

TABLE OF CONTENTS

	Page
3.0 PROJECT DESCRIPTION	3-1
3.1 Scope of the Project.....	3-1
3.2 Project Phases.....	3-1
3.2.1 Planning Phase.....	3-1
3.2.2 Design Phase.....	3-3
3.2.3 Construction Phase.....	3-3
3.2.4 Operation and Maintenance Phase.....	3-5
3.2.5 Decommissioning.....	3-5
3.3 Project Components	3-5
3.3.1 All-Season Road	3-6
3.3.2 Watercourse Crossings	3-7
3.3.3 Temporary Access.....	3-16
3.3.4 Temporary Construction Staging Areas.....	3-16
3.3.5 Temporary Construction Camps.....	3-17
3.3.6 Quarries and Borrow Areas	3-17
3.3.7 Facilities for the Storage of Explosives	3-20
3.4 Project Activities	3-20
3.4.1 Right-of-Way Clearing Activities	3-20
3.4.2 Blasting Activities.....	3-20
3.4.3 Road Construction Activities.....	3-22
3.4.4 Alterations to Linked Roadways	3-22
3.4.5 Bridge Construction Activities.....	3-23
3.4.6 Culvert Installation Activities	3-24
3.4.7 Closure and Reclamation of Temporary Components.....	3-24
3.4.8 Road Maintenance Activities	3-25
3.4.9 Bridge and Culvert Maintenance Activities	3-26
3.5 Construction Vehicles and Equipment.....	3-26
3.6 Project Construction Materials.....	3-27
3.7 Fuel and Hazardous Materials	3-29
3.8 Potable Water Supply	3-29
3.9 Waste and Hazardous Materials Handling, Disposal and Treatment	3-29
3.10 Project Workforce.....	3-30

3.11 Project Schedule 3-31
 3.12 Project Funding 3-31

LIST OF TABLES

Table 3.1: Geometric Design Criteria for the Proposed P4 Project 3-7
 Table 3.2: List of Watercourse Crossings and Proposed Crossing Standards 3-9
 Table 3.3: Crossing Structures with Navigation Requirements 3-10
 Table 3.4: Project Activities Expected During Construction and Operation and Maintenance Project Phases 3-21
 Table 3.5: Expected Construction Equipment and Vehicles Used for Project Components 3-26
 Table 3.6: Expected Construction Materials List 3-27
 Table 3.7: Projected Quantities of Raw Materials Required for P4 Construction 3-28
 Table 3.8: Expected Fuels and Hazardous Materials List 3-29
 Table 3.9: Planned Schedule for the P4 All-Season Road 3-31

LIST OF FIGURES

Figure 3-1: Proposed P1 and P4 All-Season Roads on the East Side of Lake Winnipeg 3-2
 Figure 3-2: Proposed P4 All-Season Road Alignment 3-4
 Figure 3-3: P4 All-Season Road Proposed Watercourse Crossings 3-8
 Figure 3-4: Locations of Bridge Crossings 3-11
 Figure 3-5: Example of Culvert Installation Method for Boreal Fen and Bog Areas (after Louisiana Pacific *et al.* 2014) 3-15
 Figure 3-6: Potential Construction Quarry Sites 3-19

LIST OF PHOTOGRAPHS¹

Photograph 3-1: Typical Multi-Span Bridge with Piers – Longbody Creek (P1 All-Season Road) 3-13
 Photograph 3-2: Typical Clear-Span Bridge – Loon Creek (P1 All-Season Road) 3-13
 Photograph 3-3: Typical Multi-Culvert Stream Crossing 3-14

¹ Unless otherwise indicated, photos showing construction-related activities and components such as constructed road, bridges and culverts are from the Project 1 area (P1 all-season road currently under construction between PR 304 and Berens River First Nation).

Photograph 3-4:	Typical Single-Culvert Stream Crossing.....	3-14
Photograph 3-5:	Typical All-Season Road 60 Metre-Wide Right-of-Way Clearing for Construction	3-22
Photograph 3-6:	Typical Road Construction along an All-Season Road Right-of-Way	3-23

LIST OF APPENDICES

Appendix 3-1:	Project Drawings
Appendix 3-2:	Representative Watercourse Crossing Design Drawings
Appendix 3-3:	Potential Quarry Site Locations
Appendix 3-4:	Examples of Erosion and Sedimentation Control Methods
Appendix 3-5:	Culvert Installation at Environmentally Sensitive Watercourse Crossings
Appendix 3-6:	ESRA’s Native Seed Mix for Revegetation

3.0 PROJECT DESCRIPTION

This chapter of the Project Environmental Impact Statement (EIS) provides a description of the proposed 94.1 km all-season road between Berens River First Nation and Poplar River First Nation. The proposed all-season road will be constructed on provincial Crown land and will connect to, and extend north from, ESRA's Project 1 (P1) all-season road currently under construction from provincial road (PRfoigu304 near Hollow Water First Nation to Berens River (**Figure 3-1**). By connecting Berens River First Nation with Poplar River First Nation the road will provide an all-season connection for the community of Poplar River with the southern Manitoba road network.

This Chapter provides the Project description information required to facilitate the identification and analysis of potential environmental effects and to identify the mitigation required to avoid or minimize potential adverse effects.

3.1 Scope of the Project

The scope of the Project includes components and activities described in this Chapter related to the construction and operation of the Project including Project maintenance activities and the decommissioning and reclamation of Project components, such as quarries, not required for on-going maintenance of the Project (e.g., borrow areas). There is no intent to decommission the proposed P4 Project as it will provide all-season road access between Berens River and Poplar River First Nations for the foreseeable future (> 50 years).

3.2 Project Phases

The proposed Project will comprise the following four main phases:

1. Planning;
2. Design;
3. Construction; and
4. Operation and Maintenance.

Further discussion of each Project Phase is provided below.

3.2.1 Planning Phase

The Project is currently in the planning phase. For the P4 Project, the planning phase began with the identification of broad road corridors, possible road alignments within the corridors, selection of the final road alignment, and preparation of detailed road designs (see **Section 2.2.2**). Exploratory clearing was required to support information requirements for the selection of the road alignment. Baseline environmental studies were initiated during this phase and included gathering information that



Project 4 - All-Season Road Connecting Berens River to Poplar River First Nation

**Figure 3-1
Proposed P1 and P4 All-Season
Roads on the East Side of Lake
Winnipeg**

- Proposed P4 All-Season Road
- P1 All-Season Road (South of Berens to PTH 304) - Under Construction
- Existing Road Network
- First Nation Reserve
- Manitoba / Ontario Border

Map Drawing Information:
ESRI Base Layers, Province of
Manitoba, CanVec, GeoGratis,
Dillon Consulting Limited

Map Created By: ECH
Map Checked By: MG/PS/DM
Map Projection: NAD 1983 UTM Zone 14N

DATE: 12/1/2015



influences the alignment and the development of the road design. This included studies of heritage resources, fisheries, wildlife, soil and vegetation assessments, geophysical surveys, quarry inspections, Aboriginal and public engagement, and Traditional Knowledge studies and workshops. The EIA is conducted during this planning phase.

3.2.2 Design Phase

During the design phase, the functional and detailed construction design will be completed and environmental protection plans finalized. Bridge and stream crossing locations, quarry and borrow areas, temporary access routes, construction staging areas and construction camps will also be located, surveyed and flagged. Detailed geotechnical investigations and testing will be conducted along the proposed all-season road right-of-way, temporary access routes and at quarry sites and borrow areas.

3.2.3 Construction Phase

During the construction phase, equipment, machinery, vehicles, construction materials and supplies including fuel, generators, trailers and other provisions will be transported to the Project area via the newly constructed P1 all-season road from PR 304 to Berens River First Nation (**Figure 3-1**). Construction supplies and equipment will also be transported staging areas at Berens River and Polar River First Nation and potentially to selected locations of the proposed all-season road via the existing 92.7 km-long winter road (**Figure 3-2**).

During the design phase, the functional and detailed construction design will be completed and environmental protection plans finalized.

The Project will be constructed in approximately 10 segments beginning from both Berens River First Nation and Poplar River First Nation, to maximize benefits to these communities and optimize construction scheduling and resource use.

Segments will be constructed sequentially such that completion of the construction phase at one segment will initiate construction of the adjacent segment. Right-of-way clearing will be conducted in similar segments, with clearing being completed during the winter months, wherever possible, to facilitate clearing machinery access and to minimize potential adverse environmental effects. Separate contracts will be tendered for each of the four bridges of the Project.

Vegetation along the right-of-way will be cleared on the inside of curves to increase sightlines of road users. Equipment marshalling areas, laydown areas, and construction camps will be prepared within the cleared right-of-way, where possible. Additional information on clearing activities is provided in **Section 3.4.1**.

Rock quarries and borrow areas will be cleared and prepared for use. Rock fill and granular materials will be excavated, crushed, sorted and stockpiled. The Project roadway, bridges, and culvert crossings will then be constructed. Culverts will be installed as construction progresses along the alignment.



Project 4 - All-Season Road Connecting Berens River to Poplar River First Nation

**Figure 3-2
Proposed P4 All-Season Road Alignment**

	P4 All-Season Road Alignment (April 2015)		Berens River First Nation Reserve
	5 km Station		Poplar River First Nation Reserve
	PI All-Season Road (South of Berens to PTH 304) - Under Construction		Berens River Northern Affairs Community
	2013/2014 Manitoba Winter Road		

Map Drawing Information:
ESRI Base Layers, Province of Manitoba, CanVec, GeoGratis, Dillon Consulting Limited

Map Created By: ECH
Map Checked By: MG/PS/DM
Map Projection: NAD 1983 UTM Zone 14N

DATE: 11/30/2015



Temporary facilities and work areas during construction including quarry and borrow areas, access routes, staging areas, and construction camps that will not be needed for future maintenance activities will be decommissioned following construction.

Additional information on the construction activities is provided in **Sections 3.4**.

3.2.4 Operation and Maintenance Phase

Following construction, the P4 all-season road will be owned and operated by the Government of Manitoba. Once the all-season road is designated as a departmental road (Provincial Road) under *The Highways and Transportation Act*, the Government of Manitoba will assume responsibility for road safety, operations and stewardship.

The 94.1 km all-season road will have a design width of 10 m within a typical cleared width of 60 m in the 100 m right-of-way.

Maintenance activities for the proposed Project, such as routine scheduled grading, topping the road with additional aggregate, management of vegetation and culvert cleanouts, will occur over the life of the road. Road maintenance and safety methods used will conform to the most current Manitoba Infrastructure and Transportation practices and guidelines. Additional information on maintenance activities is provided in **Sections 3.4.8** and **3.4.9**.

3.2.5 Decommissioning

There are no plans to decommission or abandon the Project as it will provide all-season access from Poplar River First Nation to Berens River First Nation and to the southern all-season road network for the foreseeable future (i.e., > 50 years). Decommissioning of temporary components (i.e., staging areas, construction camps, temporary access routes, quarries, and borrow areas not required for on-going road maintenance) will occur as part of the construction phase of the Project. Once no longer required, the existing winter road will be decommissioned by blocking access points and revegetating and restoring disturbed areas, where required.

3.3 Project Components

The main components of the proposed Project are:

- Gravel-surface two-lane all-season road (94.1 km);
- Major water crossings (bridges) over the Berens, Etomami, North Etomami, and Leaf Rivers;
- Culvert crossings at fish-bearing watercourse crossings;
- Culverts (estimated) for conveyance and drainage equalization at non-fish-bearing watercourse crossings;
- Temporary construction access routes;
- Temporary construction staging areas;
- Temporary construction camps;
- Construction quarry sites;

- Construction borrow areas; and
- Facilities for the storage of explosives.

The total permanent footprint area of the Project, including the all-season road, bridges, culverts, and quarries required for on-going maintenance will be approximately 640 ha. The footprint of cleared areas required for temporary Project components and activities during Project construction such as construction camps, equipment laydown/staging areas, borrow areas, and most quarries is estimated to be less than 340 ha. In total, the Project will therefore result in a permanent and temporary footprint of approximately 980 ha. The footprint area of temporary Project components and activities that will be required only during Project construction will be rehabilitated by natural re-vegetation and seeding/planting.

Details of the main Project components are described in **Sections 3.3.1 to 3.3.7**. Activities associated with constructing and maintaining the Project are described in **Section 3.4**.

3.3.1 All-Season Road

The proposed alignment for the 94.1 km P4 all-season road between Berens River and Poplar River First Nations is shown in **Figure 3-2**. Most of the alignment is located approximately 5 to 10 km east of the existing winter road corridor to avoid the topographically lower and wetter conditions of the winter road route which traverses extensive bog/fen complexes. Approximately 5 km of the Project alignment south of Poplar River First Nation (kilometre station 90 to 94.1) is in close proximity to the current winter road. The proposed two-lane gravel road will be centered on a new 100 m right-of-way. Typical clearing width of the road right-of-way will be 60 m with additional clearing as required in horizontal curves to maintain sight lines for safety. An estimated 570 ha of Crown land will be cleared for the road right-of-way.

The road will be built to the standard of a secondary arterial road, according to published Manitoba Highway Standards (Manitoba Department of Highways and Transportation 1998). In keeping with these standards, the roadway will be constructed with a road top width of 10 m. The road will be constructed with a design speed of 100 km/h, or potentially less where natural landscape features inhibit the design standard. The posted speed limit will be 80 km/h or less where required for safety. The Geometric Design Criteria (GDC) for the proposed Project is provided in **Table 3.1**.

To accommodate safe snowmobile/ATV crossings of the proposed all-season road, the road platform will be modified at trapline access points and other community access points to include gradual slopes and sufficiently cleared areas to facilitate on-coming traffic visibility. Signage indicating these crossing locations will be installed.

Drawings for the proposed all-season road are provided in **Appendix 3-1**.

Table 3.1: Geometric Design Criteria for the Proposed P4 Project

Criterion	P4 Project Standard
Estimated 10 Year Average Annual Traffic	<500
Terrain	Rolling
Design Speed	100 km/h
Gradient – Maximum Percentage	6%
Posted Speed	80 km/h (posted speed limits may vary in certain locations such as at high wildlife density/crossing areas, bridge approaches, snowmobile crossings, and curves)
Minimum Stopping Sight Distance	200 m
Minimum Passing Sight Distance	680 m
Minimum Vertical Curve “K” Values*	KC = 70, KS = 50
Curvature – Minimum Radius	440 m
Number and Widths of Lanes	2 lanes at 5.0 m
Total Right-of-Way Width	100 m (60 m cleared)
Truck Use (Percentage of AADT)	10% Assumed
Truck Haul Type	Supply / Haulage
Roadbed Width	Approximately 18.0 to 24.0 m (variable)
Roadway Fill Slope	4H:1V
Ditch Bottom Width	3.5 m
Ditch Back Slope	3H:1V
Clear Roadway Minimum Width on Structure	9.6 m

Note: * Parabolic curves are defined by the K value: the length of curve divided by its change in grade %

3.3.2 Watercourse Crossings

The proposed Project will require construction of the following crossings at fish-bearing watercourses:

- Multi-span bridges at the Berens and Etomami Rivers;
- Clear-span bridges at the North Etomami and Leaf Rivers;
- Large-diameter (>900 mm) navigable steel arch or reinforced concrete box culverts at Okeyakkoteinewin Creek; and
- Culverts (minimum 900 mm diameter) at 5 unnamed streams.

Culverts will also be installed at 23 non-fish-bearing watercourse crossings. The minimum culvert size is 900 mm.

The locations of proposed watercourse crossings are indicated in **Figure 3-3**. **Table 3.2** lists the UTM locations of each watercourse crossing and the type of crossing structure to be installed. Additional descriptions of these crossing structures are provided in **Sections 3.3.2.1 to 3.3.2.3**. Representative



Project 4 - All-Season Road Connecting Berens River to Poplar River First Nation

Figure 3-3
P4 All-Season Road Proposed
Watercourse Crossings

- P4 All-Season Road Alignment (April 2015)
- Crossing
- PI All-Season Road (South of Berens to PTH 304) - Under Construction
- 2013/2014 Manitoba Winter Road
- Berens River First Nation Reserve
- Poplar River First Nation Reserve
- Berens River Northern Affairs Community

Map Drawing Information:
 ESRI Base Layers, Province of
 Manitoba, CanVec, GeoGratis,
 Dillon Consulting Limited
 North/South Consultants Inc. 2015

Map Created By: ECH
 Map Checked By: MG/PS/DM
 Map Projection: NAD 1983 UTM Zone 14N

DATE: 11/30/2015



Table 3.2: List of Watercourse Crossings and Proposed Crossing Standards

Site*	Crossing	Northing	Easting	Crossing Structure
Bridges over Major Rivers				
P4-X01	Berens River	5798650	643706	Multi-span bridge with 1 in-water pier
P4-X04	Etomami River	5800281	648199	Multi-span bridge with 2 in-water piers
P4-X07	North Etomami River	5809218	648918	Clear-span bridge (no in-water piers)
P4-X22	Leaf River	5827149	647669	Clear-span bridge (no in-water piers)
Culverts in Fish-Bearing Streams				
P4-X03	Unnamed Etomami River Tributary	5798546	644741	Single or Multiple Round Culverts
P4-X05	Unnamed North Etomami River Tributary	5808550	648934	Single or Multiple Round Culverts
P4-X24	Unnamed Pamatakakowin Lake Tributary	5838914	648252	Single or Multiple Round Culverts
P4-X29	Unnamed Okeyakkoteinewin Creek Tributary	5850093	639943	Multiple Round or Steel Arch Culverts
P4-X30	Okeyakkoteinewin Creek	5851547	637435	Steel Arch or Reinforced Concrete Box Culvert
P4-X31	Unnamed Okeyakkoteinewin Creek Tributary	5854014	635069	Single or Multiple Round Culverts
Culverts in Drainage Channels				
P4-X02	Unnamed drainage	5798617	644288	Small Diameter Culvert
P4-X06	Unnamed drainage	5808634	648929	Small Diameter Culvert
P4-X08	Unnamed drainage	5815230	648712	Small Diameter Culvert
P4-X09	Unnamed drainage	5815629	648495	Small Diameter Culvert
P4-X10	Unnamed drainage	5815981	648272	Small Diameter Culvert
P4-X11	Unnamed drainage	5816070	648235	Small Diameter Culvert
P4-X12	Unnamed drainage	5817308	647869	Small Diameter Culvert
P4-X13	Unnamed drainage	5817516	647782	Small Diameter Culvert
P4-X14	Unnamed drainage	5817642	647730	Small Diameter Culvert
P4-X15	Unnamed drainage	5817671	647718	Small Diameter Culvert
P4-X16	Unnamed drainage	5817756	647690	Small Diameter Culvert
P4-X17	Unnamed drainage	5819729	647281	Small Diameter Culvert
P4-X18	Unnamed drainage	5820298	647170	Small Diameter Culvert
P4-X19	Unnamed drainage	5820337	647167	Small Diameter Culvert
P4-X20	Unnamed drainage	5821742	647184	Small Diameter Culvert
P4-X21	Unnamed drainage	5821786	647191	Small Diameter Culvert
P4-X23	Unnamed drainage	538188	648249	Small Diameter Culvert
P4-X25	Unnamed drainage	5840254	647835	Small Diameter Culvert
P4-X26	Unnamed drainage	5840294	647804	Small Diameter Culvert
P4-X27	Unnamed creek	587454	641366	Small Diameter Culvert
P4-X28	Unnamed creek	5849291	640598	Small Diameter Culvert
P4-X32	Unnamed drainage	5862152	624506	Small Diameter Culvert
P4-X33	Unnamed drainage	5864651	620897	Small Diameter Culvert

Note: * Refer to map **Figure 3-3** for watercourse crossing site locations

design drawings for watercourse crossings are provided in **Appendix 3-2. Chapter 8** (Aquatic Environment) provides a description of the major water crossing location characteristics.

Hydraulic and geotechnical investigations will be conducted to finalize crossing locations and determine site hydraulics and foundation conditions at watercourse crossings. The results of hydraulic analyses will be used to determine the size of crossings to meet 1 in 100 year flood scenario design (i.e., Q1% flood/flow), fish passage requirements and navigation requirements for crossing designs, as required. While all watercourses to be crossed by the Project are identified as “non-scheduled” under the federal *Navigation Protection Act*, six crossings will be constructed to accommodate navigation (see **Table 3.3**) in response to input from community members and stakeholders. Requirements to accommodate navigation are based on the vertical clearance from the ordinary high water mark to the underside of the structure.

3.3.2.1 Bridge Crossings

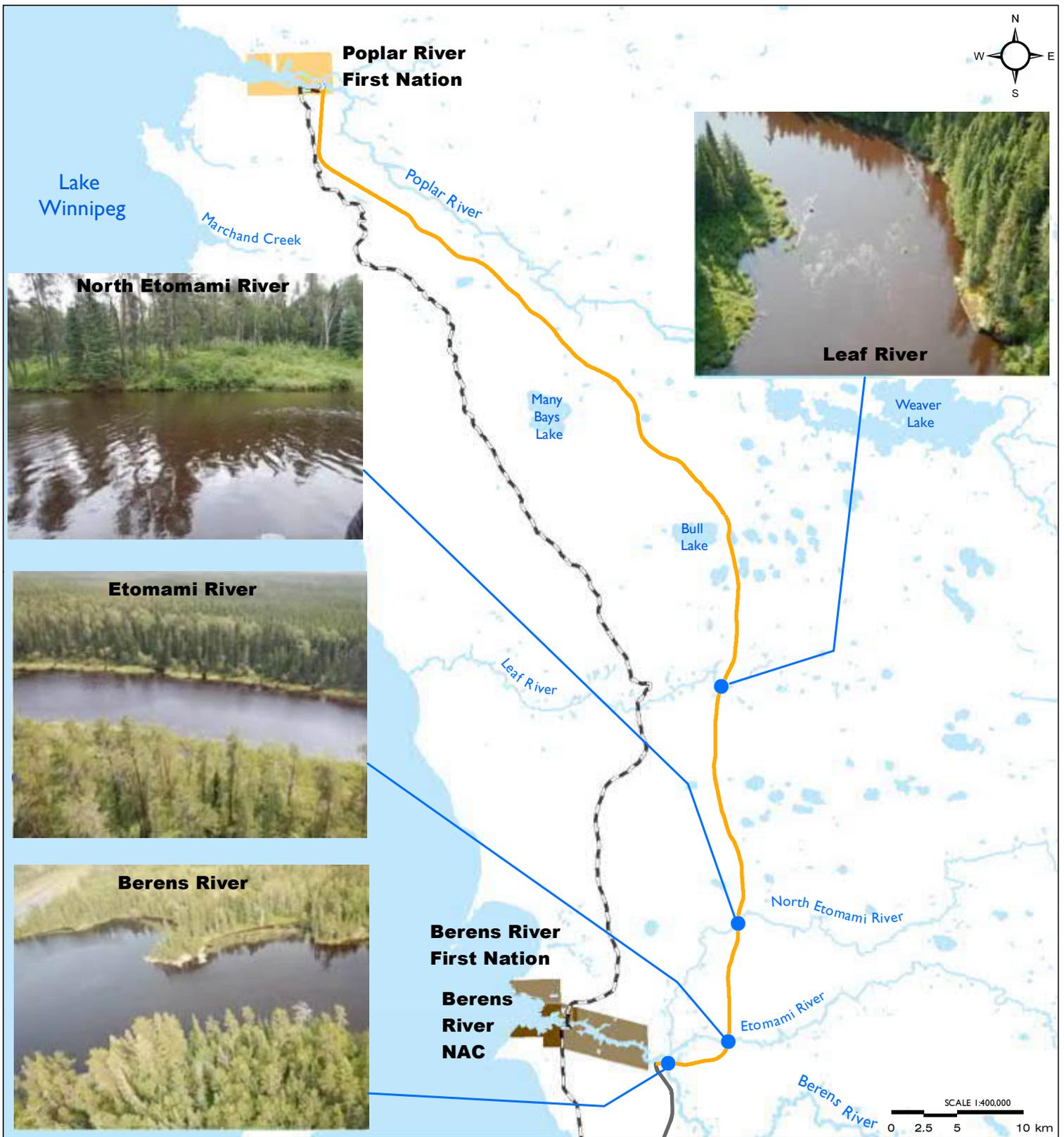
The general design criteria and assumptions used for the bridges and structures will be in accordance with [American Association of State Highway and Transportation Officials \(AASHTO\) – Load and Resistance Factor Design \(LFRD\) Bridge Design Specifications \(Latest Edition\)](#) as required by the Government of Manitoba. Additionally, the structure designs will comply with the Manitoba Infrastructure and Transportation Structures Design Manual and the following live loading requirements:

- Modified HSS40 Truck Loading;
- HS40 Lane Loading; and
- HL-93 Combined Truck and Lane Loading.

Figure 3-4 illustrates the locations of the four bridge crossings along the P4 all-season road alignment.

Table 3.3: Crossing Structures with Navigation Requirements

Site	Crossing	Crossing Structure	Approximate Horizontal Clearance (m)	Vertical Clearance (m)
P4-X01	Berens River	Multi-span bridge	60	2.5 (min)
P4-X04	Etomami River	Multi-span bridge	40	2.5 (min)
P4-X07	North Etomami River	Clear-span bridge	30	2.5 (min)
P4-X22	Leaf River	Clear-span bridge	30	2.5 (min)
P4-X29	Unnamed Okeyakkoteinewin Creek Tributary	Round or steel arch culvert	4.0 (min)	2.0 (min)
P4-X30	Okeyakkoteinewin Creek	Steel arch culvert	4.0 (min)	2.0 (min)



Project 4 - All-Season Road Connecting Berens River to Poplar River First Nation

Figure 3-4
Locations of Bridge Crossings

- P4 All-Season Road Alignment (April 2015)
- P1 All-Season Road (South of Berens to PTH 304) - Under Construction
- 2013/2014 Manitoba Winter Road
- River Crossing
- Berens River First Nation Reserve
- Poplar River First Nation Reserve
- Berens River Northern Affairs Community

Map Drawing Information:
ESRI Base Layers, Province of
Manitoba, CanVec, GeoGratis,
Dillon Consulting Limited

Map Created By: ECH
Map Checked By: MG/PS/DM
Map Projection: NAD 1983 UTM Zone 14N

DATE: 11/30/2015



All four bridges will be two-lane ‘steel girder’ structures. A typical steel girder multi-span bridge is illustrated in **Photograph 3-1**. A typical clear-span bridge is illustrated in **Photograph 3-2**. The vertical alignment for the steel girder bridges will be horizontal with approach grades parallel to the road grade. Navigation requirements for all four bridges will be a minimum of 2.5 m clearance from ordinary high water mark to the underside of the bridge girder. The length of each bridge will be the sum of the river width plus abutment offsets. Typical abutment offsets will be approximately 7 m from the water’s edge. The overall width of the bridge is dependent on the length of the structure, but will generally be 10.8 m wide plus two 0.6 m curbs/guardrails. Width of each traffic lane will be 3.7 m. Structural materials for each bridge will consist of concrete and reinforcing steel.

3.3.2.2 Culvert Crossings at Fish-Bearing Watercourses

Culvert crossings at fish-bearing watercourses will be constructed using either corrugated steel pipe culverts or box culverts with minimum culvert diameters of 900 mm. The culvert crossings may involve either closed or open-bottom designs depending on fisheries sensitivities and soil conditions. Where culverts cross fish habitat (six locations), the culverts will be sized to accommodate fish passage requirements as specified in the [Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat](#) (Fisheries and Oceans Canada and Manitoba Natural Resources 1996).

The following design criteria and assumptions will apply to culverts at smaller creek/stream crossings:

- Maximum head loss of 0.3 m during passage of the design discharge (1% Flood); and
- Velocities through culverts shall be less than 1.0 m/s for the 2-year, the 3DQ10³ and the 100-year return periods event for culverts less than 25 m in length, and 0.8 m/s for culverts greater than 25 m in length in accordance with the [Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat](#) (Fisheries and Oceans Canada and Manitoba Natural Resources 1996).

Examples of culvert crossings are illustrated in **Photographs 3-3** and **3-4**.

³ 3DQ10 = 3 day delay discharge with a 10% probability of exceedance



(Source: Joro Consultants)

Photograph 3-1: Typical Multi-Span Bridge with Piers – Longbody Creek (P1 All-Season Road)



(Source: Dillon Consulting Limited)

Photograph 3-2: Typical Clear-Span Bridge – Loon Creek (P1 All-Season Road)



(Source: Joro Consultants)

Photograph 3-3: Typical Multi-Culvert Stream Crossing



(Source: Joro Consultants)

Photograph 3-4: Typical Single-Culvert Stream Crossing

3.3.2.3 Culvert Crossings of Non-Fish Bearing Watercourses and Drainage Pathways

An estimated 23 culverts will be installed at non-fish-bearing stream crossings and an additional 284 culverts (estimated) will also be installed to facilitate drainage/prevent flooding and to maintain hydraulic function at fen/bog locations (i.e., equalization culverts). Culvert design and installation methods will consider best practices for crossings in boreal forest areas of Manitoba and Saskatchewan (Louisiana Pacific *et al.* 2014). Equalization culverts will be a minimum of 900 mm in diameter. An example equalization culvert installation method for boreal fen and bog areas is illustrated in **Figure 3-5**. Note that the use of large rock in the road base promotes subsurface flow from one side of the road to the other in a manner consistent with fen and bog environments.

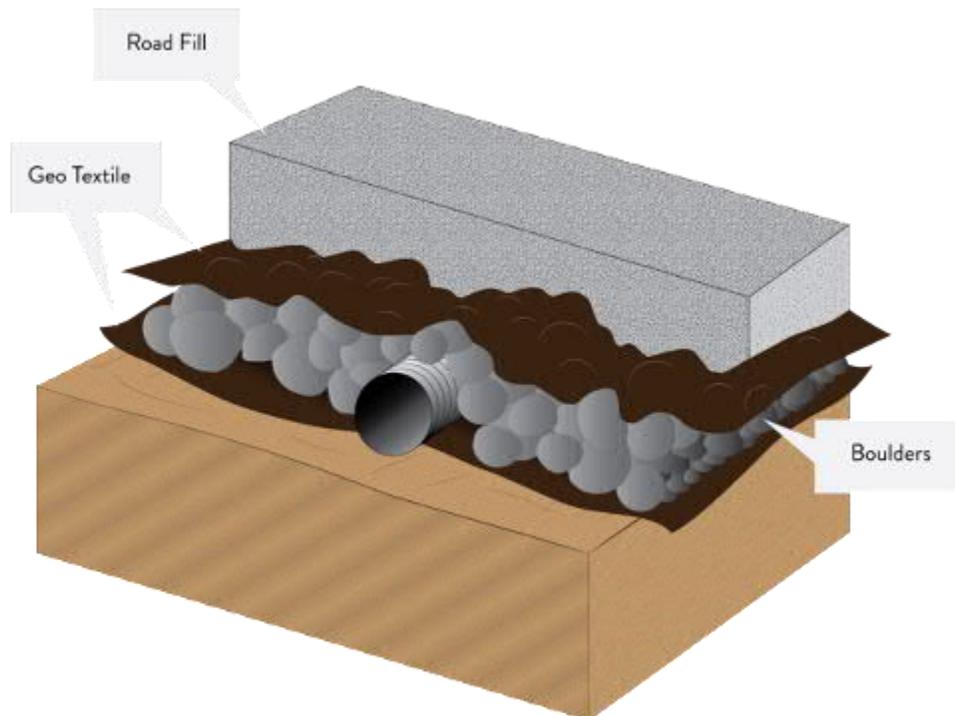


Figure 3-5: Example of Culvert Installation Method for Boreal Fen and Bog Areas (after Louisiana Pacific *et al.* 2014)

3.3.2.4 Temporary Crossings

It is anticipated that temporary crossings of watercourses may be required during the construction phase within the 60 m cleared right-of-way. Existing roads and cut lines will be used as access to temporary crossings whenever possible. At fish-bearing watercourses, in-stream placement (if required) and removal of temporary crossing structures will be scheduled in accordance with Fisheries and Oceans Canada [timing windows](#) for instream work to avoid serious harm to fish. Temporary crossing structures will be removed when no longer required and temporary crossings will be rehabilitated and revegetated using a native vegetation seed mix.

3.3.3 Temporary Access

Temporary access will be required to access quarries and borrow areas, staging areas, construction camps, and other areas required for road construction purposes. These will range from informal and unimproved trails where vegetation may be removed or snow compacted to service roads that are cleared, grubbed, graded, compacted, and gravelled to support heavy construction vehicle movement (e.g., quarry access). An estimated 3.5 km of temporary access is expected to be developed during construction of the Project, which equates to an approximate 3.5 ha of disturbed area.

Construction-related traffic will be restricted to the Project right-of-way and associated temporary access routes required during Project construction and maintenance. Existing trails, portages, and other travel routes will not be altered adjacent to the Project footprint area other than as required for Project construction and maintenance purposes. Where temporary access is accessible to the public, access will be blocked when not in use.

Staging areas will be located to minimize the amount of clearing required, thereby maximizing road construction efficiency and helping to minimize overall impacts to the environment, Project construction costs and schedule.

After Project construction, access not required for on-going maintenance of the road will be decommissioned by leveling, decompacting, and trimming to encourage natural re-vegetation and will be seeded and/or planted as required. Access will be blocked using large boulders.

3.3.4 Temporary Construction Staging Areas

A maximum of ten temporary construction staging areas totalling an estimated 57 ha (0.57 km²) of cleared area will be established by the Project construction contractor at various locations within 500 m of the proposed all-season road right-of-way to store construction vehicles, machinery, construction materials and supplies, petroleum products, Portland cement, bridge and culvert components, geotextile rolls, explosives, erosion control supplies, and other construction materials for the Project.

Staging areas will be located to minimize the amount of clearing required, thereby maximizing road construction efficiency and helping to minimize overall impacts to the environment, Project construction costs and schedule.

Buildings and other structures used for equipment maintenance and materials storage at staging areas will be trucked in⁴, skidded in or constructed on site. Sanitary, hazardous, and solid waste storage will be provided at staging areas and at quarry sites as required. Details regarding waste materials storage and disposal are provided in **Section 3.9**. Petroleum products (diesel fuel and gasoline) will be stored in double walled tanks in accordance with the National Fire Code of Canada 2010 and the *Storage and Handling of Petroleum Products and Allied Products Regulation of The Dangerous Goods Handling and Transportation Act* of Manitoba.

⁴ Equipment may be trucked-in via the existing winter road or by barge depending on the season.

Where staging areas are located outside of the 60 m cleared right-of-way, vegetation will be cleared, stockpiled, and burned. Organic matter may be scraped from the surface and stockpiled for site reclamation purposes. Staging areas may be contoured and levelled using dozers and graders and an aggregate base may be installed depending on operational needs and duration of use.

Following construction, temporary construction staging areas will be decommissioned by levelling, decompacting, and redistributing organic materials to encourage natural revegetation.

3.3.5 Temporary Construction Camps

Temporary construction camp facilities will be established by the construction contractor at strategic locations within 500 m of the proposed road right-of-way to support crews constructing the Project. It is estimated that up to four temporary camp locations totalling approximately 64 ha (0.64 km²) of cleared area will be established. Each camp will accommodate approximately 40 workers. Temporary camps are expected to comprise of structures for sleeping, dining, offices, and also structures for equipment storage and maintenance. Construction camps will be fenced, where necessary, and site security may be provided, where required. Potable water, sanitary waste, and solid waste storage will be provided. Waste disposal and treatment is described in **Section 3.9**.

Existing vegetation at temporary camp locations will be cleared, stockpiled and burned to allow for functional temporary camp areas. Organic matter will be scraped from the surface and stockpiled for use in site reclamation purposes. The area will be contoured and levelled using dozers and graders, and provided with drainage control and erosion protection. An aggregate base may be established depending on the time of year and ground conditions. A non-permeable liner to contain potential fuel spills will be used at fuel tank sites and equipment maintenance areas.

Following construction, temporary construction camps will be decommissioned by removal of temporary facilities, levelling, decompacting, and redistributing organic materials to encourage natural revegetation.

3.3.6 Quarries and Borrow Areas

New rock quarries and borrow areas will be developed to provide rock fill, crushed rock, and granular materials for construction of the all-season road, as well as bridge abutments, culvert crossings, temporary access routes, construction staging areas, and construction camps. To the extent possible, the road layout and design will attempt to balance “cut and fill” quantities; however, additional fill and aggregate is known to be required from local quarries and borrow areas for Project construction.

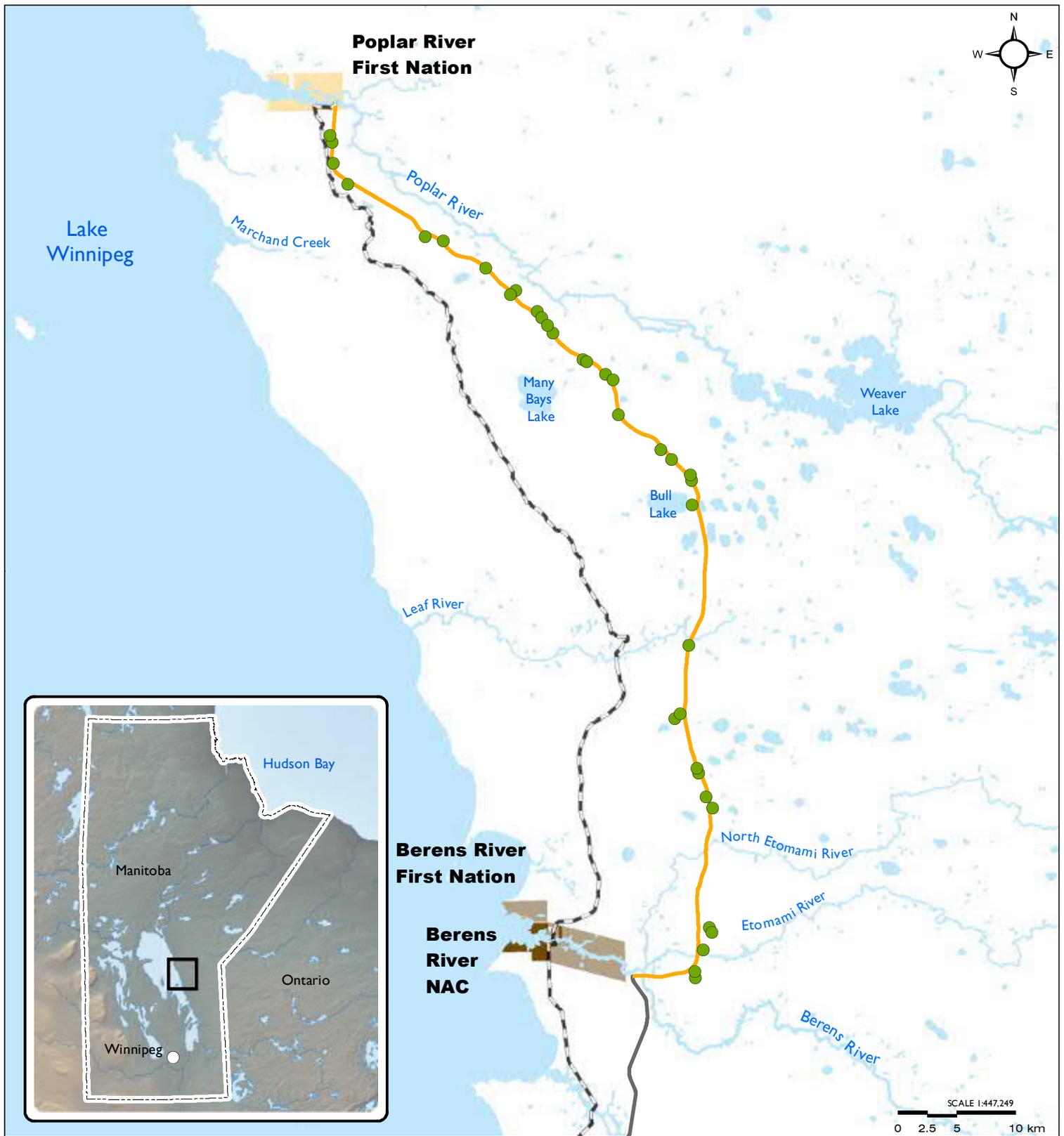
All quarry and borrow areas will be located on provincial Crown land as close to the centerline of the proposed road alignment as possible. It is expected that borrow areas will be within 500 m of the road centreline while quarries may be up to 1 km from the road alignment to minimize the need for temporary access route development and minimize haul distance by heavy construction equipment. The estimated area of borrow areas, quarries, and temporary access required during the construction phase is 290 ha (2.9 km²).

Rock from quarries will be drilled, blasted, excavated, crushed, and stockpiled while granular materials from borrow areas will be excavated, crushed (where necessary), screened/separated, and stockpiled. The work will require the use of drill rigs, excavators, rock crushers, loaders, trucks, and a variety of construction equipment. Blasting activities (see **Section 3.4.2**) will be conducted at quarries by appropriately-trained blasting crews. Explosives will be stored in magazines in accordance with applicable provincial and federal safety protocols and regulations. The extent, location, and technology of crusher facilities will be determined by the Contractor's requirements and in consideration of the quantity of material needed from each specific quarry and borrow site. Preliminary estimates of quantities of aggregate and granular materials sourced from quarry and borrow areas are provided in **Section 3.6**.

Approximately thirty-five quarries totaling an estimated surface area of 362 ha have been identified in the vicinity of the proposed all-season road alignment (**Appendix 3-3**), although only about thirteen quarries are expected to be required for Project construction (see **Figure 3-6** for potential quarry locations). Geochemical testing of rock at potential quarries will be completed early in the detailed design phase of the Project to assess the potential for metal leaching and acid generation from quarried rock. This information will be used in the selection of quarry sites. In 2015, thirteen quarry locations were examined for the presence of cultural materials or features as part of a Heritage Resource Impact Assessment (HRIA; AMEC Foster Wheeler Environment and Infrastructure 2015c). No archaeological sites were discovered during the HRIA survey and no modern traditional use camp sites, cabins, or traplines were observed. Of the estimated thirteen quarries required for Project construction, three or four will remain open for on-going maintenance of the P4 all-season road (approximately 73 ha of permanent quarry area). Quarry sites not required for on-going maintenance of the Project 4 all-season road will be rehabilitated as described in **Section 3.4.7**.

Quarry and borrow sites will be located on provincial Crown land as close to the centreline of the proposed all-season road alignment, as feasible, to minimize environmental disturbance.

Borrow areas will be developed at regular intervals along the road alignment as sources of clay and granular materials for use in the construction of road embankments or side slopes. Borrow areas will be excavated as uniformly as possible to the depths and widths permitted. Individual borrow areas are typically used for short periods only and will be backfilled with stockpiled organic materials and other organic debris from the right of way and contoured to blend with the existing terrain.



Project 4 - All-Season Road Connecting Berens River to Poplar River First Nation

Figure 3-6
Potential Construction Quarry Sites

- | | |
|--|---|
| P4 All-Season Road Alignment | Poplar River First Nation Reserve |
| P1 All-Season Road (South of Berens to PTH 304) - Under Construction | Berens River Northern Affairs Community |
| 2013/2014 Manitoba Winter Road | Berens River First Nation Reserve |
| P4 Potential Quarries | |

Map Drawing Information:
ESRI Base Layers, Province of Manitoba, CanVec, GeoGratis, Dillon Consulting Limited
Manitoba Mineral Resources 2015d

Map Created By: ECH
Map Checked By: MG/PS/DM
Map Projection: NAD 1983 UTM Zone 14N

DATE: 11/30/2015



Vegetation at quarry sites will be cleared, stockpiled and burned. Where organic soils are present, they will be scraped from the surface and stockpiled for site restoration purposes. All borrow areas will be decommissioned upon the completion of Project construction by levelling, decompacting, and redistributing organic materials to encourage natural revegetation. For additional information on the decommissioning of quarry sites and borrow areas, see **Section 3.4.7**.

3.3.7 Facilities for the Storage of Explosives

Explosives and initiation systems to be used for blasting activities during the construction phase will be stored in temporary, independent magazines. Explosives magazines will be situated in reasonably close proximity to blasting sites to minimize transportation distance.

Magazines used for the storage of explosives will meet the federal standards and licensing requirements as specified in the *Explosives Regulation of the federal Explosives Act*. Siting of magazines will meet the provincial standards and licensing requirements as specified in the *Operation of Mines Regulation of The Workplace Safety and Health Act of Manitoba*. Safety procedures regarding the storage of explosives will also follow ESRA's Workplace Safety and Health Specifications regarding magazine license and explosives storage (GR140.37 in **Appendix 5-5, Chapter 5**).

3.4 Project Activities

A summary of the Project activities that are expected to be carried out during the construction and operation and maintenance phases of the proposed Project is provided in **Table 3.4**.

3.4.1 Right-of-Way Clearing Activities

Right-of-way clearing for Project construction will generally be 60 m wide (e.g., **Photograph 3-5**), will be conducted in accordance with regulatory requirements and applicable [forest management guidelines](#), and may be contracted under a Community Benefits Agreement (CBAs). Right-of-way clearing will consist of the removal and disposal of trees, shrubs, fallen timber, and surface litter from the right-of-way and other areas such as borrow pits, prior to grading. Organic materials stripped from the surface will be stockpiled for use on road shoulders or placed in berms along edges of the cleared right-of-way. Materials such as logs or timber suitable for manufacturing forest products will be salvaged, where feasible. Where required, stumps, and roots will be grubbed out and separated from the soil. The non-salvageable material such as brush, roots, and limbs will be piled and burned or buried.

3.4.2 Blasting Activities

Blasting of rock will occur at quarries (**Section 3.3.6**) and, as required, at specific locations in association with road and bridge construction. Contractors will be required to store, handle and transport explosives in compliance with relevant provincial and federal laws, regulations, and best practices and guidelines for safety and environmental protection. To the extent possible, the timing of blasting activities will consider area-specific environmental sensitivities.

Table 3.4: Project Activities Expected During Construction and Operation and Maintenance Project Phases

Project Component	Project Activities				
	Construction		Operation and Maintenance		
All-Season Road	<ul style="list-style-type: none"> ▪ Clearing right-of-way ▪ Salvaging ▪ Windrowing ▪ Burning ▪ Drilling 	<ul style="list-style-type: none"> ▪ Blasting ▪ Excavating ▪ Stockpiling ▪ Grading ▪ Contouring ▪ Filling ▪ Controlling erosion ▪ Producing aggregate 	<ul style="list-style-type: none"> ▪ Transporting equipment ▪ Operating equipment ▪ Operating machinery ▪ Operating vehicles ▪ Signing ▪ Refueling 	<ul style="list-style-type: none"> ▪ Grading ▪ Operating equipment ▪ Operating vehicles ▪ Maintaining ▪ Producing aggregate ▪ Stockpiling 	<ul style="list-style-type: none"> ▪ Controlling vegetation ▪ Controlling dust ▪ Clearing snow ▪ Inspecting
Steel Girder Multi-span Bridges	<ul style="list-style-type: none"> ▪ Minor clearing ▪ Staging equipment ▪ Excavating ▪ Filling 	<ul style="list-style-type: none"> ▪ Drilling: testing ▪ Blasting Contouring ▪ Cofferdamming ▪ Controlling erosion 	<ul style="list-style-type: none"> ▪ Operating equipment ▪ Transportation of bridge materials ▪ Batching concrete ▪ Pouring concrete 	<ul style="list-style-type: none"> ▪ Maintaining 	<ul style="list-style-type: none"> ▪ Inspecting
Culvert Stream Crossings/ Drainage Equalization Culverts	<ul style="list-style-type: none"> ▪ Excavating ▪ Filling 	<ul style="list-style-type: none"> ▪ Contouring ▪ Controlling erosion 	<ul style="list-style-type: none"> ▪ Restoring 	<ul style="list-style-type: none"> ▪ Maintaining ▪ Inspecting 	<ul style="list-style-type: none"> ▪ Steaming ▪ Cleaning
Temporary Crossings over Watercourses	<ul style="list-style-type: none"> ▪ Minor clearing ▪ Excavating ▪ Filling ▪ Contouring ▪ Cofferdamming 	<ul style="list-style-type: none"> ▪ Controlling erosion ▪ Crossing stream ▪ Operating equipment ▪ Transporting materials ▪ Dismantling 	<ul style="list-style-type: none"> ▪ Recycling materials ▪ Removing abutments ▪ Contouring ▪ Controlling erosion ▪ Restoring 	<ul style="list-style-type: none"> ▪ Testing for contamination 	<ul style="list-style-type: none"> ▪ Inspecting
Temporary Access Areas	<ul style="list-style-type: none"> ▪ Clearing ▪ Grubbing (only for quarries and temporary camps) ▪ Grading ▪ Graveling 	<ul style="list-style-type: none"> ▪ Closing ▪ Restoring 	<ul style="list-style-type: none"> ▪ Demobilizing ▪ Restoring 	<ul style="list-style-type: none"> ▪ Inspecting 	
Temporary Construction Staging Areas	<ul style="list-style-type: none"> ▪ Clearing ▪ Stockpiling materials ▪ Operating equipment 	<ul style="list-style-type: none"> ▪ Storing fuels 	<ul style="list-style-type: none"> ▪ Dispensing fuels ▪ Demobilizing ▪ Restoring 	<ul style="list-style-type: none"> ▪ Testing for contamination 	<ul style="list-style-type: none"> ▪ Inspecting
Temporary Construction Camps	<ul style="list-style-type: none"> ▪ Clearing ▪ Operating equipment ▪ Operating generator ▪ Housing workers 	<ul style="list-style-type: none"> ▪ Storing foods ▪ Sourcing water ▪ Disposing solid wastes ▪ Disposing liquid wastes 	<ul style="list-style-type: none"> ▪ Demobilizing ▪ Drilling ▪ Testing soil ▪ Restoring 	<ul style="list-style-type: none"> ▪ Testing for contamination 	<ul style="list-style-type: none"> ▪ Inspecting
Quarries and Borrow Areas	<ul style="list-style-type: none"> ▪ Clearing ▪ Grubbing ▪ Excavating ▪ Stockpiling soils 	<ul style="list-style-type: none"> ▪ Blasting ▪ Crushing rock ▪ Stockpiling ▪ Operating equipment 	<ul style="list-style-type: none"> ▪ Transporting materials ▪ Closing ▪ Restoring 	<ul style="list-style-type: none"> ▪ Testing for contamination 	<ul style="list-style-type: none"> ▪ Inspecting



(Source: ESRA)

Photograph 3-5: Typical All-Season Road 60 Metre-Wide Right-of-Way Clearing for Construction

3.4.3 Road Construction Activities

Road construction activities will be used to construct the road fill, bed and surface. This process will consist of four sub-activities:

1. Top soil stripping, if required;
2. Unsuitable soil removal;
3. Rock and granular placement and compaction; and
4. Trimming and shaping.

Photograph 3-6 illustrates typical road construction activities.

3.4.4 Alterations to Linked Roadways

The P4 all-season road will connect to the P1 all-season road at Berens River. The connecting P1 road is being constructed to similar roadway and intersection design standards and also has a 10 m road-top and suitable road structure for connection with the proposed P4 all-season road.



(Source: ESRA)

Photograph 3-6: Typical Road Construction along an All-Season Road Right-of-Way

3.4.5 Bridge Construction Activities

There are four basic activities associated with bridge construction:

1. Construction of land-based footings and abutments and in-water piers using reinforced concrete;
2. Steel girder placement across the span of the bridge;
3. Bridge deck construction using reinforced concrete; and
4. Establishment of a gravel surface on the bridge deck.

A concrete batch plant will be established in close proximity to each bridge crossing location to produce concrete for the bridge abutments, piers, and deck. Heavy equipment required for bridge construction will include loaders, excavators, dump trucks, dozers, hoisting equipment, pump trucks, concrete trucks, and compactors. Temporary erosion protection and sediment control measures such as cofferdams are included in typical bridge construction activities as are more permanent measures such as riprap placement. Bridge construction activities will also include site restoration activities such as natural re-vegetation and seeding and/or planting, as required.

3.4.6 Culvert Installation Activities

Culverts will be installed along the road embankments at six fish-bearing stream crossings and 23 non-fish bearing drainage channels. In addition, approximately 284 drainage equalization culverts will be installed along road embankments where there is no defined drainage channel. Typical culvert installation activities will include placing silt fencing and silt curtains, excavating the stream bottom, laying geotextile material, installing the culvert, and placing and compacting granular fill and road topping. Culverts will be installed and embedded so that post-construction settlement of fill will result in a level profile. Riprap will be placed at the entrance and exit of the culverts to control erosion. Temporary erosion protection and sediment control measures (**Appendices 3-4 and 3-5**), including the installation and removal of cofferdams as required (e.g., at fish-bearing watercourse crossings), will be utilized during construction. Following installation of culverts, the culvert sites will be rehabilitated by natural re-vegetation and seeding and/or planting with native species, as required. Seeding and/or planting may also be undertaken at locations vulnerable to erosion and sedimentation, as required. Refer to **Sections 3.3.2.2 and 3.3.2.3** for further description of culvert components.

3.4.7 Closure and Reclamation of Temporary Components

Facilities and work areas including quarry and borrow areas, access routes, staging areas and construction camps that will not be needed for future Project maintenance activities will be decommissioned following construction.

Stockpiles of organic soils and other material will be used as fill and capped, where required, for borrow area rehabilitation. Side slopes will be maintained at a slope of 4:1 unless otherwise permitted. Quarries will undergo a two-stage rehabilitation process:

1. Site cleanup, including the removal of waste and contaminated soils, if present, and establishment of rock tiers into the quarries to reduce the steepness of the quarry walls and depth.
2. Additional quarry rehabilitation by the Manitoba Department of Mineral Resources through [Manitoba's Pits and Quarry Rehabilitation Program](#) under *The Mines and Minerals Act* if required after quarry inspection by the Department.

Access routes to quarries not required for on-going maintenance of the road will be blocked with boulders to discourage access and encourage regrowth of vegetation. Where organic materials were stripped to develop temporary access routes, they will be redistributed and seeded using ESRA's native seed mix (**Appendix 3-6**).

Closure of temporary construction work areas will involve levelling and trimming the areas to encourage natural re-vegetation. Organic materials stripped from the areas will be redistributed to encourage natural regeneration of the area. Seeding using ESRA's native seed mix (**Appendix 3-6**) and/or planting will be done as required on disturbed lands such as in areas vulnerable to erosion and sedimentation.

3.4.8 Road Maintenance Activities

Mowing of vegetation on road shoulders will occur during the summer months to improve visibility for driver safety and control noxious weeds while native vegetation becomes established. Generally, mowing will be completed within 4.5 to 9 m of the road surface. Various types of mowing equipment will be used including tractors, riding mowers, and weed-eaters.

The removal of brush and small trees growing in the road right-of-way will be completed by mechanical brushing to improve or maintain driver sight lines, maintain proper drainage, and to reduce the cost of snow removal. The majority of mechanical brushing will take place in areas of abundant tree growth or where conventional mowing equipment cannot access ditch slopes due to rock outcrops or wetland areas.

Grading of the finished road surface will be an on-going maintenance activity to promote a safe and reliable all-season road. As necessary, washout repair will be completed in the event that the road sub-grade, surface, shoulders or culverts are damaged by flooding, erosion, or debris. These repairs will be undertaken as soon as possible and as soon as conditions permit safe site access. Traffic controls may be required to provide safe travelling alternatives until repairs can be completed.

Ditch maintenance will be carried out on an on-going basis to maintain drainage to original design standards and as a means to prevent sub-grade saturation and erosion. This activity will consist of excavating, filling, trimming, and shaping to maintain required roadside ditch profiles including ditch slopes, inverts and the functioning of riprap areas. Ditch maintenance activities will also include the removal of sediment and debris from culverts inlets and outlets, where conveyance may be impeded.

Application of water and/or magnesium chloride for dust control will be undertaken, as required, to minimize the amount of dust generated by road traffic to promote a safe and reliable all-season road. Only chemicals approved for use on similar roads in Canada may be used and applied as specified by the manufacturer, and only if and where necessary (i.e., not beyond the road surface). Chemicals such as magnesium chloride used for dust control will not be applied within 100 m of a stream crossing.

Facilities and work areas including quarry and borrow areas, access routes, staging areas and construction camps that will not be needed for future Project maintenance activities will be demobilized and sites rehabilitated after construction.

Plowing snow from the road surface will be undertaken on an as required basis with motor graders, truck plows or rotary plows.

ESRA's native seed mix will also be used in the disturbed area of the proposed road right-of-way to stabilize disturbed soils and minimize erosion. Where tree and/or shrub planting is required to adequately rehabilitate temporarily disturbed sites in sensitive areas, locally-appropriate native species will be used.

3.4.9 Bridge and Culvert Maintenance Activities

Seasonal inspections of culverts and bridge crossings will be conducted to assess the potential build-up of debris caught on piers or at the inlets of culverts to prevent upstream flooding, reduce stress on the structure, and allow for fish passage. Culverts and bridges will be inspected following heavy to confirm their condition and proper function. Erosion control techniques (e.g., riprap) will be implemented, if necessary. As required, maintenance crew will be dispatched to locations where the accumulation of debris represents a potential risk to the structure or the environment. Bridge and culvert maintenance and erosion control activities will be undertaken in accordance with [Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat](#) (Fisheries and Oceans Canada and Manitoba Natural Resources 1996).

Required road repairs will be undertaken as soon as possible and as soon as conditions permit safe site access.

3.5 Construction Vehicles and Equipment

Construction equipment and vehicles likely to be used during construction of the proposed Project are listed in **Table 3.5**. A variety of rubber-tired and tracked equipment and vehicles will be used during construction of the proposed P4-ASR and other Project components. The types and numbers of equipment and vehicles to be used during the construction of the proposed Project cannot be determined at this time as the type and quantity of equipment will be depend on the number and size of individual construction contracts.

Table 3.5: Expected Construction Equipment and Vehicles Used for Project Components

Project Components	Equipment / Vehicle		
All-Season Road	Tree feller buncher Logging truck Dozers Haul trucks	Excavators Packers Pick-up trucks Fuel truck/trailer	Hand tools Snow-clearing equipment Graders Sprayer
Steel Girder Bridges	Flatbed trucks Crane Drill rig Blast truck Excavator	Loader Grader Dozers Back hoe Dump truck	Fuel truck/trailer Concrete batch plant Concrete truck Pick-up trucks Hand tools
Culvert Stream Crossings/Drainage Equalization Culverts	Excavator Pick-up trucks	Dump truck	Grader
Temporary Construction Bridges	Flatbed truck Excavator Loader Grader	Dozer Backhoe Dump truck	Pick-up truck Hand tools Crane

Project Components	Equipment / Vehicle		
Temporary Access	Tree feller buncher	Dozer	Grader
	Hand tools	Dump truck	Pick-up trucks
Temporary Construction Staging Areas	Semi-trailers	Fuel truck	Grader
	Excavator	Generator	Pick-up trucks
	Haul truck	Dozer	Hand tools
Temporary Construction Camps	Excavator	All-terrain vehicles	Pick-up trucks
	Haul truck	Dozer	Hand tools
	Fuel truck	Grader	Generator
Quarries and Borrow Areas	Drill rig	Dozer	Grader
	Excavator	Loader	Pick-up trucks
	Rock crusher	Haul truck	Generator
	Blast truck (explosives transportation)		

3.6 Project Construction Materials

Construction materials anticipated to be used for the proposed Project are listed in **Table 3.6** by Project component.

Table 3.6: Expected Construction Materials List

Project Components	Construction Materials	Use
All-Season Road	Crushed rock	Road bed
	Granular materials	Road bed
	Clay	Road bed
	Riprap	Erosion protection
	Geotextile	Liner
	Organic materials	Side slope cap
Steel Girder Bridges	Steel	Girders
	Concrete	Abutments/bridge bed
	Granular materials	Abutments
	Organic materials	Shoulder/reclamation
	Riprap	Erosion protection
Culverts	Steel or other culverts	Water passage
	Riprap	Erosion protection
	Crushed rock	Road bed
	Granular materials	Embedding
	Organic materials	Reclamation
Temporary Construction Bridges	Steel	Girders
	Concrete	Abutments
	Pressure treated wood	Bridge bed
	Granular materials	Abutments
	Organic materials	Shoulder/reclamation

Project Components	Construction Materials	Use
Temporary Access	Granular materials Organic soil	Route bed Reclamation
Temporary Construction Staging Areas	Granular materials Organic soil	Site pad Reclamation
Temporary Construction Camps	Granular materials Wood Metal Organic materials	Site pad Construction Construction Reclamation
Quarries and Borrow Areas	Crushed rock Granular materials Organic materials	Reclamation Reclamation Reclamation

Various quantities of raw materials will be required in the construction of the proposed Project. Raw materials will be locally-sourced and obtained on provincial Crown land and Federal Reserve lands, as required (e.g., quarries and borrow pits). **Table 3.7** indicates the type of raw materials and estimated quantities required for construction of the P4 all-season road.

Table 3.7: Projected Quantities of Raw Materials Required for P4 Construction

Raw Material Required	Estimated Quantity	Unit
P4 All-Season Road		
Composite Excavation ^a	516,000	m ³
Solid Rock Excavation ^b	2,600,000	m ³
TG Class ^d	120,000	m ³
Quarried Rock Base Course ^c	200,000	m ³
Quarried Rock Base Course ^d	740,000	m ³
Rock Fill ^c	TBD	m ³
Stone Riprap Class 350	7,800	m ³
Access Routes		
Composite Excavation*	8,500	m ³
Solid Rock Excavation**	125,000	m ³
TG Class ^d	6,000	m ³
Quarried Rock Base Course ^c	9,300	m ³
Quarried Rock Base Course ^d	34,000	m ³
Rock Fill	TBD	m ³
Stone Riprap Class 350	TBD	m ³

Note: a Existing suitable composite material from areas above the road bed elevation, ditches and within the 100 m right-of-way will be used.

b Estimate based on approximately 27,000 m³ of solid rock required per kilometre of road.

c Riprap quantities are described in square metres (m²). Estimate based on approximately 25 m² per culvert for approximately 313 culverts.

d Excludes estimate for the four bridge crossings (to be determined).

3.7 Fuel and Hazardous Materials

Expected fuels and hazardous materials for the proposed Project are summarized in **Table 3.8** by Project component. Fuels and other hazardous materials will be transported, stored, dispensed, and managed as described in **Section 3.9**.

Table 3.8: Expected Fuels and Hazardous Materials List

Project Components	Fuel/Materials	Purpose
All-Season Road; Temporary Access; and Quarries and Borrow Areas	Diesel	Construction equipment/vehicle fuel
	Gasoline	Construction equipment/vehicle fuel
	Propane	Construction equipment/vehicle fuel Heating trailers/structures
	Oil	Construction equipment/vehicle motor lube
	Hydraulic fluid	Construction equipment
Steel Girder Bridges; Culverts; and Temporary Construction Bridges	Diesel	Construction equipment/vehicle fuel
	Gasoline	Construction equipment/vehicle fuel
	Propane	Construction equipment/vehicle fuel Heating trailers/structures Heating under hoarding
	Oil	Construction equipment/vehicle motor lube
	Hydraulic fluid	Construction equipment
	Acetylene	Cutting steel
Temporary Construction Staging Areas and Temporary Construction Camps	Diesel	Construction equipment/vehicle fuel Electrical generator
	Gasoline	Construction equipment/vehicle fuel
	Propane	Construction equipment/vehicle fuel Heating/cooking Heating trailers/structures
	Oil	Construction equipment/vehicle motor lube
	Hydraulic fluid	Construction equipment

3.8 Potable Water Supply

Potable water will be trucked to the construction camps from existing sources including Poplar River and Berens River First Nations, as required. Depending on availability, and with prior approval, groundwater may be obtained from wells drilled on site and treated to comply with Manitoba standards for potable water.

3.9 Waste and Hazardous Materials Handling, Disposal and Treatment

Solid, liquid, and hazardous wastes from the road project will be collected, stored, transported, disposed of, and/or treated in accordance with *The Environment Act (Waste Disposal Grounds Regulation)* and *The Dangerous Goods Handling and Transportation Act (Dangerous Goods Handling and Transportation*

Regulation, Environmental Accident Reporting Regulation, and Storage and Handling of Petroleum Products and Allied Products Regulation). If contaminated soil is discovered during the life of the proposed Project, the affected site will be assessed and soil determined to be contaminated will be removed to an approved treatment site.

Domestic solid waste will be collected and transported to the nearest approved landfill (e.g., Berens River or Poplar River First Nations facilities). Wastewater (sewage and grey water) from work camps and construction sites will be collected in approved holding tanks and disposed of at licensed and approved wastewater treatment facilities. Waste petroleum products (e.g., lubricants, oils, greases) from construction vehicles and equipment will be collected and stored in designated areas and containers until they can be removed from site for recycling or disposal through a licensed waste disposal/treatment company.

Fuel handling and storage areas will be located a minimum of 100 m from a waterbody unless otherwise authorized by regulatory authorities. Fuel storage containers will incorporate secondary containment to minimize the potential contamination area in the event of an unexpected spill or container leak. Materials and equipment for the containment and recovery of accidental hazardous material spills will be available at all construction sites. Rock barricades will be placed around fuel tanks to minimize potential for construction vehicle collision with tanks.

3.10 Project Workforce

Construction will be carried out under contracts tendered and managed by ESRA. Presently, the number and scope of the contracts to support the construction of the P4 all-season road Project are not fully known. It is anticipated that multiple contractors will be engaged concurrently on the Project and as per ESRA's Project Management Agreement. During the period of peak construction on the proposed all-season road, an estimated maximum workforce of 120 is anticipated. As part of ESRA's commitment to local residents participating in and benefiting from the P4 Project, ESRA specifically includes local hiring requirements in construction tenders. The local hiring requirement is 30% for road construction tenders and 20% for bridge construction tenders. Presently, ESRA's P1 all-season road that is being constructed has an estimated First Nation workforce of 80%.

Solid, liquid and hazardous wastes from the Project will be collected, stored, transported, disposed of and/or treated in accordance with government regulations.

During the initial construction phase of the Project, it is expected that non-local contractor employees, contract administration staff and ESRA staff will travel to the Project site by air, winter road, and/or the newly constructed P1 all-season road terminating at Berens River. As each segment of the Project is completed, the completed all-season road segments will provide access for employees to the construction site of the next road segment. It is anticipated that employees from local communities will either commute to the site or reside in temporary construction camps and employees who are not from local communities will use local accommodations (e.g., lodges) or reside in contractor-provided accommodations.

3.11 Project Schedule

Construction of the proposed Project is anticipated to begin in November 2016 and be completed approximately 8 years thereafter (i.e., 2024). The schedule to achieve an in-service date of 2024 is summarized in **Table 3.9**.

Table 3.9: Planned Schedule for the P4 All-Season Road

Project Components	Project Phase / Activity	Start Date	Completion Date
All-Season Road	Planning/Design	2014	November 2016
	Construction	2016	2024
	Operation/Maintenance	2024	On-going
Steel Girder Bridges	Planning/Design	2014	2018
	Construction	2018	To be determined
	Operation/Maintenance	2024	On-going
Culvert Stream Crossings / Drainage Equalization Culverts	Planning/Design	2014	2018
	Construction	2016	2024
	Operation/Maintenance	2024	On-going
Temporary Access Routes	Planning/Design	2014	2018
	Construction	2016	2024
	Decommissioning	2019	On-going through to 2024
Temporary Construction Staging Areas	Planning/Design	2014	2018
	Construction	2016	2024
	Decommissioning	2019	On-going through to 2024
Temporary Construction Camps	Planning/Design	2014	2018
	Construction	2016	On-going through to 2024
	Decommissioning	2019	2024
Quarries and Borrow Areas	Planning/Design	2014	2018
	Construction	2016	On-going through to 2024
	Operation/Maintenance	2018	On-going for those quarries retained for Project maintenance
	Decommissioning of construction phase quarries and borrow areas	2019	On-going through to 2024

3.12 Project Funding

The source of funding for construction and operation of the proposed Project is the Manitoba Government.