CREE DEVELOPMENT CORPORATION

LA GRANDE ALLIANCE

LA GRANDE ALLIANCE

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

TECHNICAL NOTE 1
COMPARABLE PROJECTS

FINAL VERSION

DATE: MARCH 25, 2024

PREPARED BY:

Pierre Therrien, ing.

VERIFIED BY:

2024-03-25

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

wsp

EXECUTIVE SUMMARY

This Technical Note 1 is aiming to provide a list of comparable infrastructures similar with the foreseen infrastructures of La Grande Alliance Phases II & III (road, railway, and port facility). The objective is to set up a database that will serve as a benchmark for the upcoming various infrastructures components that will be developed as part of this pre-feasibility study.

TABLE OF CONTENTS

APPENDICES

1 INTRODUCTION

This Technical Note 1 is aiming to provide a list of comparable infrastructures similar with the foreseen infrastructures of La Grande Alliance Phases II & III (road, railway, and port facility).

1.1 OBJECTIVE

The objective of identifying comparable projects is to set up a database that will serve as a benchmark for the upcoming various infrastructures components that will be developed as part of this pre-feasibility study.

Comparable infrastructures were selected based on the similarity/relevance to those criteria:

- Design Parameters;
- Construction Cost and Financing;
- Operations and Maintenance;
- Impact on the Environment;
- Economic and Land Use Impact;
- Other.

The following sections are organized based on the three infrastructure types such as Road, Railway, and Port infrastructure. The intention is to build the database including the following key elements:

- Availability of information;
- Work progression and schedule;
- Elements of interest.

2 ROADS

We have compiled a list of roads that already exist or are under development to serve the northern isolated areas. Since La Grande Alliance already includes serving land users and existing communities, we have disregarded projects that are roads solely serving mining and forestry industries functional vehicle transportation needs.

Therefore, the retained projects are in Canada, on First Nations lands and meant to accommodate both passenger and commercial vehicles.

2.1 INUVIK TO TUKTOYAKTUK HIGHWAY

The Hamlet of Tuktoyaktuk, the Town of Inuvik and the Government of the Northwest Territories are proposing to construct, operate and maintain a 140 km road that can be used all year around from the Town of Inuvik to the Hamlet of Tuktoyaktuk.

2.2 BILLY DIAMOND HIGHWAY ROAD REHABILITATION

The Billy Diamond Road, which is 620 km long and is the main access to Eeyou Itschee territory, has been undergoing an extensive rehabilitation and asset maintenance program valued at $335 million for Phase I. This major rehabilitation took place from 2015 to 2021 and Phase II is scheduled to begin in 2023. The work also included culvert replacement, bridge and structure rehabilitation, pavement reconstruction, paving, drainage work, guardrail site upgrades and pavement marking. This project required the opening and exploitation of new borrow pits, the construction of work camps and the installation of paving plants by the contractors.

The interest for this project is obvious from a legal, permit, environmental, financial and local economic point of view, which are very similar and current.

2.3 ROUTE 167 EXTENSION TO THE OTISH MOUNTAINS

The project involves extending Route 167 to the Otish Mountains over 140 km and connecting it to the forest road leading to the Stornoway Mine site. This 100% completed project was carried out as part of the Northern Action Plan initiated in 2011.

3 RAILWAY

The study team has compiled a list of northern railways that already exist or are under development. The following elements of comparison, which were developed by the Phase I Study Team, are used to evaluate these projects:

- Track class
- Status
- Ownership
- Track length
- Transport mode
- Speed
- Track installation
- Location
- Axle load
- Project cost
- Annual tonnage
- Total bridge length
- Type of bridges
- Number of bridges
- Type of work
- Market study
- Environmental and Social conditions
- Operating plan
- Type of study
- Standards used
- Various

These elements of comparison were finally qualitatively rated as having either a strong, a medium, or a weak comparison with the proposed La Grande Alliance Phases II & III railway. The results of this analysis are presented in Appendix B of this Technical Note.

3.1 TSHIUETIN RAIL TRANSPORT

Tshiuetin Rail Transport is equally owned by the Naskapi community of Kawawachikamach and the Innu communities of Uashat Mak Mani-Utenam and Matimekush-Lac John. It owns and operates a 216 km railway that connects with the Quebec North Shore and Labrador Railway (QNS&L) at Rose Bay junction.

3.2 QUEBEC NORTH SHORE AND LABRADOR RAILWAY (QNS&L)

The QNS&L is a mining railway which operates in both Quebec and Newfoundland and Labrador, making it a “common carrier” under Transport Canada regulations. This 418 km railway was inaugurated in 1954. The terrain traversed by this railway is comparable to that of the proposed La Grande Alliance Phases II & III railway lines.

3.3 ARCELOR MITTAL MINING RAILWAY

The Arcelor Mittal Mining Railway, formerly the Québec-Cartier Railway, is a mining railway which operates in Quebec between mine facilities at Mont Wright and port facilities in Port Cartier. This 418 km railway was inaugurated in 1960. The terrain traversed by this railway is comparable to that of the proposed La Grande Alliance Phases II & III railway lines.

3.4 ALASKA – ALBERTA RAILWAY

The Alaska – Alberta Railway Development Corporation (A2A Rail) was established to build, own and operate a new railway connecting the Alaska Railroad and Alaska's tidewater, to northern Alberta (1,600 miles or 2,570 km). It is a project at the design stage.

4 PORTS

We have compiled a list of facilities that already exist in different parts of the world (mainly in the North). Since it is also part of the pre-feasibility study to define the type of the future port facility, we have compiled a list of 29 projects that have different vocations to provide perspectives on the type and scope of facilities that can be developed within the framework of La Grande Alliance.

- 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)

APPENDIX

A ROADWAY INFRASTRUCTURE LIST

Roadway Infrastructures list

Legend
Strong comparison
Medium Comparison
Weak Comparison
Reference

Road	Extension of Route 167 from the Otish Mountains to the Trans-Taiga	Access road from Whapmagoostui to Chisasibi Road	Inuvik to Tuktoyaktuk Road	Road 167 Extension	Billy-Diamond Highway Rehabilitation Phase I
Location	Canada Northern Quebec	Canada Northern Quebec	Canada Northwest Territories	Canada Northern Quebec	Canada Northern Quebec
Status	Pre-feasibility study	Feasibility study	100% completed	100% completed	100% completed
Owner	MTQ/To confirm	MTQ/To confirm	Government of the Northwest Territories	MTQ	MRNF
Type	Provincial Road	Provincial Road	Provincial Road	MTQ provincial road	Main access road to territory
Environment	Built in undeveloped area	Built in undeveloped area	Built in undeveloped area on permafrost	Built in undeveloped area	Rehabilitation of an existing road
Operational Season	All year around	All year around	All year around	All year around	All year around
Design parameters	Provincial Road type E	Provincial Road type E	· two-lane · packed gravel · passenger, commercial and industriel vehicles	· two-lane · gravel road - possibility of pavement · passenger and commercial vehicles	· two-lane · paved · passenger, commercial and industriel vehicles
Length (km)	To be determined	200	138	143	620 km Phase II = 380 km
Total Cost (construction or estimate)	To be determined	To be determined	$300M	$250M	$334M
Cost/km (construction or estimate)	To be determined	To be determined	$2,17M/km	$1.75M/km	$0.88M/km
Elements of interest / Relevance	· two-lane - gravel · all year operation · isolated area	· two-lane - gravel · all year operation · isolated area		· two-lane · all year operation · same territory · similar roadway uses and construction conditions · recent and available data	· two-lane · all year operation · same territory - same environmental rules · similar roadway uses and construction conditions · recent and available data
Speed limits (km/hr)	70	70	70	70	100

APPENDIX

B

RAILWAY INFRASTRUCTURE LIST

Rail Infrastructures list

Legend
Strong comparison
Medium Comparison
Weak Comparison

Num.	Elements of Comparison	Reference Project / Grande Alliance Phases 2 and 3	Tshiuetin Rail Transport	Québec North Shore and Labrador Railway (QNS&L)	Arcelor Mittal Mining Railway	Alaska – Alberta Railway
1	Track class	Class 3 / Class 4	Class 3	Class 3/ Class 4 (45 mph)	Class 2/ Class 3 (35 mph)	N/A
2	Status	Study Underway	Operating	Operating	Operating	Concept
3	Ownership	Cree	· Naskapi community of Kawawachikamach · Innu communities of Uashat Mak Mani-Utenam · Matimekush-Lac John	Private	Private (Arcelor Mittal)	A2A Rail
4	Track length	Ph2 + Ph3	216 km	418 km	420 km	2570 km
5	Transportation mode	Freight / Passenger (TBC)	Freight/Mine, Passenger	Freight/Mine, Passenger	Freight/Mine	N/A
6	Speed	90 - 130 km/h	64 - 96 km/h	45 mph	35 mph	N/A
7	Track installation	Ballasted Track	Ballasted Track	Ballasted Track	Ballasted Track	Ballasted Track
8	Location	Canada (Northern Quebec)	Canada (Northern Quebec)	Canada (Northern Quebec)	Canada (Northern Quebec)	Canada, United States
9	Axle load	30-32 t		32,4 t	32,4 t	N/A
10	Project cost	N/A	N/A	N/A	N/A	N/A
11	Annual tonnage	N/A	4 MTPA	30-35 MTPA	25 MTPA	N/A
12	Total bridge length	N/A	N/A	N/A	N/A, maximum bridge length = 270m	N/A
13	Type of bridges	N/A	N/A	N/A	N/A	N/A
14	Number of bridges	N/A	N/A	N/A	20	N/A
15	Type of work	New line	Existing line	Existing line	Existing line	New line
16	Market study	Yes (preliminary)	No	No	No	No
17	Environmental and Social conditions	Northern forested area; coordination with First Nations	Northern forested area; operated by First Nation	Northern forested area	Northern forested area	Northern forested area
18	Operating Plan	Yes	No (Existing railway)	No (Existing railway)	No (Existing railway)	N/A
19	Various	Intermodal, sidings, port facilities, others	Sidings and facilities	Sidings, Mine and port facilities, others	Sidings, Mine and port facilities, others	N/A
20	Type of Study	Pre-feasibility	N/A (Operating railway)	N/A (Operating railway)	N/A (Operating railway)	N/A
21	Standards used	AREMA, Transport Canada, Transport Québec, CN, CSA	AREMA, Transport Canada, Transport Québec, CN, CSA	AREMA, Transport Canada	AREMA	N/A

APPENDIX

C MARITIME INFRASTRUCTURE LIST

Maritime Infrastructures list

Port Type	Mining			
Port	**Deception Bay Port**	**Voisey's Bay Mine Wharf**	**Milne Inlet Ore Dock**	**Steensby Inlet (Proposed)**
Location	Deception Bay, QC	Edward's Cove, Anaktalak Bay, NL	Milne Inlet, Baffin Island, NU	Steensby Inlet, NU
Port Owner	Glencore Canada	Voisey's Bay Nickel Company Vale	Baffinland Iron Mines	Baffinland Iron Mines
Cargo				
Type	Nickel, copper, cobalt	Nickel-cobalt-copper concentrate, copper concentrate Also used for goods and materials required for the mine including fuel oil	Iron ore	Iron ore
Source	Raglan Mines	Voisey's Bay Mine	Mary River Mine	Mary River Mine
Owner	Glencore Canada	Vale	Baffinland Iron Mines	Baffinland Iron Mines
Volume	1.5 million tonnes of crude ore. 39,230 tonnes nickel-in-concentrate, 8,988 tonnes copper, 827 tonnes cobalt (2020)	6,000 tonnes-per-day	4.2M tonnes or iron ore per year	Projected 18M tonnes per year (regulator could cap at 12M)
Vessel				
Vessel Type(s)	Ore-Bulk-Oil Carrier	Ice-breaking Bulk Carrier	Bulk Ore Carriers	
Vessel Name(s)	MV Arctic - Icebreaker	Umiak I - Fednav	Fednav Bulk Carrier ships up to Post-Panamax size (Ex: Golden Bull)	
Capacity	7 holds: 34,522 m3 (grain) 24,309 m3 (oil at 96%)	5 holds, 40,490 m3 (grain)		
DWT (deadweight tonnage)	28,094 t	31,992 t	75,000 t (Summer)	
Beam (m)	22,92	26,6	32,67	
LOA (m) (lenght overall)	220,82	188,8	224,9	
Draft (m)	11.52 (summer) 10.67 (winter)	11,7	8,6	
Ice Class	CAC 2	DNV ICE-15		

Maritime Infrastructures list

Port Type	O&G		
Port	**Yamal LNG (Sabetta Seaport)**	**Arctic LNG 2 (2023)**	**Varandey**
Location	Sabetta, RUS	Utrenneye, Gydan Peninsula, Siberia, RUS	Varandey region of the Barents Sea, RUS
Port Owner	Novatek & Russian Government	OOO Arctic LNG 2	LLC LUKOIL-Trans
Cargo			
Type	LNG	LNG	Crude Oil
Source	Yuzhno Tambeyskoye Gas Field - Yamal LNG	Utrenneye field	Trebs and Titov fields
Owner	JSC Yamal LNG - Novatec	Novatek	LLC LUKOIL-Trans
Volume	The Yamal LNG plant will have three trains with total capacity of 16.5 million tonnes of liquefied natural gas per year when fully operational	19.8 Mtpa (3 trains x 6.6 Mtpa) Cumulative has condensate production capacity of 1.6M tons per annum (2023)	
Vessel			
Vessel Type(s)	Icebreaker/Tanker ships.	Arctic LNG Carriers	Arctic shuttle tankers (panamax)
Vessel Name(s)	Sovcomflot, MOL, Dynagas, Teekay (Ex: Sovcomflot - Christophe De Margerie)	Zvezda	Vasily Dinkov, Tomofey Guzhenko and Kapitan Gotsky
Capacity	172,600 m3	172,600 m3	
DWT (deadweight tonnage)	80,200 t 96,779 t (Summer)		70,000 t 72,722 t (summer)
Beam (m)	50,13	48,8	34
LOA (m) (lenght overall)	299	300	258
Draft (m)	11,7		14
Ice Class	Russian Register Arc7	Russian Register Arc7	Russian Maritime Register of Shipping - 1A Super RMRS LU 6

Maritime Infrastructures list

Port Type				SCH
Port	**Ikerasaarsuk Wharf**	**Hay River Wharf**	**Moraine Bay Wharf**	**Simpson Islands**
Location	Greenland	Hay River, NWT	Moraine Bay, NWT	Simpson Islands, Great Slave Lake, NWT
Port Owner	Government of Greenland	DFO Great Slave Lake Harbour Authority	DFO Great Slave Lake Harbour Authority	DFO Great Slave Lake Harbour Authority
Cargo				
Type	Small (fishing) craft harbour, small passenger vessels	Fishing		
Source				
Owner				
Volume				
Vessel				
Vessel Type(s)	Small fishing vessels and Passenger ferries	Small fishing vessels		
Vessel Name(s)	Diskoline Aviaq Ittuk Passenger Ship			
Capacity	36 passengers			
DWT (deadweight tonnage)	Up to 160 t			
Beam (m)	5			
LOA (m) (lenght overall)	30			
Draft (m)	< 3			
Ice Class				

Maritime Infrastructures list

Port	Pond Inlet	Pangnirtung Wharf	Salluit (Proposed)	Port of Churchill
Location	Pond Inlet, Nunavut	Pangnirtung, Nunavut	Salluit, QC	Churchill, MT
Port Owner	Department of Community and Government Services - Nunavut	DFO Pangnirtung Harbour Authority		Arctic Gateway Group LP (Private)
Cargo				
Type	Fish, misc. cargo	Turbot-fishing, summer commercial Arctic Char and other fisheries in Cumberland Sound		Grain, bulk commodities, general cargo, tanker vessels
Source				
Owner				
Volume				
Vessel				
Vessel Type(s)	Small fishing vessels, marine cargo vessels anchor outside harbour, barges bring cargo to berth	Small fishing vessels	Dock is only big enough for canoes and small boats	Panamax
Vessel Name(s)				
Capacity				5,000 TEU (twenty-foot equivalent unit)
DWT (deadweight tonnage)				52,500 t
Beam (m)				32,31
LOA (m) (lenght overall)				289,56
Draft (m)				12,04
Ice Class				

Maritime Infrastructures list

Port	Port of Murmansk	Nuuk Port and Harbour	Port of Ilulissat	Pevek
Location	Kola Bay, Barents Sea - Murmansk, RUS	Nuuk, Greenland	Ilulissat, Greenland	Kosa, Pevek, RUS
Port Owner	Managed and operated by JSC Murmansk Commercial Port (SUEK - 75.47% owner)	Sikuki Nuuk Harbour A/S	Royal Arctic Line, Arctic Umiaq Line and Royal Greenland (Public)	Eastern base of the northern sea route's Marine Operations Headquarters, run by the Far East Shipping Company from an icebreaker in the harbor. Port owned by the Russian Ministry of Transport
Cargo				
Type	3 parts: Fishing, Commercial, and Passengers Coal, non-ferrous and ferrous metals, nickel sulfide (NiS), Arctic destination containers, apatite concentrate, mineral fertilizers, oil products, crude oil, refrigerated cargoes	Container terminal Ny Alantkaj (Trawler and Cruise) Feederkaj (smaller Cruise, expedition, trawlers, navy ships) Gl. Atlantkaj (primary inner port berth) Skonnertkaj (Sarfaq Ittuk, contractors, Navy ships) Montagekaj (Repairs and maintenance) Kutterkaj (Smaller vessels) Trawlerkaj (small fishing vessels + line boats) Fiskerikaj (smaller fishing vessels) Sandlosningskaj - Bulk Quay Sissiugaq (Recreation)	Container terminal, bulk sand pumping, oil storage, small and large fishing vessels, tourist vessels, privately owned marina	Cargo has seen a reduction lately. Mainly dealing with the import of fuel (coal) Arctic Shipping Company take coal from Zheleny Mys to Pevek Also coal, container freights, industrial equipment, ferrous metals, and timber freights
Source				
Owner				
Volume				
Vessel				
Vessel Type(s)		Container, trawler, cruise, expedition, navy, small vessels, small fishing vessels, line boats, bulk carriers, kayaks	Container ships, small fishing boats	
Vessel Name(s)			Mary Arctica	
Capacity			588 TEU	
DWT (deadweight tonnage)	Up to 130,000 t		6,365 t	
Beam (m)			23	
LOA (m) (lenght overall)		13 docks, piers, pontoons with lengths ranging from 25 - 310 m	113	
Draft (m)		13 docks, piers, pontoons with depths ranging from 2.0 - 10.5 m	6,2	
Ice Class			+1A1, ICE-1A*	

Maritime Infrastructures list

Multipurpose				
Port	**Tiksi**	**Igarka**	**Dudinka**	**Seaport of Vitino**
Location	Tiksi, RUS	Igarka, RUS	Dudinka, RUS	Karelskiy shore of Kandalakshskaya Bay in the White Sea, RUS
Port Owner		Igarka Stevedoring Company	Berth owners: Norilsk Nickel, Maymyr Oil Company	Vitino Specialised Sea Port
Cargo				
Type	The main cargoes are commodities, general and construction cargoes, containers, coal, and timber freights. During the summer navigation local passenger transportations are performed.	Passenger, general cargo, building materials, lumber	Containers, general cargo, ore, oil products 2 stevedoring companies work at the port: Polar Transport Branch of OAO Mining and Metallurgical Company Norilsk Nikel and ZAO Taymyr Fuel Company. The Polar Transport Branch of OAO MMC Norilsk Nikel uses mooring berths to unload final products and nickel sulfides (NiS) as well as to handle containers and local general cargoes. ZAO Taymyr Fuel Company is involved in handling of oil products.	Oil, naphtha and gas condensate. Transfer of oil and oil products arriving by rail from Russia's oil refineries to seagoing oil tankers for export
Source				
Owner				
Volume			Approx. 7,500,000t of cargo and 5,000 vessels handled annually.	In 2004, 3.7 million tons of oil and oil products were handled by the port
Vessel				
Vessel Type(s)				Port Fleet, Oil Vessels
Vessel Name(s)				
Capacity				
DWT (deadweight tonnage)				40,000 t (Displacement)
Beam (m)		Up to 25 m	Up to 32.2 m	Up to 32.2 m
LOA (m) (lenght overall)		Up to 150 m	Up to 260.3 m	Up to 230 m
Draft (m)		Up to 8 m	Up to 11.8 m	Up to 11.1 m
Ice Class				

Maritime Infrastructures list

Port	Port of Arkhangelsk	Novy Port	Port of Tuktoyaktuk (Proposed)	Iqaluit Port (2022)
Location	Arkhangelsk, RUS	Novy Port, Yamalo-Nenets Autonomous Okrug, RUS	Tuktoyaktuk, NWT	Iqaluit, Nunavut
Port Owner	Joint Stock Company Arkhangelsk Commercial Sea Port	Gazprom Neft		Gov. of Nunavut
Cargo				
Type	Major naval base of the Northern Fleet of the Russian Navy Sends and receives cellulose, cardboard, metals, timber, containers, heavy equipment, bulk cargoes, refrigerated cargoes, and oil cargoes, lumber, pulp, coal, machinery, industrial and consumer goods	Crude Oil		Service ships carrying supplies, tourism, fishing vessels Set to improve the efficiency and safety of sealift and fuel deliveries in Iqaluit because it will be accessible during all tides
Source		Novoportovskoye oil field		
Owner		Gazprom Neft		
Volume	Annual Cargo: 4.4 million tonnes (2013)	> 8.5 million tonnes of oil per year		
Vessel				
Vessel Type(s)	Six Shturman Arctic tankers, and two diesel—electric icebreaker	Crude Oil Tankers		
Vessel Name(s)		Shturmar		
Capacity		42,000 tonnes		
DWT (deadweight tonnage)		41,500 t		
Beam (m)	Up to 30 m	34		
LOA (m) (lenght overall)	Up to 190 m	249		
Draft (m)	Up to 9.2 m	9,5		
Ice Class		Tankers: ARC7-class Icebreaker: 8-clkass		

Maritime Infrastructures list

Port	**Port of Kirkenes**	**Nanisivik Naval Facility**
Location	Kirkenes, Norway	Nanisivik, Nunavut
Port Owner	The port area comprises a number of private and Port Authority (Municipality of Sor-Varanger) owned quays	Royal Canadian Navy
Cargo		
Type	Oil Terminal. Also handles iron ore, fish, passengers and general cargo	Docking and refuelling station (Formerly a lead-zinc mine company town)
Source		
Owner		
Volume		
Vessel		
Vessel Type(s)	Dry cargo, Passenger, Tankers	Ice-breaking Harry DeWolf-class offshore patrol vessels
Vessel Name(s)		HMCS Harry DeWolf
Capacity		
DWT (deadweight tonnage)		6,615 t Displacement
Beam (m)		19
LOA (m) (lenght overall)	Passenger: 303 Tanker: 200	103,6
Draft (m)	Dry Cargo: 13.1 (tidal) Passenger: 12.4 (tidal) Tanker: 8.2 (tidal depth)	
Ice Class		Polar Class 5