie-James[16]	Diploma of Vocational Studies (DEP)	DEP in Mining - blasting drilling; diamond drilling; operating ore processing machinery; ore extraction	6 months	Chibougamau, Lebel-sur-Quévillon, Matagami
		Mechanics - construction equipment mechanics; electromechanics of automated systems; industrial construction and maintenance mechanics	12 to 18 months	
		Construction - plumbing and heating	14 months	

[8] Available on line: Eeyou Education - Regional Vocational Training Centre (SRVTC)
[9] Available on line: Institut de recherche en mines et en environnement | UQAT
[10] Available on line: Gestion | UQAT
[11] Available on line: École de génie | UQAT
[12] Available on line: Institut de recherche en mines et en environnement | UQAT
[13] Available on line: Cégep de Saint-Félicien (cegepstfe.ca)
[14] Available on line: Labour Market Development - Apatisiiwin Skills Development
[15] Available on line: TRAINING & EMPLOYMENT : Niskamoon Corporation
[16] Available on line: Programmes - Centre de formation professionnelle de la Baie-James (cfpbj.ca)

3.4 TRAINING NICHES FOR NON-TRADITIONAL JOBS

The main sectors of "non-traditional" employment and resource-based social economy are linked, among others, with the proposed protected areas network. They are presented below according to the particularities of the communities. In a second step, the training niches are presented in the form of a list, followed by a table listing the potential institutions, their trainings, and the duration and location of trainings (see Table 3-2).

3.4.1 NON-TRADITIONAL EMPLOYMENT SECTORS

The following main “non-traditional” economic sectors were identified:

- Forestry (forest management and conservation, including protected area development);
- Development of public services (such as waste management, management of protected areas);
- Entrepreneurship (including the development of Cree businesses and the social economy to promote local purchasing, crafts and sustainable development);
- Environment (environmental monitoring, biologist, game warden);
- Tourism (including the future development of a UNESCO world geopark, trail development, industrial site visits, cultural trips, ecotourism and mycotourism, snowmobile, unusual accommodations, outfitting, river rafting, landscape enhancement and historical trails);
- Communications, including the commercialization of the fibre-optic network, the connection to communication towers and the expansion of the electricity distribution network.

The identified non-traditional employment sectors that are under development or that could become so, according to the will of the Crees, are indicated below, by community:

Chisasibi

- Development of Cree entrepreneurship and community autonomy, including the food market (bread, berries, mushrooms) and the wood industry;
- Development of conservation projects and protected areas, including planning and operation;
- During the engagement activities, the wood industry was also mentioned, such as the development of a plank factory.

Eastmain

- Development of conservation and land management projects, including environmental monitoring, management of mitigation measures for development projects, animal population management, development of conservation areas, development of land accessibility such as the creation of hiking trails, management of hunting, fishing and harvesting with quotas;
- Non-timber forestry production;
- Development of the tourism and recreation industry, including sports and cultural programming;
- Development of the waste management service.

During the engagement activities with the women's group, the possibilities of developing cultural tourism were put forward. In addition, training or apprenticeships provided by the elders were valued by women and youth. They also mentioned that they would like to develop businesses related to mushroom picking, tent making (pop up teepee style), greenhouse construction and management, recycling, pottery, and wooden house construction.

It should also be noted that the community wishes to carry out a market study to see what types of businesses could be developed with the other Cree communities and outside the region (engagement activities with Chief and Council).

Mistissini

- Development of conservation and land management projects to protect the most productive and culturally sensitive areas of the Mistissini territory;
- Rehabilitation and protection, by silviculture, of affected areas;
- Development of the cultural industry including a community program on Cree culture and language;
- Maintaining the tourist market based on, among other things, fishing trips, snowmobile trails and a 20-room hotel.

Nemaska

- Conservation and management of the territory, including management of hunting and fishing;
- Development of cultural industries such as the establishment of annual activities (e.g., fishing).

Waskaganish

- Conservation and management of the territory, including hunting and fishing management, creation of sanctuaries and integration of traditional knowledge of the elders;
- Creation of an Eeyou Istchee National Park;
- Development of the cultural industry to promote Cree culture with a cultural program;
- Development of Cree industries, for example, the exploitation of eco-responsible energy sources;
- Development of waste management services.

Wemindji

- Development of eco-responsible tourism and blueberry and cranberry picking;
- Cultural development in the community and the community's desire to create a cultural camp for the Cree;
- Business development in collaboration with other Cree communities and those of the south, such as the case of Petro-Nord;
- Development of Cree businesses in retail and manufacturing, shipping, forestry and tree planting;
- Conservation of the territory including hunting management and citizen involvement;
- Development of waste management and recycling services;
- During the interviews, it was mentioned that the wood industry could be developed with the production, for example, of matches or toothpicks. The development of a fishery to export fish was also mentioned.

Whapmagoostui

- Currently, development is difficult because of the high cost of goods and services (community without road access).

3.4.2 LIST OF TRAINING NICHES

The following training niches are identified based on the main employment sectors that could be linked to the proposed infrastructures, and the opportunities and issues present in the communities:

- Wildlife officer or assistant wildlife officer;
- Conservation officer;
- Hunting and fishing officer;
- Biologist, biological or environmental technician;
- Land use planning technician;
- Park ranger;
- Field research assistant;
- Guide;
- Tourism and public relations officers;
- Cultural or community facilitator;
- Cree craft seller and creator;
- Business management and social economy (e.g., Specialization in eco-construction and renewable energy);
- Residual materials management;
- Telecommunications technician.

3.4.3 INVENTORY OF TRAINING OPPORTUNITIES FOR "NON-TRADITIONAL" JOBS

Table 3-2 lists the main training opportunities related to the training niches identified in the Section 3.4.2. It should be noted that basic training is available in the Eeyou Istchee region, notably offered by the Cree School Board. More specialized training is generally offered outside this region. In addition, it should be noted that the duration of training varies between 3 months and 3 years (on average about 1 year). These trainings generally respond well to the identified niches in terms of conservation of the territory, but not to the niches in terms of economic development and entrepreneurship, as well as telecommunications. This is without considering the issues of accessibility to training for the Cree population.

Table 3-2 Training Opportunities for "Non-Traditional" Jobs, Depending on Institutions, Programs, Training Duration and Location

INSTITUTION	PROGRAM	TRAINING	DURATION	LOCATION
Cree School Board[17]	Vocational training and jobs related to adult education	Photography	72 weeks (1 800 hours)	Waswanipi
		Recreation management	52 weeks (1 290 hours)	Eeyou Istchee region
		Professional cooking	59 weeks (1 470 hours)	Eeyou Istchee region
		Hunting and fishing guide	29 weeks (720 hours)	Eeyou Istchee region
		Protection and development of wildlife habitats	53 weeks (1 320 hours)	Mistissini
		Business start-up	14 weeks (330 hours)	Chisasibi
UQAT	Undergraduate	Micro-program "Indigenous Tourism Management"[18]	3 to 6 months (15 credits)	UQAT Val-d'Or and distance learning
		Certificate in Territorial Management in an Indigenous Context [19]	6 months to 1 year (30 credits)	Amos, Chibougamau, UQAT Center in Abitibi-Ouest, Mont-Laurier, Rouyn-Noranda, Remote learning, Val-d'Or, UQAT Center in Témiscamingue
		Public Management in an Indigenous Context (DESS)[20]	6 months to 1 year (30 credits)	
Cree Native Arts & Crafts Association[21]	Arts and Crafts Training and Education Program	Traditional knowledge and production techniques, such as moose hide tanning, sewing and tamarak decoy making, as well as business development and marketing.	Not specified	Oujé-Bougoumou
Cégep de Saint-Félicien[22]	Diploma of Collegial Studies (DEC) and Diploma of Vocational Studies (DEP) - technical	Natural Environment - forest resource management; wildlife management; natural heritage management and interpretation; environmental protection	DEP: 2 months to 1 year (600 to 1 800 hours) DEC: 3 years	Chibougamau
		Sustainable development, environment, and health		
Apatisiiwin Skills Development[23]	Various programs offered for skills development and training	Professional training - preparation and financial assistance	Case by case	Eeyou Istchee region
		Employability program - mentoring, on-the-job learning, company integration		
		Internship for Cree graduates		
Centre d'études collégiales in Chibougamau	Natural Environment Technology	This program is adapted to the context of Northern Quebec and aims to develop the skills necessary to manage wildlife habitats and measure the impacts of such management and of resource development and exploitation.	3 years	Chibougamau
	Accounting and Management Technology	Program that provides the skills necessary to become an accounting and management technician. Includes three teaching units (accounting, management and sustainable development) focusing on sustainable development in decision-making.	Not specified	Chibougamau
	Tremplin DEC – First Nations	The Tremplin program leading to a DEC offers a flexible learning approach with a variety of courses tailored to the needs of students who wish to begin or complete a program of study leading to a college diploma (DEC).	2 sessions	

[17] Available online: Eeyou Education - Regional Vocational Training Centre (SRVTC)
[18] Available online: Indigenous Students | UQAT
[19] Available online: École d'études autochtones | UQAT
[20] Available online: École d'études autochtones | UQAT
[21] Available online: Programs & Services - Cree Native Arts & Crafts Association (cnaca.ca)
[22] Available online: Cégep de Saint-Félicien (cegepstfe.ca)
[23] Available online: Labour Market Development - Apatisiiwin Skills Development

3.5 IMPLEMENTATION OF TRAINING COURSES

3.5.1 LA GRANDE ALLIANCE TRAINING COMMITTEE

Potential stakeholders for the training programs are identified in the previous tables (Table 3-1 and Table 3-2). Discussions should be held with these stakeholders and they should be included in a future training committee to oversee and facilitate the implementation of the training programs as soon as possible in the next phases of the development of the proposed infrastructures. The early establishment of this committee, and the tasks it will have to perform, will need to be defined as soon as possible to ensure that the targeted training can be carried out at the appropriate time.

It is strongly recommended that the following organizations be considered as stakeholders in the process:

- Cree School Board;
- The Niskamoon Corporation;
- Apatisiiwin Skills Development;
- CÉGEP de Saint-Félicien;
- Université du Québec en Abitibi-Témiscamingue (UQAT);
- Centre d'études collégiales in Chibougamau (also offers personalized service for Indigenous students and training in English).

In addition, the following potential funding partners have been identified:

- Creeco, an investment company of the Cree Nation of Quebec, holding several subsidiaries including CCDC (construction), Air Creebec (air transportation), Quality Inn & Suites Val-d'Or (hotel), ADC (catering and maintenance services), Valpiro (ground handling and aircraft refuelling), EERP (property development and management);
- The Société du Plan Nord (SPN) created by the Quebec government's Bill 27 to improve development in Northern Quebec. The Northern Plan provides for a four-pronged funding strategy where private sector partners will participate in financing infrastructure development. Government revenues from economic development initiatives as well as direct and indirect tax revenues from public infrastructure projects will be reinvested in the Plan Nord. Investissement Québec, the investment arm of the Quebec government, will take equity stakes in mining companies (and other businesses) as part of the Plan Nord. Hydro-Québec will also contribute annually to development projects in the region;
- Economic development corporations, such as the Waskaganish Business Corporation.

It should be noted that Technical Note 15 presents the provisional timetable for the implementation of the various phases of La Grande Alliance proposed infrastructures to allow, in particular, for the planning of local training programs in an adequate timeframe.

3.5.2 TRAINING APPROACHES

The remoteness of the Cree communities from the major centres, where a variety of training is offered, is an obvious obstacle for young people, as is the use of French in most training. Thus, as mentioned above, partnerships must be established to develop training programs adapted to the Cree context and the needs of La Grande Alliance. The distinct context of economic development, the active population and the issues and needs of each Cree community must also be taken into account when developing training programs. To this effect, more specific engagement activities should be held in each community, notably with the stakeholders in the sector (education, human resources) and the youth, in order to paint an accurate and current picture of the situation (possibilities, issues and needs), and to effectively feed the training committee.

The training of the Cree workforce is successful through continuous and direct formal and informal contacts with the Cree communities, personalized follow-up, companionship, mentoring, cooperative education, work-based learning programs and the promotion of Cree employability based on the Cree reality (Desfor, 2022, cited in the market study). The following methods were observed in the different resources consulted and represent good practices in training and employability development:

- Workshops (see below);
- Use of Indgenous/mother languages;
- Flexible hours to accommodate the hunting season, for example;
- Prioritize access to local training;
- Developing partnerships with local organizations and businesses;
- Promoting the inclusion of youth and women;
- Promoting retention and perseverance of students (students from communities are often missing prerequisite courses, so they have to catch up).

It should be noted that the worksite-school approach can be interesting for participants who acquire concrete job experience during their training. For example, there are two worksite-schools on the territory of Eeyou Istchee that are part of the DEP in Mining. One is affiliated with the Renard Diamond mine (Stornoway), the other with the Windfall Gold mine (Osisko). After approximately two months of theoretical, workshop and simulation training at the Chibougamau Training Centre, the ore extraction students have fly-in/fly-out access to the training site, and after four to six months, have good employment opportunities (CFPBJ, 2022). However, depending on the degree or trade sought, the training could be longer. For example, the Duchesnay School of Forestry offers different DEPs of 10 to 18 months with apprenticeships in outfitters, wildlife reserves, and on its Research and Teaching Forest site. Once you graduate, there are also many job opportunities. Finally, let's mention the training site on the portion of Route 138 between Natashquan and Kegaska, almost entirely built by Native People. This work site was set up through an agreement between the Innu, the Government of Québec and the company Atik, which was responsible for the work. In three years, it has allowed some fifty young people to have practical experience in the trade, and it is, according to the Chief of Natashquan, a success and an example to follow (Radio-Canada, 2011). This axis should be explored by the Training Committee which could encourage partnerships between certain training centres and businesses working in the relevant fields, or which obtain contracts in the framework of La Grande Alliance infrastructures.

It should also be noted that since the pandemic, online training and remote working have developed significantly. These avenues should also be explored to counter the obstacles of distance and mobility for certain trade sectors.

3.5.3 OTHER COMMENTS ON EMPLOYMENT AND TRAINING

During the Cree community engagement activities, it was mentioned that economic development in the communities has a mix of “traditional” and “non-traditional” businesses, without preference. The key, according to some, is to reconcile the two areas of activity with the community members.

Some also recall the importance of developing the capacity to transform the raw material harvested on the territory, since it is economically more interesting. The example of the transformation of fur into mittens was given, as well as the transformation of ore. However, the opposite is also indicated for the transformation of ore, since it represents an important environmental issue. Although it provides employment, many Crees are opposed to mining development on the territory.

As for the young people, several mention that it is important that they can maintain a link with the territory. It was suggested that training programs that bring young people to the territory for at least two weeks be developed. In addition, in order to facilitate their employment opportunities, it was mentioned that the emphasis should be put on French in the teaching at school. The language barrier was identified as an important obstacle for young and old alike.

Participants identified other barriers to employment, such as the certification of all truckers by Transport Québec and their affiliation with a truckers' association to obtain contracts that are not too short or limited. They propose that Band Councils will obtain the contracts themselves to avoid these constraints.

Finally, in terms of employment and contracting, it was mentioned that the Crees expect La Grande Alliance to provide them in advance with the expected workforce qualifications for each phase so that each community is well prepared to meet the needs and requirements of the project when the time comes. Many Crees agree that the acceptability of the proposed infrastructure depends on ownership of the project, the contracts, and the jobs.

4 MANAGEMENT OF RESIDUAL MATERIALS

4.1 WASTE MANAGEMENT

This section covers the principles and leading practices that apply to construction waste management for large infrastructure projects in northern regions. It discusses the waste management hierarchy as the key principle to guide waste management decisions, the importance of waste segregation to optimize diversion, the types of waste generated by infrastructure projects, the Envision certification and associated leading practices, and an overview of leading practices applicable to these proposed infrastructures.

4.1.1 WASTE MANAGEMENT HIERARCHY

The waste management hierarchy is the key principle to guide waste management decisions in Québec and globally, and participates in achieving a circular economy. In Québec this principle is embedded in the provincial waste management policy (MDDEP, 2011). The waste management hierarchy aims to promote the practices that have the least negative impacts on the environment and is aligned with sustainable development, notably the United Nations sustainable development goal 12: Ensure sustainable consumption and production patterns. Unless a life cycle analysis demonstrates otherwise, the priority order of management options is source reduction, reuse, recycling including biological treatment or land application, other forms of material recovery, energy recovery and disposal (Figure 4-1).

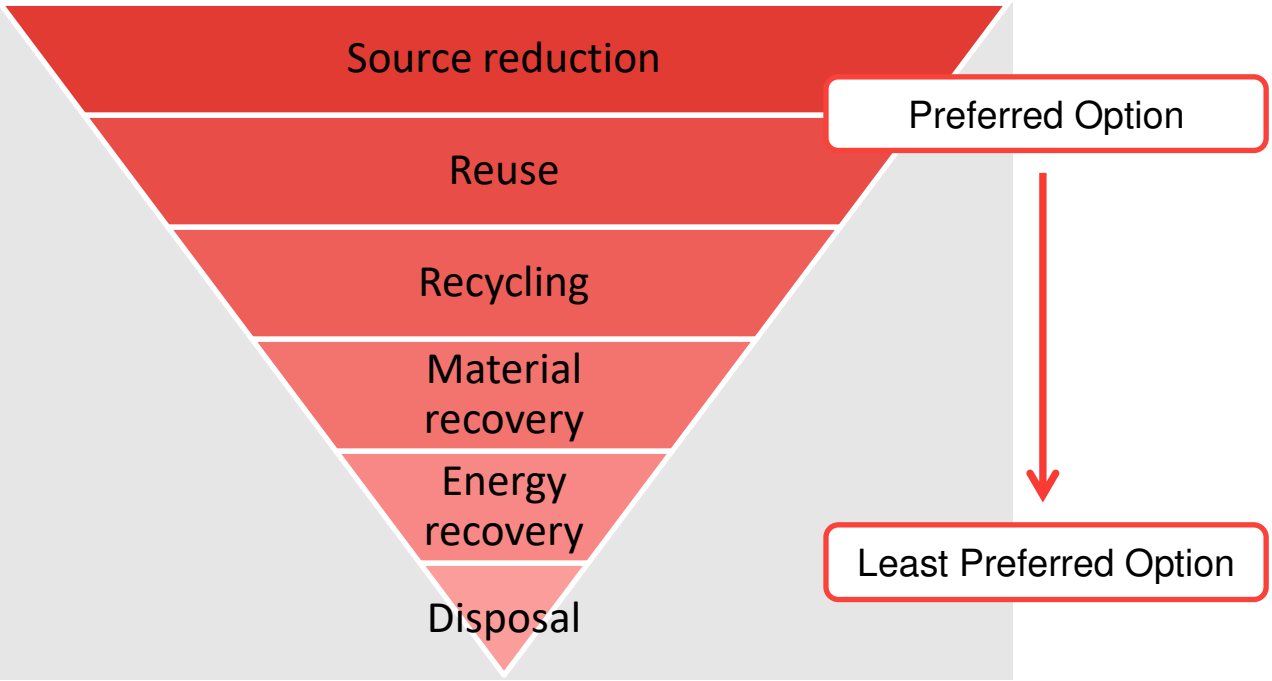

Figure 4-1 Waste Management Hierarchy

Source reduction simply means not creating waste in the first place. In construction, this concept can be applied effectively through eco-design practices.

Reuse means to utilize an item multiple times for the purpose it was originally designed, without transforming it. For example, this can be achieved by reusing temporary wooden structures on the worksite.

Recycling means to transform a material that has reached the end of its life into a resource and then into new goods. For example, this can be achieved by transforming concrete and asphalt residues into aggregates that can be used to produce new asphalt.

Energy Recovery is the action of producing energy from waste through different industrial processes (e.g., incineration, gasification, pyrolysis). It can be used to produce energy in different forms: heat, electricity, gas, etc.

Disposal means eliminating waste without creating value out of it in any way. It is usually done through landfilling or incineration without energy recovery.

Diversion is defined as any environmentally sustainable initiative that decreases the quantity of waste that must be landfilled or incinerated (without energy recovery).

Diversion rate means the proportion of waste that is not sent to disposal (landfill or incineration).

4.2 THE IMPORTANCE OF WASTE SEGREGATION

Adequately segregating waste based on its type (e.g., metal, plastic, wood) directly on the worksite can be vastly beneficial to the overall diversion rate of a project. Segregated waste can more easily be reused, recycled or recovered without the necessity of going through an additional sorting step, by transiting through a material recovery facility, for example. This practice increases the proportion of waste that can find a use directly on the work site or facilitate its transit to the appropriate treatment facility. Concretely, in the field this can be achieved by having containers clearly identified for the different types of waste generated on the work site, giving adequate training and information to site workers and having regular surveillance of the containers to ensure that the materials are sorted adequately.

Figure 4-2 Waste segregation on site

4.3 INFRASTRUCTURE PROJECTS WASTE GENERATION

The residues generated by road infrastructure projects include surplus natural materials (clay, sand, gravel, rock) and granular materials (crushed aggregate) generated during excavation and backfill activities. These natural materials are not considered as waste, but it is still important to ensure that they are free of contaminants. Road infrastructure projects also generate demolition materials (asphalt materials and cement-based materials), hazardous wastes (bitumen, paint, chemical waste, fuels, oils), wood, cardboard and plastic packaging as well as some specific materials (e.g., geotextile, pipes) (MDDELCC, 2014).

The residues generated by rail infrastructure projects also include surplus natural materials (ballast, sub-ballast) that are not considered as waste. These projects also generate waste such as treated and untreated wood, steel, hardware and wood or plastic packaging.

Table 4-1 shows the typical alternatives to disposal for the different types of CRD waste materials.

Table 4-1 Types of CRD Waste Material Categories and Typical Alternatives to Disposal

Waste type	Subtypes	Typical alternatives to disposal
Wood	Untreated wood	— Salvage for reuse/resale (depending on condition) — Chip for landscaping — Use as an alternative fuel (where applicable)
	Treated, painted, and engineered wood	— Salvage for reuse/resale (depending on condition) — Do not chip for landscaping — Do not burn
Asphalt materials	Road asphalt	— Use in reclaimed asphalt paving — Use in road bases
Cement-based materials	Concrete	— Use as base material/backfill
Metals	Ferrous and non-ferrous metals	— Sell to metal recyclers
Plastics		— Ship off-site for recycling

Adapted from Environment and Climate Change Canada, 2017

4.4 ENVISION

ENVISION is a program of the Institute for Sustainable Infrastructure (ISI) whose fundamental vision is to support better performance through more sustainable choices in infrastructure development. It is a consensus-based framework for evaluating projects for their sustainability performance and resilience. The program includes several credits associated with waste management as shown in Table 4-2. Each credit is scored based on the implementation of several leading practices by the project.

Table 4-2 ENVISION Certification Waste Management Credits

Credit	Intent	Associated leading practices
Use recycled materials	Reduce the use of virgin natural resources and avoid sending useful materials to landfills by specifying reused materials, including structures, and material with recycled content.	At least 5-50% [according to achievement level] (by weight, volume, or cost) of recycled materials including materials with recycled content and/or reused existing structures or materials.
Reduce operational waste	Reduce operational waste and divert waste streams from disposal to recycling and reuse.	Develop an operational waste management plan that, at a minimum, identifies the materials to be diverted from disposal and whether the materials will be sorted on site or commingled. The project team identifies waste streams or byproducts that will occur as a result of the operation of the project. The project is planned or designed to divert at least 25-95% [according to achievement level] of operational waste. Diversion may be a combination of waste reduction measures and/or sourcing waste to other facilities for recycling or reuse.
Reduce construction waste	Divert construction and demolition waste streams from disposal to recycling and reuse.	Implement a construction waste management plan that, at a minimum, identifies the materials to be diverted from disposal and whether the materials will be sorted on site or commingled. The project team sets a target goal for construction waste diversion. During construction at least 25-95% [according to achievement level] of waste materials are recycled, reused, and/or salvaged. Diversion may be a combination of waste-reduction measures and sourcing waste to other facilities for recycling or reuse.

Adapted from ISI, 2018

4.5 OVERVIEW OF LEADING PRACTICES

Upon reviewing relevant documentation and based on WSP's expertise on waste management, the following leading practices were identified for large infrastructure construction waste management (ECCC, 2017; MDDELCC, 2014; ISI, 2018, CREDDO, 2014):

- Integrate waste management considerations at the design stage through eco-design practices. Ideally, the complete life cycle of the infrastructure should be considered in this process (construction, operation, and end-of-life). This includes the use of recycled materials (including materials with recycled content), reusing existing structures and materials, selecting materials that can be reused or recycled and designing for deconstruction rather than demolition;
- Leverage the technical information from the design stage to set waste management targets and consider implementing such targets in contract terms;
- Develop and implement a construction waste management plan that identifies the materials that will be generated, their approximate quantity, the way they will be managed and their destination;
- Appoint a waste management manager who is accountable for results to ensure that targets are met;
- Install clearly identified containers for the different types of waste generated on the work site. Ensure that the containers are emptied before they overflow;
- Give adequate training and information to site workers and subcontractors on the management methods used;
- Set up regular surveillance of the containers to ensure that the materials are sorted adequately;
- Implement a system to track the amount of waste by type and its destination to measure project performance against its goals. Require weighing slips from transporters to ensure traceability and destination of materials;
- Develop and implement an operational waste management plan that identifies the materials that will be generated, the way they will be managed and their destination;
- Publicly announce the project's waste management objectives and transparently report on project performance.

5 CONCLUSIONS AND ADDITIONAL CONSIDERATIONS

This Technical Note 5 provided an overview of the various impacts that La Grande Alliance proposed infrastructures could have on the Cree and Jamesian communities, as well as some of the actions that could be taken (good practices, measures, monitoring) to avoid or manage them as best as possible.

A predictive noise assessment should be conducted along the road and rail corridor, particularly where there are human activities such as hunting camps and at the approach to the municipalities of Whapmagoostui/Kuujjuarapik and Radisson. An assessment is also required for the Whapmagoostui/Kuujjuarapik port. The study area can be refined once the project alignment and construction program are established.

In terms of maintaining the quality of drinking water that could be affected by the project (during construction and operation), as well as air quality, good practices and construction techniques to mitigate or avoid impacts have been identified.

The other social and health impacts that could affect the Cree and Jamesian communities were determined on the basis of the literature and the engagement activities carried out in the context of the study. This revealed a need for the Crees to clearly understand the project's objectives and issues, and to continue engagement activities in an inclusive manner. It is suggested that, in order to determine mitigation measures specific to the health of the communities, a Health Impact Assessment should be conducted with a gender and intersectional approach (GBA+) in order to understand the differential impact on different groups such as youth, women, hunter trappers, workers, etc. Finally, it should be noted that many Crees agree that the social acceptability of the planned infrastructures depends on their taking control of the project and their responsibility for contracts and jobs. The social acceptability of the planned infrastructures also depends on the preservation of a healthy environment, which is of paramount importance for the perpetuation of the Cree culture and identity.

As for the Jamesians, the social and health impacts are conditional on the economic impacts and on a regional strategic development elaborated in a global approach, including the provincial and federal levels. As with the Crees, the Jamesians have identified a need to understand more clearly the project's objectives and issues, and to pursue engagement activities in an inclusive manner.

It should be noted that Inuit communities were not involved at this stage as this remains a Cree initiative that may not be extended beyond this study. However, it is strongly recommended that, if any study components overlapping Inuit territory were to be pursued, engagement with Inuit communities be initiated immediately in subsequent steps.

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