CREE DEVELOPMENT CORPORATION

LA GRANDE ALLIANCE

LA GRANDE ALLIANCE

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

TECHNICAL NOTE 15
CONSTRUCTION OVERVIEW

FINAL VERSION

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PREPARED BY:

Francis Boivin, ing., M.Sc.
Project Director, Major projects
Licence Number: 110493

VERIFIED BY:

Jean-Pierre Blondin, ing., M.ing.
Director – Railway & Transit
Licence Number: 114104

COLLABORATION:
Pierre Therrien, ing.

WSP

EXECUTIVE SUMMARY

The purpose of this Technical Note 15 is to provide an overview of the construction methods and the complications and mitigation measures involved in the construction of the proposed infrastructure.

As per WSP's mandate, this technical note focuses on the phase II and III component of the La Grande Alliance study as listed below. The overall foreseen project planning is also as listed below.

La Grande Alliance proposed transportation infrastructures consists of:

PHASE I (1-5 YEARS)[1] (THE PHASE I IS STUDIED BY OTHERS)

- **Roadway: Upgrading and paving of the community access roads** for Waskaganish, Eastmain, Wemindji and Nemaska.
- **Railway: Matagami to Rupert**

  A proposed railway line following, as much as possible, that of the Billy-Diamond Highway (BDH) starting at the town of Matagami towards km 257 of the BDH (Rupert River Bridge).
- **Railway: Grevet to Chapais**

  A return to service for the railway line between Grevet (Lebel-sur-Quévillon) and Chapais (approximate distance of 147 km).

PHASE II (6-15 YEARS)

- **Railway: Rupert to La Grande**

  A proposed railway alignment following, as much as possible, that of the Billy-Diamond Highway (BDH) starting at km 257 (after the Rupert River Bridge, which is the junction point with the railway alignment developed by the Phase I Consultant) all the way to La Grande River. The Phase II railway alignment extends over an approximate distance of 340 km.
- **Route 167: Upgrade & extension to Trans-Taiga**

  Upgrade and paving the section from the Mistissini community access road to the Stornoway Renard Mine access road over an approximate distance of ±204 km;

  North extension to connect with the Trans-Taiga Road near km 408, over an approximate distance of 172 km.
- **Roadway: La Grande to Whapmagoostui/Kuujjuarapik**

  A proposed road corridor connecting Chisasibi community's access road and Whapmagoostui/Kuujjuarapik, over 207 km.

PHASE III (16-30 YEARS)

- **Railway: La Grande to Whapmagoostui/Kuujjuarapik**

  A proposed railway alignment extending from the Phase II railway alignment, and which follows, as much as possible, the feasibility roadway alignment leading to Whapmagoostui/Kuujjuarapik developed during this study by WSP. The Phase III railway alignment extends over an approximate distance of 219 km.
- **Harbour at Whapmagoostui/Kuujjuarapik**

  A proposed seasonal Harbour for shallow draft vessels/boats (~6 m water depth) along the Whapmagoostui/Kuujjuarapik coastline between the mouth of Great Whale River and the entrance of the Manitounuk Strait.

[1] All dates indicated herein are hypothetical and would begin as of the start of the construction period. This therefore does not include all pre-project phases, most notably the Environmental and Social Impact Assessment, that would be required if the infrastructures are pursued.

For each component, a generic master project schedule was developed considering the various steps that will be required. This includes planning, obtaining approvals, environmental and social assessment, construction, and commissioning of the system. As agreed with the phase I consulting team, the year "0" has been established as 2028 for the beginning of construction and it is assumed that the first infrastructures will be ready for use by 2035.

Among the factors that will impact the schedule, the procurement mode selection to award the various contracts to execute the work is critical. However, since the project is such at an early stage, procurement analysis decisions are not yet available. We therefore considered a conservative approach based on a traditional delivery mode for this preliminary review. The preferred method of implementation will certainly be discussed and analyzed during the future stages of the project as it progresses. The various economic and project-specific issues (manpower, training, Cree culture, financing, potential participation of the private sector and others) will have to be integrated into the analysis for the choice of a procurement mode. The selected implementation and procurement option could also significantly influence the total delay as well as the scheduling/overlapping of some of the activities related to the realization of a project. Please note that procurement modes are further detailed in Technical Note 21. In addition, the isolated northern location of this project brings a unique aspect to the potential project. Weather conditions and challenges related to the availability of labour and materials will affect the schedule and the field work planning.

Many factors, such as laws & regulation, environment, soils conditions & permafrost, site accesses, market conditions, and labour resource, can still influence this schedule assessment and must be further studied in the upcoming phases. It will be necessary to assess these issues and to mitigate risks to construction timelines. The timeline herein is realistic but remains theoretical as many contingencies, real or imagined, cannot be considered at such an early stage in the evaluation due to such a high level of uncertainty. Appropriate risk and sensitivity analyses will be required at future phases to evaluate timelines adequately.

As illustrated in the figure below, the proposed timeline for this study is anticipated as follows:

- **Phase I**
  - 2023-2029: Field investigation, consultation, permits, detailed engineering, and procurement;
  - 2030-2035: Railway Construction and start operation.
- **Phase II**
  - 2030-2035: Field investigation, consultation, permits, detailed engineering, and procurement;
  - 2035-2040: Roadway and Railway Construction and start operation.
- **Phase III**
  - 2035-2040: Field investigation, consultation, permits, detailed engineering, and procurement;
  - 2040-2045: Railway and Harbour Construction and start operation.

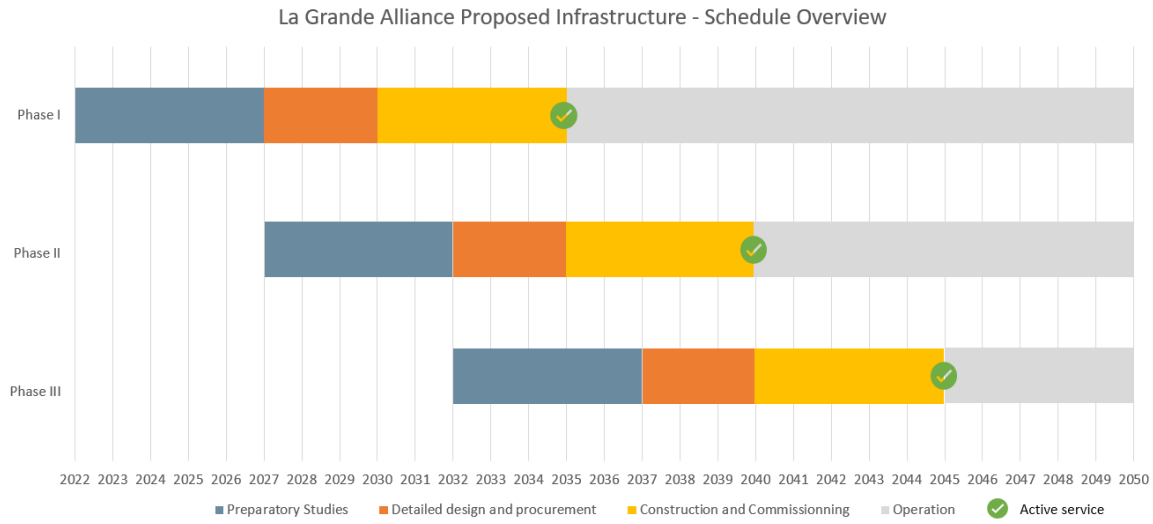

Figure La Grande Alliance Proposed Infrastructure - Schedule Overview

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1 INTRODUCTION

The purpose of this Technical Note 15 is to provide an overview of the construction methods and the complications and mitigation measures involved in the construction of the proposed infrastructure.

As per WSP's mandate, this technical note focuses on the phase II and III components of the La Grande Alliance study as listed below. The overall foreseen project planning is also as listed below:

PHASE I (1-5 YEARS)[1] (THE PHASE I IS STUDIED BY OTHERS)

- **Roadway: Upgrading and paving of the community access roads** for Waskaganish, Eastmain, Wemindji and Nemaska.
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- **Port at Whapmagoostui/Kuujjuarapik**

  A proposed seasonal Harbour for shallow draft vessels/boats (~6 m water depth) along the Whapmagoostui/Kuujjuarapik coastline between the mouth of Great Whale River and the entrance of the Manitounuk Strait.

As agreed with the phase I consulting team, the year "0" has been established as 2028 for the beginning of construction and it is assumed that the first infrastructures will be ready for use by 2035.

[1] All dates indicated herein are hypothetical and would begin as of the start of the construction period. This therefore does not include all pre-project phases, most notably the Environmental and Social Impact Assessment, that would be required if the infrastructures are pursued.

2 CONSTRUCTION CHALLENGES & OPPORTUNITIES

2.1 GENERAL

One of the key challenges that will have a significant impact on the schedule is the procurement mode selection to award the various contracts to execute the work. However, since the project is such at an early stage, procurement analysis was not yet performed. We therefore considered a conservative approach based on a traditional delivery mode for this preliminary review. The preferred method of implementation will certainly be discussed and analyzed during the future stages of the project as it progresses. The various economic and project-specific issues (manpower, training, Cree culture, financing, potential participation of the private sector and others) will have to be integrated into the analysis for the choice of a procurement mode. The traditional mode consists of completing all the detailed plans and specifications and then soliciting bids for the construction of all the works by a general contractor. This mode allows for better control of projected construction costs but tends to lengthen the schedule because some project phases, such as design and construction, cannot be completed simultaneously. Other project delivery modes could potentially be considered such as construction management or alternative modes. There is design-build or design-build and maintenance which do offer the main advantage to considerably reduce the time between the design and the execution of the work since both can be done in parallel. The preferred method of implementation will certainly be discussed and analyzed during the future stages of the project as it progresses. The various economic and specific issues (manpower, training, Cree culture, financing, potential participation of the private sector and others) will have to be integrated into the analysis for the choice of a mode of realization.

Given the scope of each component of La Grande Alliance proposed infrastructures, we would recommend dividing each component into several lots of construction to reduce the scope of the work and maintain an attractive bidding pool. This should allow for the participation of a greater number of designers, workers, and trades. However, as multiple lots of construction are being carried out simultaneously and potentially overlapping, the construction health and safety responsibility (master builder) should be carefully reviewed and contractually identified. The responsibility for the safety of everyone on the construction site, including traffic control, management of an entry and exit log at the site, use of public roads, temporary electrical installation, housekeeping, toilets and their accessories, public safety, access to the site, fire protection, permanent railings and guardrails, temporary heating, transportation and rescue on water and other general safety measures are the responsibility of the master builder. Given that the work is in an isolated area, this health and safety responsibility is even more significant than on other regular construction sites, hence why it should be addressed carefully. Therefore, the owner should ensure that it has sufficient resources to properly manage the contracting process.

2.2 SPECIFIC TO JAMES BAY TERRITORY

Given that the work is to be performed in northern, and often isolated, regions, many considerations specific to the Eeyou Istchee – James Bay territory need to be considered both in the planning as well as in the execution of the work:

- **Laws and regulation:** Obtaining all the relevant construction and operation permits required considering the different jurisdictions and authorities within the territory may influence the schedule. Refer to Technical Note 2 for more details on applicable laws and regulation that will govern required permits and authorizations.

- **General Market conditions:** It is difficult to predict today the availability of resources, contractors, and materials when the work is scheduled to take place between 2033 and 2043. Currently, there is a labour shortage and significant supply problems that could continue for several years, but it is difficult to predict whether these issues will persist into the future. This remains an important element that will need to be considered in the next planning stages of this project.
- **Construction season:** The construction period is normally from May to October, an effective period of 5 to 6 months at most. These are the months when the average daytime temperatures are generally above freezing. Winter conditions (below freezing) prevent and/or highly complicate the execution of the following activities:
  - Compaction of granular materials;
  - Concreting work is possible but lower temperatures require more sensitive implementation measures, such that concreting work is more expensive in winter;
  - Paving and laying rails;
  - Construction of an harbour infrastructures (water/ice conditions);
  - Supply of the construction site (fuel oil and gasoline - machinery) mainly for the isolated construction sites where there is no existing roads or infrastructures;
  - Producing granular materials is possible during the winter period in preparation for the next work season.
- **Site access:** Limited access to the various work areas is a major constraint that will have a significant impact on the project schedule and costs. Planning material and equipment delivery ahead of construction may be required to optimize the construction season, specifically for the Whapmagoostui/Kuujjuarapik infrastructures that will be mainly dependant on marine transportation, which can only occur between June and October. The existing accesses are:
  - Roads: Billy-Diamond Road, Route 167 and Trans-Taiga Road;
  - Airports: Chibougamau-Chapais (YMT), Waskaganish (YKQ), Weminji (YNC), Chisasibi (YKU), La Grande Rivière (YGL) and Whapmagoostui/Kuujjuarapik (YGM);
  - Port: Marine transportation via Hudson Bay to Whapmagoostui/Kuujjuarapik.
- **Construction methods**: Existing standards defined for construction in permafrost such as those defined by the Standards Council of Canada and research by academics and government organizations such as the National Research Council of Canada and Polar Knowledge Canada.
- **Limited Local Labour Resource:** The scope of the construction work will require a significant input of resources throughout many years. The context of isolated area with a limited specialized resource pool leads to the necessity of bringing external workers. The transportation and housing of resources will therefore be very important to consider and plan before the work is carried out. Workers camps offering food and lodging will have to be set up for the workers to maintain an efficient permanent work force on site. The implementation of these services will certainly take at least one season to set up, including safety elements such as a heliport for emergency evacuations.
- **Sensitive Site conditions:**
  - Archaeological sites are usually identified prior to construction, but it is possible that unrecorded unknown sites may be uncovered during construction. Such a discovery could cause significant delays in the execution of the work;
  - Forest fires: It is important to consider that the proposed works are in the northern protection zone of SOPFEU, whose southern limit with the intensive protection zone is found between the 50th and 52nd parallel. This limit corresponds to the northern limit of the commercial forest. SOPFEU detects all fires in the northern zone but only fights some of them, which could lead to the cessation of work if forest fires break out near the work sites and SOPFEU does not intervene. SOPFEU's intervention priority is granted according to the following criteria: protection of human lives, communities, strategic installations, and essential infrastructures based on the socio-economic impacts of the values threatened. Specific agreements will have to be negotiated with SOPFEU for the protection of life, camps and work sites.

- **Management of workers and wildlife's resource:** Once the location and size of the camps will be established, it will be necessary to evaluate, in the next stages of the development of La Grande Alliance infrastructures, the need to determine special hunting and fishing forbidden zones to minimize negative impacts on wildlife populations. The objective will be to prevent overexploitation of wildlife resources during the construction of La Grande Alliance infrastructures. Among the restrictions that could be implemented, there could be a lowering of fishing and hunting quotas and the modification of the length of fishing and hunting seasons. Land users and tallymen should be involved in the decisions that will be made to protect the territory.
- **Soils conditions**: As mentioned in Technical Note 10 - Geotechnical Engineering, in most of the study areas (except for the Whapmagoostui/Kuujjuarapik area), permafrost is found in sporadic permafrost zones where permafrost is discontinuous and dispersed. It is therefore possible to find some patches of permafrost in all the work areas and at higher risk over a length of ± 50 km from Whapmagoostui/Kuujjuarapik to Chisasibi. The encounter of permafrost during the execution of the work could have a significant negative impact on the schedule if it is not detected by the geotechnical investigation campaign. The construction of transportation infrastructures in permafrost conditions certainly affects the thermal regime of the frozen ground, which may cause degradation of the permafrost on which the structures will be supported. The presence of permafrost becomes an important engineering problem for northern transportation infrastructures, especially in the context of global warming. In this context and considering the importance of rock outcroppings on the surface, we will favour a route that passes over bedrock. The goal will be to reduce the quantity of soil cuttings and to favour rock fills.
- **Site opportunity:** High potential for commercial grade lumber to be studied in future phases.
- **Local Workforce Opportunity:**
  - Partnership with existing local enterprises: Projected schedule allows to start partnership with local existing enterprises to assist with upcoming field work studies by providing local field staff (ex: environmental sampling collection, surveying, archeology, etc.) and future construction contracts (material and labour);
  - Short term opportunities: construction sites workers camps will generate services needs spin-offs opportunities (food, cleaning, etc.) and construction sites will offer various unspecialized job opportunities;
  - Long term opportunities: Projected schedule allows to start local technical training programs for locals to optimize the participation of local communities in the work and the positive economic spin-offs of the work. The training of workers, technicians and engineers is conceivable considering a training period of approximately one to six years depending on the specialization. This program would be beneficial not only for the realization of the different phases of La Grande Alliance but in the long term for the economic autonomy of the local population. This training could also allow, in the longer term, the involvement of these specialized resources in the operations and maintenance of the new infrastructures after the completion of the work;
  - The Project will also require a dedicated client project team to oversees all projects steps, procedures and progress of all different specialists and experts. This will require a considerable work force input;
  - Refer to Technical Note 5 for more details.

3 SCHEDULE

A project of this magnitude involves many steps that take place over several years. Several factors, unforeseen events and decisions may influence its development over the years. This section is therefore intended to outline the main steps to be anticipated for a project of this nature.

Since the project is only at the pre-feasibility and feasibility study stage, several technical elements remain to be analyzed in greater depth. This could influence the definition of the project and change its planning. The selected implementation and procurement option could also significantly influence the total delay as well as the scheduling/overlapping of some of the activities related to the realization of a project. The different procurement modes that exist are listed below and described in section 2.2.2 of the Technical Note 21 (Financial Analysis):

Traditional modes

- Construction Management Mode;
- Design-Bid-Build Mode.

Alternatives modes

- Design-Build Mode;
- Design-Build-Finance Mode;
- Design-Build-Finance-Maintain Mode;
- Design-Build-Finance-Operate-Maintain Mode.

The recent trend for large infrastructures comparable to what is currently being contemplated in La Grande Alliance is to follow non-Traditional Modes. However, due to the large degree of uncertainty that remains to be addressed at this stage in the study, we are unable to fully recommend a procurement method best adapted to the circumstances presented in this study. Therefore, we adopt as a working hypothesis that a Traditional Mode will be followed for project construction. This approach still allows for parallel activities (different teams working on different batches) and some overlap between major steps (initiation of the next step possible when the previous one reaches 50-75% progress, depending on the complexity of each of the sectors, disciplines and authorizations required). It is important to mention that the procurement method will need to be reviewed in future phases of the studies to identify the best path forward for managing construction contracts.

As stated earlier, the main phases are as follow:

PHASE I (1-5 YEARS)[2] - Construction from 2030 to 2035

- By others.

PHASE II (5-10 YEARS) - Construction from 2035 to 2040

- Railway: Rupert to La Grande;
- Route 167: Upgrade & extension to Trans-Taiga;
- Roadway: La Grande to Whapmagoostui/Kuujjuarapik.

[2] All dates indicated herein are hypothetical and would begin as of the start of the construction period. This therefore does not include all pre-project phases, most notably the Environmental and Social Impact Assessment, that would be required if the infrastructures are pursued.

PHASE III (10-15 YEARS) - Construction from 2040 to 2045

- Railway: La Grande to Whapmagoostui/Kuujjuarapik;
- Harbour at Whapmagoostui/Kuujjuarapik.

For each component, a generic master project schedule was developed considering the various steps that will be required. The schedule includes planning, obtaining approvals, environmental assessment, construction, and commissioning of the system.

As agreed with the phase I consulting team, the year "0" has been established as 2028 for the beginning of construction. It is assumed that the first infrastructures will be ready for use by 2035.

It is also important to note that all studies and preparatory work for Phases II and III could be done in parallel with Phase I and begin before 2035 if the developer chooses so.

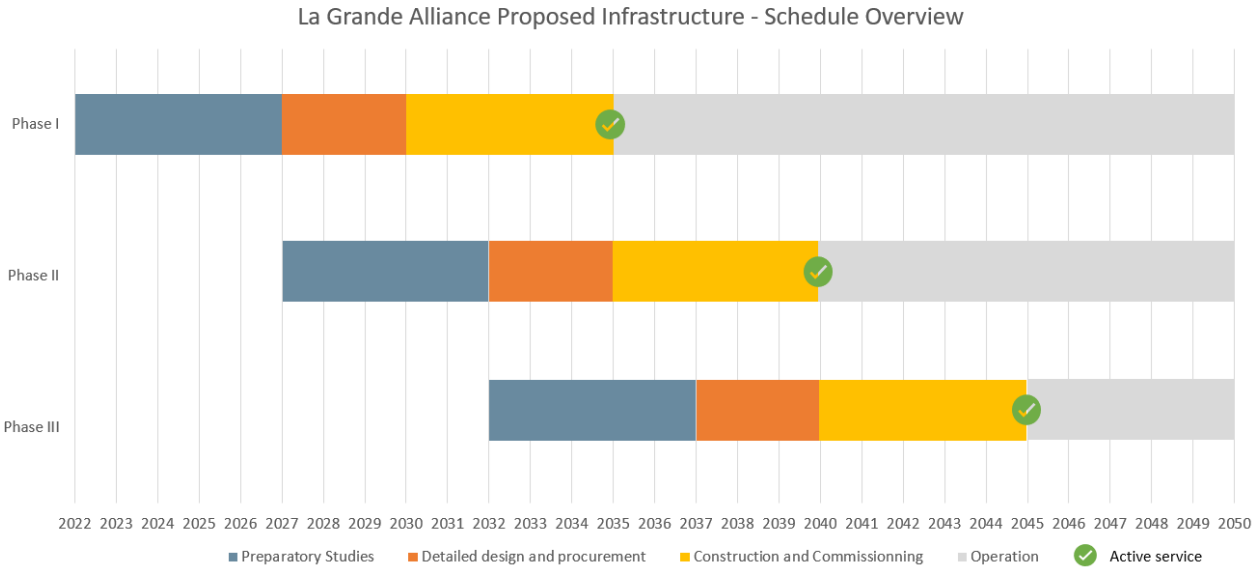

Figure 3-1 La Grande Alliance Proposed Infrastructure - Schedule Overview

3.1 RAILWAY: RUPERT TO LA GRANDE

As described in the methodology, we have taken a conservative approach by considering the construction of this proposed ±340 km long railway section would be built via a traditional project delivery mode. Based on our experience on similar rail projects, the construction of this infrastructure would, if carried out by a single construction team, take around 7 to 9 years (based on a production of approximately 40 to 50 km/year).

Obviously, this delay would not meet the project's objectives of being completed at the end of 2040, within the expected maximum of 5 years construction period. To achieve this objective, we recommend dividing the construction of the railway infrastructure platform into four (4) separate construction lots covering an approximate length of 85 km to be completed over four (4) construction seasons, i.e. 2035 to 2038. The railway infrastructure platform work could be done with general contractors not specialized in railway track. During this period, these general contractors will also build culverts and approximatively 8 bridges in each lot. The contractor will also settle access road from existing BDH.

On the other hand, the railway construction and the laying of the tracks in particular do need to be by specialized contractors. The railway's specific materials are rails, rail attach system, wood ties and switches and rail greasing equipment. The delivery of these materials could take up to 3 years and represent an important delay. It is recommended to go through a tendering process to purchase these materials before the tendering process for the railway construction contracts. This purchase process should start in 2035 to follow the proposed schedule.

Therefore, the contracts for railway construction could include transportation, manipulation and laying of those track materials on the infrastructure platform constructed by the general contractors. The beginning of rail laying will not be possible before 2037, since a length of more than 40 km of railway platform is necessary before starting the laying of the rail if we want to avoid stopping / demobilizing the rail installation team. We then recommend dividing the laying of the rails into two separate batches of 170 km in length to be laid down between 2037 and 2040. This represents a production of a little more than one kilometer per day, which is realistic in the context of work in a northern region.

This schedule is feasible but remains optimistic. An additional year will most likely be required to finalize the work and more specifically to commission the structures.

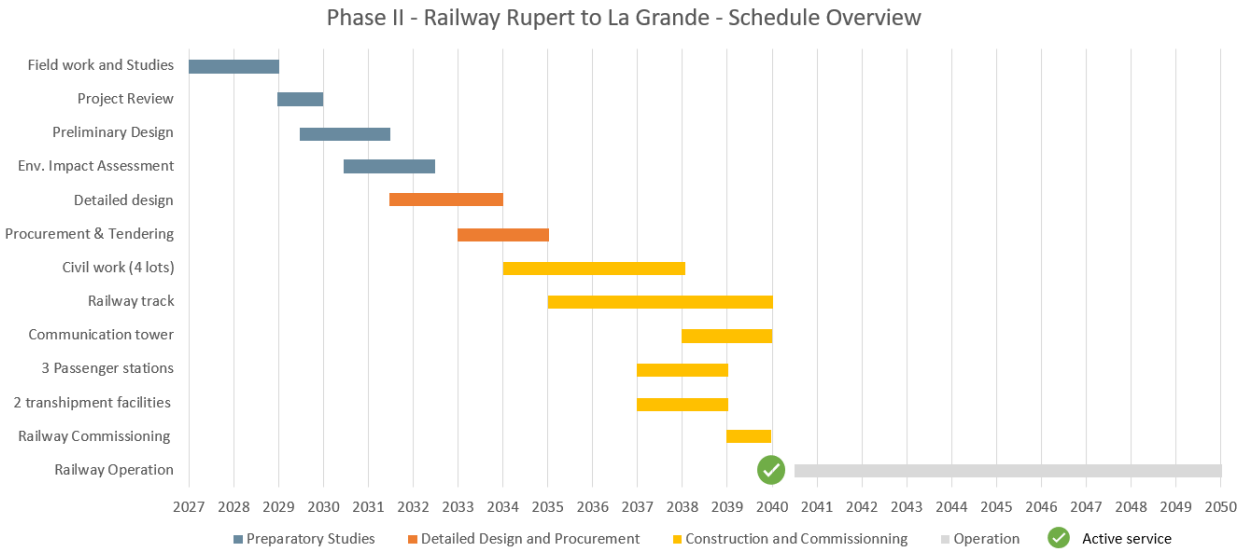

Figure 3-2 Phase II - Railway Rupert to La Grande - Schedule Overview

3.2 ROUTE 167: UPGRADE & EXTENSION TO TRANS-TAIGA

As described in the methodology, we have taken a conservative approach by considering the construction of this road section would be built via a traditional project delivery mode. We also assumed that the 204 km section of Route 167 to be rehabilitated, as well as the 172 km extension of this same road to connect to the Trans-Taiga Road, will be carried out jointly.

Based on our experience on road work in similar northern conditions, the existing road upgrade section could be divided in 2 different construction contracts, each to be completed over a 2 years of construction schedule, i.e., 50 km per construction season. For the new extension section up to the Trans-Taiga highway, we also recommend dividing it in 2 different construction contracts, each to be completed over a 2-3 years of construction schedule, i.e., 45 km per construction season. We also anticipate a specific construction contract for the construction of La Grande bridge during the same period.

This contract division is intended to promote competition and avoid large-scale contracts that will limit the pool of bidders. In this case, this represents 5 different construction contracts that will last 2 to 3 years and will be completed between 2037 and 2040. Figure 3-3 below illustrates each phase of the proposed schedule breakdown.

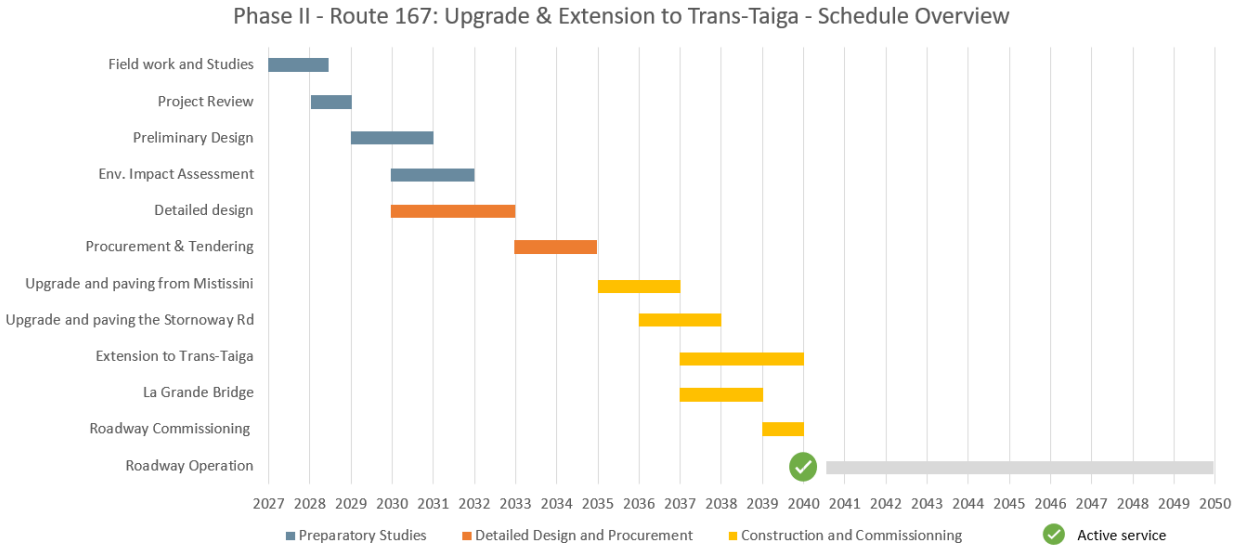

Figure 3-3 Phase II – Route167: Upgrade & Extension to Trans-Taiga - Schedule Overview

3.3 ROADWAY: LA GRANDE TO WHAPMAGOOSTUI/KUUJJUARAPIK

As described in the methodology, we have taken a conservative approach by considering the construction of this proposed 207 km road section would be built via a traditional project delivery method.

Based on our experience on similar northern road projects, the proposed road could be divided in two different construction contracts, each to be completed over a schedule of 3 years of construction, i.e., approximately 35 km per construction season. We also anticipate a specific construction contract for the construction of major bridges during this period. This contract division is intended to promote competition and avoid large-scale contracts that will limit the pool of bidders. In this case, this represents 3 different construction contracts that will last 4 to 5 years and will be completed around 2040. Figure 3-4 below illustrates each phase of the proposed schedule breakdown.

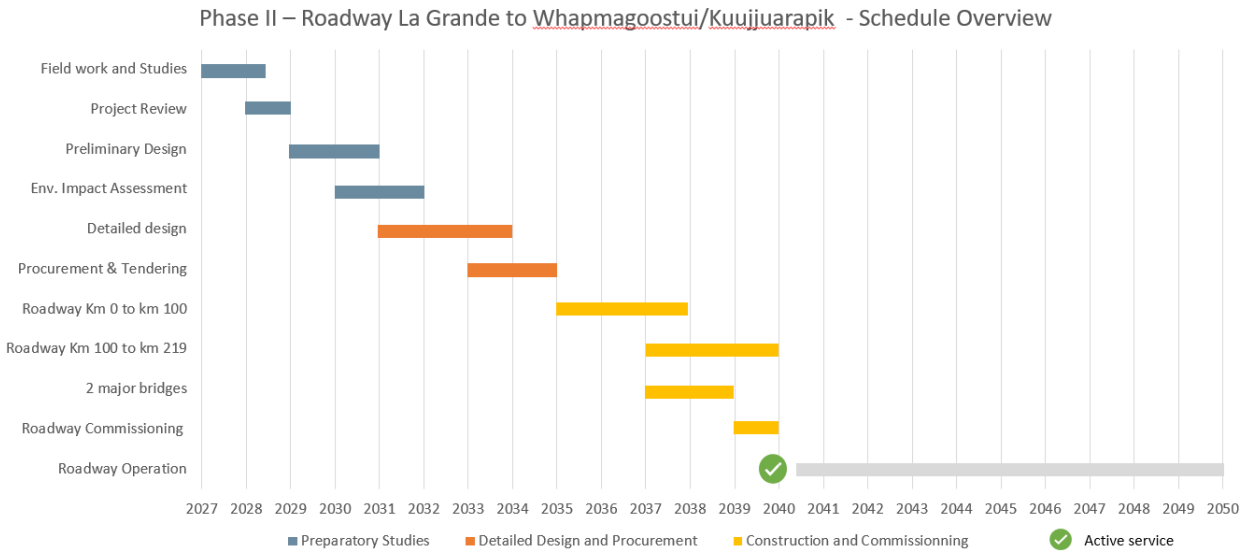

Figure 3-4 Phase II – Roadway La Grande to Whapmagoostui/Kuujjuarapik - Schedule Overview

3.4 RAILWAY: LA GRANDE TO WHAPMAGOOSTUI/KUUJJUARAPIK

As described in the methodology, we have taken a conservative approach by considering the construction of this proposed 219 km long railway section would be built via a traditional project delivery method. Based on our experience on similar rail projects, the construction of this infrastructures would, if carried out by a single construction team, take around 4 to 5 years (based on a production of approximately 40 to 50 km/year).

To achieve this objective, we recommend dividing the construction of the railway platform into two (2) separate construction lots covering an approximate length of 110 km to be completed over four (4) construction seasons, i.e. 2040 and 2043 (this is based on the new road construction to be completed and operational by 2038).

Then, the railway construction and the laying of the tracks will need to be carried out by a specialized contractor. The beginning of rail laying will not be possible before 2042, since a length of more than 40 km of railway platform is necessary before starting the laying of the rail if we want to avoid stopping / demobilizing the rail installation team. We recommend dividing the laying of the rails into two separate lots of 110 km in length to be laid down between 2042 and 2045.

This schedule is feasible but remains optimistic. An additional year will most likely be required to finalize the work and more specifically to commission the structures.

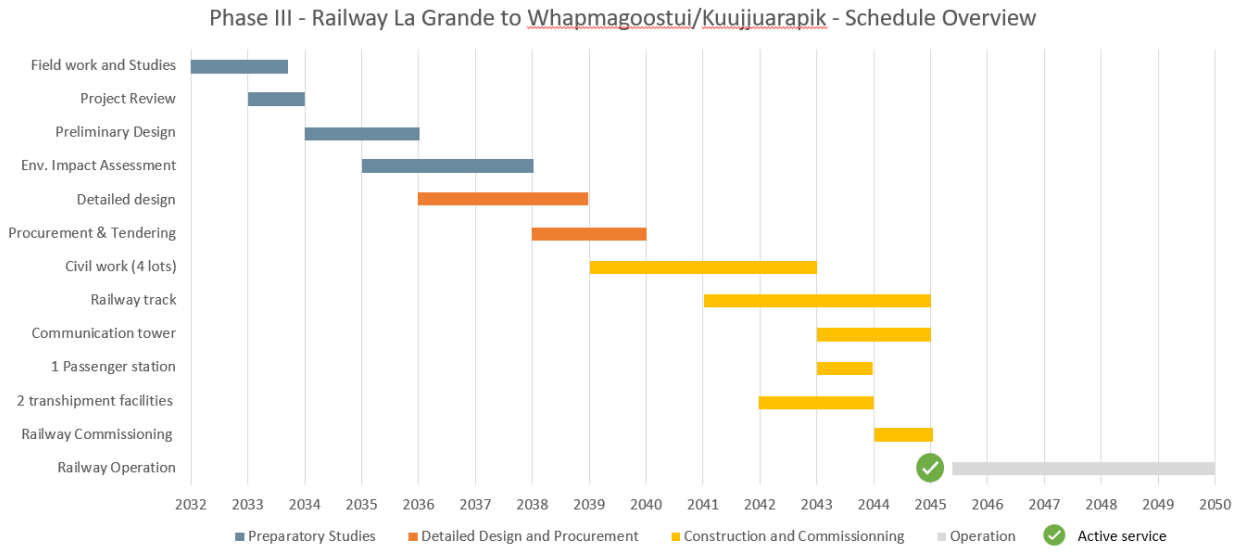

Figure 3-5 Phase III - Railway La Grande to Whapmagoostui/Kuujjuarapik - Schedule Overview

3.5 HARBOUR: WHAPMAGOOSTUI/KUUJJUARAPIK

As described in the methodology, we took a conservative approach by considering the construction of this new port infrastructure would be built via a traditional project delivery method. Based on our experience on similar harbour projects, the construction of this infrastructures would be feasible within a 3 to 4 years window (2041 to2044) during ice-free season (July to November).

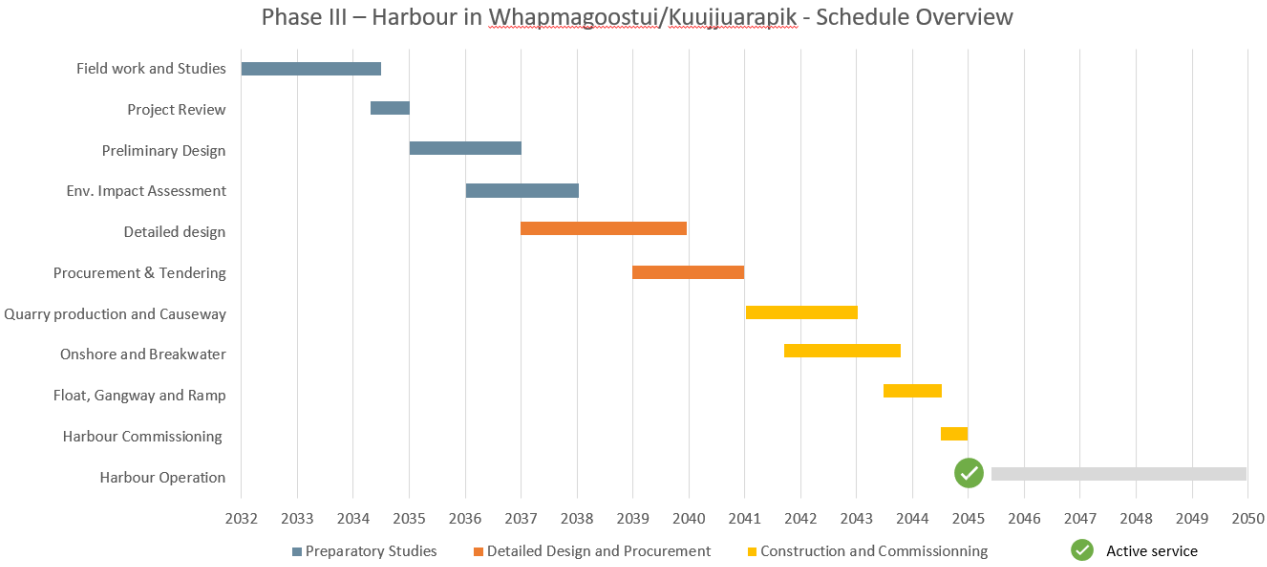

Figure 3-6 Phase III – Harbour in Whapmagoostui/Kuujjuarapik - Schedule Overview

It is important to note that this proposed schedule is subject to modifications based on an external study currently being conducted by MSP and MTQ regarding a large landslide event that occurred in 2021 on the Great Whale River, 8 km upstream from Whapmagoostui. If this study final report (expected in summer 2023) validates that this event could be the catalyst for future landslides downstream of the river, particularly on the banks of the communities of Whapmagoostui and Kuujjuarapik, the construction of a new port facilities may need to be brought forward.

4 FIELD WORK PLANNING

The proposed infrastructures are in the early stages of their life cycle and will be completed over a period of about ten years (2035-2045 for phases II and III). In addition to the major stages of implementation typical of an infrastructure project, the following recommendations are intended as avenues for reflection and optimization specific to this "*La Grande Alliance phases II and III components*".

The present study is intended to:

1. To better understand the implications, risks and opportunities related to the various proposed infrastructures;
2. To maximize connections between communities and the main drivers of economic development in the region, throughout the territory;
3. To identify transportation corridors that concentrate the development footprint, to limit environmental impacts elsewhere, in a manner that is in harmony with other land use activities on the territory;
4. To minimize the emission of harmful greenhouse gases during construction, operation and for future infrastructure developments on the territory;
5. To identify opportunities to create meaningful jobs for the inhabitants;
6. To understand how to balance infrastructure development with environmental protection as well as the preservation and enhancement of Cree culture for the benefit of future generations.

It goes without saying that this study is only the early stage of a potential project. Based on this current study pre-feasibility and feasibility results, detailed analysis should be carried out in coordination with other preparatory studies that will feed the concept design and further detailed engineering and construction work.

Recommendations listed below focus on phase II infrastructures components as those can benefit the most for an early planning and action plan. However, the same logic would apply to the phase III infrastructures components.

4.1 GENERAL RECOMMENDATIONS

Even tough, the following are not specifically related to field work, we believe that those activities should be started as early as the field work to ensure an optimized project development:

- **Project communication and social acceptability**: The project life and schedule are well influenced by its general support and mobilization. Investing in communication can help to proactively address challenges and adjustments without leading to project halt and delays. Continuing the process of community information meetings for awareness and social acceptability is critical;
- **Potential project cost sharing:** As an avenue for further reflection, public funds optimization and the regional interventions coherence, we would like to emphasize the importance of discussions and coordination between partners and stakeholders to coordinate the construction but also the maintenance and operation of the infrastructures (MTQ, HQ, SDBJ, private developer, etc.);
- **Local Workforce Opportunity:** Projected schedule allows to start local technical training programs and partnership with local existing enterprises. Identifying and encouraging potential individuals and firms that would be interested is time sensitive to be ready when needed;
- **Project Governance:** Establish the governance structure and buy-in from all partners to carry out the work;
- **Transportation of the workers and camp:** Considering the level of existing services, the transport of workers should be planned to have a reliable service available during the execution of the field work. Offering food and lodging will also have to be set up in advance considering that the lodging offer is almost non-existent in the region;
- **Supply of the field work sites** (fuel oil and gasoline - machinery): Transporting goods and machinery in remote areas requires excellent planning given the scarcity of infrastructure and must be planned in advance.

4.2 TECHNICAL RECOMMENDATIONS

4.2.1 PRE-FEASIBILITY INFRASTRUCTURE COMPONENTS

PHASE II (5-10 YEARS)

Construction from 2035 to 2040

- Railway: Rupert to La Grande.
- Route 167: Upgrade and extension to Trans-Taiga.

PHASE III (10-15 YEARS)

Construction from 2040 to 2045

- Railway: La Grande to Whapmagoostui/Kuujjuarapik.
- Harbour at Whapmagoostui/Kuujjuarapik.

Considering that the above studied components are currently at the pre-feasibility study, the next step would be to bring the project to a feasibility level. As such, current assessments will require to be deepened and some new activities are to be added, thus mainly performing some field work to feed the project development:

1. More Detailed Social Data Collection;
2. Field Geotechnical Data;
3. Field Environmental Data;
4. Field Hydraulic Data;
5. Field Archeological Data;
6. Roadways and Bridges preliminary concepts and class D cost estimate.

Because this work is to be planned in an isolated area and with short summer periods, we do recommend planning 6-8 months ahead for consulting team hiring, proper permits approvals, special equipment, and labour assignment as well as logistics planning (lodging, transportation, community information to be held prior to mobilization, coordination with local work force, etc.).

The execution of the field work (for each component) is expected to require a 2 to 3-month window (a significant portion of the summer season) hence why its appropriate planning is so critical.

4.2.2 FEASIBILITY INFRASTRUCTURE COMPONENT

PHASE II (5-10 YEARS) - Construction from 2035 to 2040

- Roadway: La Grande to Whapmagoostui/Kuujjuarapik.

Considering that the above studied component is currently at the feasibility study, the next step would be to bring the project to a schematic design level. As such, current assessments will require to be deepened and some new activities are to be added, thus mainly performing some field work to feed the proposed infrastructures development:

1. Topographic survey;
2. Environmental characterization;
3. Concepts design optimization;
4. Defining local mitigation measures:
   - Environmental protected areas impacts;
   - Environmental sensitive areas impacts;
   - Land uses impacts;
   - Archeological impacts.

TECHNICAL NOTE 15 – CONSTRUCTION OVERVIEW

The main objective of this phase would be to gather and document the information required to prepare an *Environmental and Social Impact Assessment.* This process involves a set of authorities and committees with different responsibilities (federal, provincial, and local).

5 CONCLUSIONS

The overall proposed project planning, listed below, appears to be realistic but remains optimistic.

PHASE II (2035-2040)

- Railway: Rupert to La Grande;
- Route 167: Upgrade & extension to Trans-Taiga;
- Roadway: La Grande to Whapmagoostui/Kuujjuarapik.

PHASE III (2040-2045)

- Railway: La Grande to Whapmagoostui/Kuujjuarapik;
- Harbour at Whapmagoostui/Kuujjuarapik.

Many factors can still influence this schedule assessment and must be further studied in the upcoming phases.

- Project delivery method;
- Laws and regulation;
- Environment respect;
- Construction season;
- Soils conditions and permafrost;
- Construction methods;
- Sites access;
- Market conditions;
- Limited Local Labour Resource;
- Sensitive Site conditions;
- Site opportunity.

These proposed infrastructures are also an opportunity for the Cree community of Eeyou Istchee to develop a training program allowing the training of construction workers, technicians and even engineers who will be able to participate in the realization of this project and future projects in the region.

Finally, there is still a lot of work to do before the work begins on the field, but the issues and factors that could have an impact on the work schedule have been identified in a summary and preliminary manner. It will be necessary to assess these issues and to mitigate risks to construction timelines.

The timeline herein is realistic but remains theoretical as many contingencies, real or imagined, cannot be considered at such an early stage in the evaluation due to such a high level of uncertainty. Appropriate risk and sensitivity analyses will be required at future phases to evaluate timelines adequately.