The project design criteria for a Collector Class B road are shown in Table 3.1 below.

Table 3.1: Collector Class B Design Criteria

Criteria Description	Collector Class B
Number of Lanes	Two lanes
Design Speed	90 km/h
Gradient (maximum percent)	7%
Minimum Stopping Sight Distance	170 metres
Minimum Passing Sight Distance	620 metres
Minimum Vertical Curve “K” Values*	Sag = 40, Crest = 55
Minimum Curvature (radius)	340 metres
Lane Width	3.7 metres
Shoulder Width	1.0 metres gravel
Shoulder Edge Treatment	0.25 metres
Right-of-Way Width	50 metres

*”K”values are defined as the length of a curve divided by its change in grade %

Road cross-sections, travel lanes, and ditches will be finalized during final design and in consideration of terrain types (rock, organics, till and till/organics).

The rock-fill dam crossing will be a 5.0 metre wide single lane roadway. Appropriate protection will be installed along this crossing to maintain personnel and vehicle safety.

A timber roadway deck will replace the track on the sluiceway and spillway at the Slave Falls Generating Station.

Adjacent to the Slave Falls Generating Station, a gravel pad area will be designed to accommodate the turning radius of a Low Bed Truck Unit, the largest vehicles expected to require access to Slave Falls Generating Station. This gravel pad will also be used as a parking area for staff.

A new communication line will be buried in the road RoW.

3.1.1 Drainage Design

The majority of watersheds that will be crossed by the roadway are very small (less than one square kilometre). Some have no defined stream channels at the proposed road crossings. Such minor surface discharges are best accommodated by a combination of road ditch and small through-grade culverts.

Due to the highly variable terrain at this location along the Winnipeg River, the standard methods that have been developed and supported by Manitoba Water Stewardship, (commonly used in Manitoba to dimension drainage structures in smaller ungauged watersheds) were considered unsuitable for estimation of design runoff rates. The approach taken for the drainage design was the development of a general conceptual model of surface runoff (synthetic unit hydrograph) that realistically represents the runoff response from the kind of small basins that are found on-site. The design for these small crossings will be based on 0.6 cubic metres per second per square kilometre of gross drainage area. For sub-basins with a history of washout floods, culvert sizing will match the existing capacity.

3.2 SITE PREPARATION AND CONSTRUCTION

Construction of the road will involve established methods, adapted to the environment and specific terrain of the route. To identify and evaluate potential environmental and socio-economic effects associated with the construction of the road, it is necessary to understand the process and techniques employed in the construction and operation of the roadway, from establishing the roadway centreline position and RoW clearing through to long-term maintenance.

Prior to clearing a centreline location, surveying using handheld global positioning system (GPS) equipment and light detection and ranging (LIDAR) will be carried out. The centreline will be adjusted as necessary based on ground conditions to utilize the most favourable terrain within the established corridor and to avoid, as much as possible, any environmentally sensitive areas.

Following centreline establishment, a preliminary roadway gradeline will be designed based on the surveyed profile. The limits of the RoW clearing will be flagged by measuring from the established centreline. Clearing width will be a maximum of 50 m, and will be narrower where it is environmentally desirable and technically feasible to do so.

In locations where earth grading will be required, a preliminary cross-section survey will be undertaken to describe and model the original ground terrain.

3.2.1 Right-of-Way Area Estimates

Right-of-way estimates are as follows:

- The length of the existing tramway is 9.6 kilometres. The RoW area for the existing tramway is 288,000 square metres
- The length of existing tramway that will be shared with the new roadway is 3.3 kilometres, requiring an additional 65,300 square metres of RoW
- The length of new roadway through undisturbed territory is 5.7 kilometres, requiring a RoW of 283,750 square metres
- The length of tramway to be decommissioned is 6.3 kilometres, including a RoW of 194,250 square metres
- The length of new roadway along the communication line is 0.7 kilometres, requiring a RoW of 23,100 square metres
- The area of private property required for the project is 42,000 square metres

These estimated areas are shown on Figure 3.1.

3.2.2 Right-of-Way Acquisition

The land required for the roadway RoW is currently Crown land, administered by the Province of Manitoba, with the exception of one section that is held privately. A complete legal survey of the proposed RoW is required to place legal survey markers at the limits of the RoW and to produce a plan of survey to be registered with Manitoba Land Titles Office.

Manitoba Hydro has initiated consultation and negotiation with the private landowner to acquire the required land for this project.

3.2.3 Centreline Clearing

Prior to full RoW clearing, the route location will be defined by a road centreline. The centreline will be established by field surveys and design confirmation. Once the centreline is confirmed, RoW clearing will be undertaken.

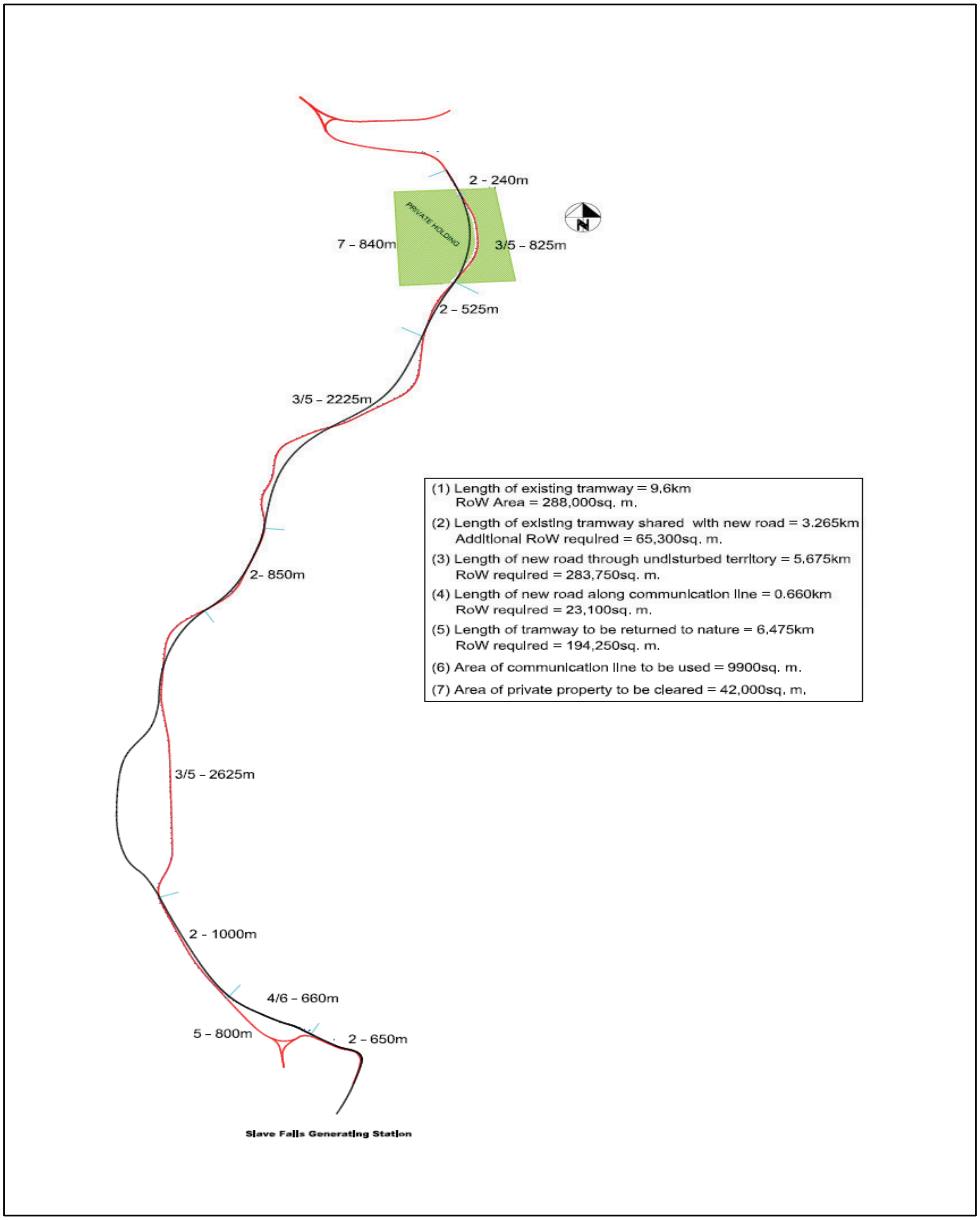


Figure 3.1: Right of Way Area Estimates

3.2.4 Right-of-Way Clearing and Grubbing

RoW clearing and grubbing will begin as soon as the road centreline is established. In general, all trees, roots and vegetation will be cleared from the predetermined limits of the proposed RoW established by the site survey. Only that area required for construction and safe sightlines will be cleared and grubbed.

Clearing and grubbing will take place in advance of the topographic survey and bulk roadway construction. Clearing and grubbing operations have been scheduled for winter months (winter 2008/2009) when freezing temperatures minimize impacts and make access to low lying areas easier.

Grubbing will take place on areas to be filled or excavated. Trees outside of, but overhanging the RoW, will be felled by hand. The actual volume of material to be removed will depend on site conditions at the time of work.

Clearing will be restricted to hand methods adjacent to watercourses, in areas of sensitive environment, and in terrain too rugged to permit the use of mechanical clearing. Vegetation reservations near watercourses will be observed according to established guidelines (i.e. DFO and MC Stream Crossing Guidelines).

3.2.5 Topographic Survey and Geotechnical Investigation

Once clearing and grubbing has been completed, a topographic survey of the proposed alignment will be completed. This will involve either a Total Station or GPS survey to determine the actual ground elevations along the final alignment. This information will be used to produce a digital terrain model of the surveyed ground surface that will be used during the detailed design stage.

A geotechnical investigation, for final design, will involve the excavation of test pits or holes at specific locations along the alignment. This investigation is required to determine the actual surface soil types and properties and the actual soil depths and overburden depths over rock. This information will be used to refine the road design.

3.2.6 Detailed Design and Tender Preparation

Detailed design will utilize the information gathered from the topographic survey and geotechnical investigation to refine the alignment horizontal geometry and vertical profile.

Updated design information will be used to determine construction material quantities and to prepare specifications for the assembly of tender documents. The tender documents will incorporate the environmental protection measures and environmental license conditions established through the environmental assessment and licensing process.

3.2.7 Roadway Embankment Construction

The roadway embankment construction activities include bulk excavation for ditches, rock excavation, embankment construction and installation of new drainage structures. Also included will be the installation of ductwork for the underground communication line between Slave Falls and Pointe du Bois.

Bulk excavation for ditches and roadway embankment construction will follow clearing and grubbing. Prior to placement of fill material alongside the railway embankment, bench cutting will be completed. Bench cutting includes minor excavation of the sideslopes of the existing embankment so that new fill material can be properly placed and compacted against the existing embankment.

Bench cutting, fill placement, and ditch construction will occur on whichever side of the existing rail bed the proposed alignment is situated. This is a common method in construction where a road is widened but traffic must be maintained. Temporary crossings will be constructed at locations where the road alignment crosses the existing rail bed, and at locations where construction access is required.

Excavation and embankment construction will proceed along the new alignment up to and around rock excavation areas. When a rock outcrop is reached, overburden will be stripped and utilized in further embankment construction, if suitable. Once exposed, rock will be drilled and blasted to the required limits. The blasted rock will be used as embankment fill in swamp areas or processed into sub-base material or gravel.

Exact rock quantities cannot be determined until the rock surface has been exposed and surveyed. The functional plans show that all sub-base and base material can be generated from processing blasted rock on-site.

The selected contractor will be required to provide a blasting plan, in accordance with regulations, for approval prior to commencing the work. Blasting methods will be employed that protect the existing rail line from damage. Short term interruption of tramway traffic will occur during blasting.

A crushing/stockpiling area will be required. The site is expected to be located on a cleared area of the alignment in a central location close to the rock excavation areas.

Transportation of construction equipment, materials and personnel to work sites will be along the cleared RoW for the project. One of the first construction tasks to be completed will include the widening of the surveyed centreline cut to allow construction vehicle access to the project area. Further RoW clearing will then be staged from the centreline access. Vehicle traffic at work sites may consist of both rubber-tired and track-mounted vehicles.

Construction equipment and materials will be transported along existing roads to a staging area or storage yard located within the cleared RoW. From the storage yard, materials and equipment will be transported along the cleared RoW to the construction area. Two main storage yards are likely to be located at either end of the road to provide staging opportunities from both ends of the project.

3.2.8 Roadway Subgrade Construction

The road will pass over areas of rough terrain and steep topography. Grading must be done to reduce the steepness of grades if the gradient is more than 7%. Embankments made will be 10 m wide at the top and have sideslopes no steeper than 2:1.

The road will pass over low wet areas and intermittent drainage channels. These will have earthen fills built across them. Fills made that would impede natural cross-drainage will have culverts installed to accommodate the drainage.

3.2.9 Track and Communication Line Removal

Track removal will commence during the spring and summer of the first construction season, and be completed following the road construction.

Also included in track removal will be levelling of the existing railway embankment to allow natural re-vegetation to occur, unless the levelling would disturb rare plants, and the removal and proper disposal of the railway ties.

The existing communication line will be removed and wires/poles recycled or disposed of.

3.2.10 Conversion of Rail to Road at the Slave Falls Generating Station

The general concept at the Slave Falls generating station includes replacement of the rails and deck at the sluiceway and spillway locations with a timber deck road surface.

The replacement will require a structural evaluation of the spillway and sluiceway, the removal of the rails and the installation of a timber deck road surface.

3.2.11 Workforce and Labour Requirements

Manitoba Hydro estimates that a construction crew of about 20 to 30 people will be required to construct the road. It is expected that workers will travel to the site daily (light trucks/cars). There will be no construction camp established. All heavy equipment such as dozers, cats, scrapers, etc. will be transported into the work site once, will stay in the work area during construction, and will then be transported out once construction is complete. Some sand or road base material will be hauled to the work-site, but the number of trips is expected to be small, on the order of 10 to 15 over the entire construction period. Work hours are expected to be weekdays from 7am to 7pm, with some weekend work on occasion.

3.3 OPERATION AND MAINTENANCE

To operate and maintain the road, the following is required:

- Vegetation Control

Control of the growth of vegetation on the RoW is required to maintain operating reliability and safe maintenance practices. Wherever possible, mechanical means will be utilized for vegetation control. Use of herbicides will be kept to a minimum

- Maintenance

Road maintenance will include dust control, regular grading and occasional resurfacing or repairs as required. Snow removal will be conducted in winter months as required

- Contingency Events and Response

Manitoba Hydro provides training to all employees on emergency response procedures in the event of an accident or other emergency

3.4 DECOMMISSIONING

The road will be operated indefinitely and no specific decommissioning plans have been developed.

Several areas will require decommissioning/rehabilitation after construction, as outlined below:

- Access Trails:

Trails used for start-up or construction activities, but not needed for maintenance, will be restored to promote the natural growth of vegetation. Snow construction ramps and ice bridges will be v-notched to promote flow and then left to melt naturally. Any logs used to strengthen snow and ice structures, will be removed before break-up

- Borrow Sites:

During construction, the existing vegetation cover, organic mat and topsoil will be stripped and stockpiled for later site rehabilitation. During decommissioning, the sides of the pit will be sloped to minimize erosion effects and the stockpiled organic material spread over the area

- Work Sites:

Garbage will be removed and the sites cleaned to the satisfaction of the local/district Conservation Officer. Contractors will ensure that any potential contamination is investigated and the site rehabilitated before abandoning any work sites. Final inspections will be conducted by the contractor, Manitoba Hydro and the local/district Conservation Officer to ensure adequate site clean-up

3.5 ACCESS CONTROL

Manitoba Hydro will own the new road and be responsible for its operation and maintenance. As owner of the roadway, Manitoba Hydro intends to restrict road vehicle access to the road by constructing physical barriers at the north and south terminal points of the road.

The physical barriers will have a card lock access control system. The barriers will be remotely controlled from the Slave Falls and Pointe du Bois Generating Stations with video and telephone service at the control points to facilitate authorized visitors to gain access through the barriers.

The barriers will be extended on either side of the road a sufficient distance to prevent road vehicles from navigating around the control system.

3.6 PROJECT SCHEDULE

Construction of the road will require approximately 2.5 years to completion. Table 3.2 provides a generalized schedule for the project. Detailed design, tendering and award will take approximately nine months.

Table 3.2: Project Schedule

Activity	*Projected Completion Date*
Geotechnical and granular testing	June, 2007 - April, 2008
Roadway design	November, 2007 - July, 2008
Establish route centreline	Winter 2008-2009
Right-of-way clearing and grubbing	Winter 2008-2009
Install drainage structures	Winter 2008, or summer 2009 (within approved DFO/MC fisheries window)
Road bed construction	Summer 2009
Removal of tramway	Fall, 2009
Operation	Winter 2009-2010
Final Grading, Clean-up, and Restoration	Fall 2009-Spring/Summer 2010

4.0 EXISTING ENVIRONMENTAL SETTING

4.1 PHYSICAL ENVIRONMENT

4.1.1 Climate

The project study area is in the Pinawa Ecodistrict within the Subhumid Transitional Low Boreal Ecoclimatic Region in southern Manitoba. The climate is characterized by short, warm summers and long, cold winters. The mean annual temperature is 2.3°C, the average growing season is 179 days, and the annual number of growing degree-days is about 1690.

The mean annual precipitation is approximately 565 mm, of which about one-quarter falls as snow. Precipitation varies greatly from year to year, and is highest during late spring and summer. The ecodistrict has a moderately cold, humid, cryoboreal soil climate. Table 4.1

shows selected climate data from the station at Pinawa Whiteshell Nuclear Research Establishment (WNRE).

Table 4.1: Selected Climate Data[1] for Pinawa WNRE

	Year	June-Aug	May-Sept	July	Jan
Temperature °C	2.3	17.6	15.2	18.9	-18.1
Precip. mm (equiv.)	565.2	81.4	73.6	78.3	27.1
Rain/Snow (mm/cm)	445.5/119.8	244.3/0	365.9/2.0	78.3/0	0.3/21.4
Growing degree-days >5°C	1690.6	1157.40	1572.90	429.5	0

[1]Source: Canadian Climate Norms, 1971-2000. Atmospheric Environment Service, Environment Canada

4.1.2 Greenhouse Gas Emissions for the Existing Tramway

Greenhouse gas emissions for the existing tramway operation were estimated using Transport Canada's baseline diesel fuel efficiency rates by vehicle class and GHG Emission Factors.

The existing tramway bus was considered to be a Heavy Duty Commercial Vehicle making 40 round trips per week and travelling 43,680 km/year.

The existing converted SUV's used on the tramway were considered to be Light Duty Commercial Vehicles making 4 round trips per week and travelling 4,368 km/yr.

The annual vehicle kilometres travelled (VKT) was used to calculate the GHG estimates shown in Table 4.2.

Table 4.2: GHG Emission Estimates – Existing Tramway Operation

Vehicle	Annual VKT	Fuel Efficiency (L/100km)	GHG Emission Factor (g/L CO_2e)	GHG Emissions (t/year CO_2e)
Converted Sport Utility Vehicle	4,368	13.5	2793	2
Tramway Bus	43,680	30.6	2757	37
			Total	**39**

4.1.3 Groundwater and Hydrological Description

The principal sources of water in the Pinawa Ecodistrict are the Winnipeg River, the many small streams and medium sized lakes along the eastern margin of the ecodistrict and groundwater from sandy and gravely aquifers associated with the glacial till, inter-till, beach, and fluvioglacial deposits (Smith et al, 1998).

Bedrock aquifer maps of southern Manitoba indicate igneous and metamorphic rocks (Precambrian) adjacent to the project area boundary (western edge). Water in these rocks is found in fractures or fracture zones in the rock. The water bearing fractures often are very scarce and therefore, considerable test drilling may be required to find them. The probability of finding water in these Precambrian rocks varies considerably from area to area. Well yields generally range from 0.01 L/s to 0.5 L/s. Water quality varies considerably from place to place within short distances and ranges from excellent to salty (Rutulis, 1986a).

Sand and gravel aquifer maps of southern Manitoba indicate areas of extensive outcrops and very thin glacial drift areas (Canadian Shield) adjacent to the study area boundary (western edge). Sand and gravel aquifers may occur in or at the base of glacial drift between bedrock outcrops. The sand and gravel aquifer area generally ranges from a fraction of a hectare to several hectares. Well yields range from less than 0.1 L/s to more than 10 L/s (Rutulis, 1986b).

There are no groundwater pollution hazard areas in the project study area. Aquifers are not likely to be polluted by infiltration from the surface. Minor shallow aquifers may exist, but are not reliable or significant sources of water (Rutulis, 1986c).

4.1.4 Surface Water

The major river located in the study area is the Winnipeg River. The Winnipeg River flows from Lake of the Woods in northwest Ontario to Lake Winnipeg in Manitoba. Numerous lakes, rivers and streams are dispersed throughout the Winnipeg River drainage system that covers approximately 150,000 km^2.

Major lakes located along the Winnipeg River in Manitoba include: Eaglenest, Nutimik, Eleanor, Dorothy, Margaret, Natalie and Lac du Bonnet. Tributaries include the Bird River, Lee River, Whiteshell River and the Whitemouth River.

4.1.5 Surface Drainage

Within the study area, most of the natural depressions in the rock surface are partially drained by surface outflow. Low lying areas are often local sinks for runoff, overflowing very slowly or irregularly, and have developed shallow to deep organic soils (see section 5.1.4 for a more detailed soil description of the project area). Overflow routes in the area have not developed into significant streams, but follow the lowest traverse across the bedrock surface. Stream cross sections tend to be highly irregular and mostly non-eroding and may flow in any direction (UNIES, 2006).

4.1.6 Physiography and Landscape

4.1.6.1 Ecological Land Classification

The project study area is in the Pinawa Ecodistrict of the Lake of the Woods Ecoregion, which is encompassed by the broader Boreal Shield Ecozone. The Ecozone is a broad geographical mapping unit indicating comparative differences in macroscale physical biography including substrate structure, climate, soil zones and plant formations (Smith et al, 1998). Ecoregions are subdivisions of Ecozones and according to Poston et al (1990), each Ecoregion can be defined as regional landforms with "ecologically distinct soils, fauna, and micro climatic influences. Each reflects a combination of gradients such as elevation, surface materials, and vegetation. Ecodistricts, are defined as integrated map units characterized by relatively homogenous physical landscape and climatic conditions (Smith et al, 1998). Ecodistricts have a more uniform biological production potential. The following sections provide a description of the project study area environment, in terms of physiography and landscape, within the above Ecodistrict context.

4.1.6.2 Surficial Geology and Physiographic Setting

Within the Pinawa Ecodistrict, a majority of the project study area is classified as having sediments from the Pre-Quaternary period (Matile et al, 2004). Rock, defined as more than 75% bedrock outcrop, can be found in the project area and is characterized as Precambrian terrain that is generally made up of unweathered intrusive, metasedimentary, and metavolcanic rocks having a glacially scoured irregular surface with high local relief. The second dominant Pre-Quaternary period sediments are those classified as non-calcareous diamicton (very poorly sorted sediment) which is derived from the Pre-Cambrian crystalline rock (Matile et al, 2004).

Small intrusions of offshore glaciolacustrine sediments (Quaternary period) also occur in the project area and are characterized by massive and laminated clay, silt and minor sand deposits, approximately 1 to 20 m thick. These sediments have been deposited from suspension in offshore deep water of glacial Lake Agassiz and have been commonly scoured and homogenized by icebergs. Peat-filled depressions and waterbodies in the project area are usually underlain by these clayey glaciolacustrine sediments (Matile et al, 2004).

4.1.6.3 Bedrock Geology

Bedrock geology of the project study area is dominantly Precambrian deposits, specifically the "Older Gneiss Complex" deposits which are comprised of gneissic tonalite. Gneissic tonalite deposits are defined as igneous, plutonic (intrusive) rock of felsic (enriched in silicon, oxygen, aluminum, sodium and potassium) composition with phaneritic texture (size of grains in rock are large enough to be distinguished with the unaided eye). Depth to bedrock in the project study area falls between 0 to 10 metres.

4.1.7 Soils

The Terrestrial Ecozones, Ecoregions, and Ecodistricts of Manitoba describes soils in the Pinawa Ecodistrict as largely well to excessively well drained Dystric Brunisols that have developed on discontinuous, sandy textures, stony veneers of water-worked glacial till (Smith et al 1998). Local areas of Eutric Brunisols occur on sandy bars and beaches, while Gray Luvisols are found on clayey glaciolacustrine sediments along the Winnipeg River and in low-lying areas throughout the ecodistrict. Most of the clayey sediments in depressions are covered by shallow to very deep peat deposits. The soils in these peatlands are dominantly Typic (deep) and Terric (shallow) Mesisols and Fibrisols, and have developed on materials from sedge to sphagnum moss peat.

4.1.7.1 Soil Investigation and Classification

A soil investigation was conducted of the proposed project area on August 15, 2007. The full report is contained in Appendix B.

Seven soil holes were dug using an auger along predetermined locations in the project area (Figure 4.1). At each site GPS coordinates were recorded as well as slope, surface expression, parent material and vegetation observed. Physical properties recorded for each soil pit investigated included: horizon, depth, color, texture (hand-texturing), structure, consistency and mottling. Photographs of each site investigated were taken.

4.1.7.2 Soil Classification

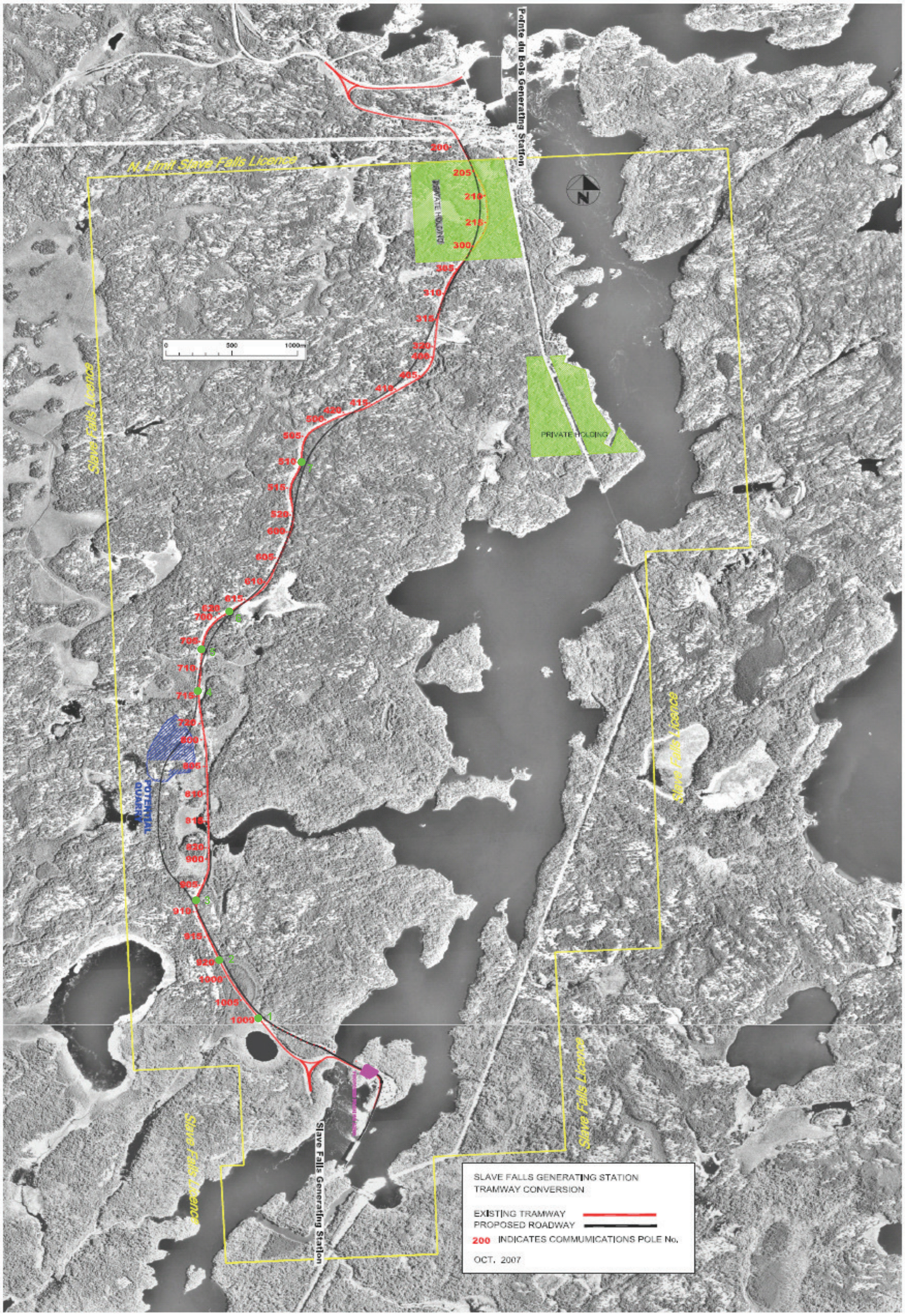
Dark Gray Luvisols were classified at Sites #1 (Aspen stand), #5 (Aspen/Balsim Fir stand) and #6 (Aspen/Spruce stand). These soils had a distinguishable Ahe horizon, ranging from 0 to 10 cm in thickness, followed by a distinguishable Bt horizon (eluvial horizon), followed by a C horizon.

At Site #2, the soil classified was a Typic Mesisol (Organic soil under Black Spruce with Tamarack stand) which was characterized as having an Of horizon, followed by an Om horizon.

A non-soil material was classified at Site #3 (Pine stand on Bedrock) which is defined as the aggregate of surficial materials that do not meet the definition of soil. Non-soils include (but are not limited to) unconsolidated mineral or organic material thinner than 10 cm overlying bedrock.

At Sites #4 (Grass area with Willow) and #7 (Jack pine with White Spruce), Typic Humisols (Organic soil) were classified. These soils are characterized as having an Om or Oh horizon, followed by an Oh horizon. At Site #4, a C horizon was also identified under the Oh horizon.

All soils investigated in the project area were classified using The Canadian System of Soil Classification Third Edition (1998).



● 1 **Soil Investigation Sites**

Figure 4.1: Map of Detailed Soil Investigation Sites

4.2 BIOPHYSICAL ENVIRONMENT

4.2.1 Aquatic Resources and Habitat

Aquatic habitat may be defined as the physical and chemical environment in which fish and other aquatic organisms live. It includes the physical presence and quality of the water, and the total aquatic, semi-aquatic, and riparian environment in which aquatic plants and animals interact. Fish habitat is defined in the Fisheries Act as *"spawning grounds, and nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly in order to carry out their life processes."*

4.2.1.1 Physical Habitat Description

Aquatic habitat along the proposed tramway alignment largely consists of small wetlands, bogs, and areas of low relief. The exception is Moose Creek an ephemeral stream transecting the proposed alignment as it flows eastward to a confluence with the Winnipeg River. Habitat assessments for the project area can be found in Appendix C.

Field investigations conducted by North/South Consultants Inc. identified the location of eleven culverts along the existing tramway line. The culverts located along the tramway provide overland drainage only, and no defined stream crossings (other than that at Moose Creek) were found to exist.

4.2.1.2 Moose Creek Description

Moose Creek is located approximately 3.0 km north of the Slave Falls Generating Station and flows eastward into the Winnipeg River. The physical properties of Moose Creek can best be described in three reaches:

- An intermittent ephemeral creek channel in the upper headwaters of the watershed
- A wetland area immediately upstream of the existing tramway crossing
- The reach downstream of the existing tramway crossing to the Winnipeg River

Ephemeral creek channel in upper watershed

The headwaters of Moose Creek drain in an easterly direction. This low lying area directs surface runoff through a series of open grassed meadows intermittently dispersed with more defined stream channels in areas confined by rock ridges. When a defined creek channel is present, it typically has a width of approximately 1.0 to 2.0 m and depth of <0.5 m. Channel substrates generally consist of inorganic sediments, interspersed with some boulder and cobble. Some undercut banks are present.

Wetland area upstream of existing tramway crossing

Immediately upstream of the existing tramway crossing, the aquatic habitat that comprises Moose Creek can be generally described as a boreal wetland. This wetland is bordered by floating mats of grasses, reeds, sedges, cattails, and (near the upland areas) stands of mixed deciduous and coniferous trees. Heavy mats of aquatic macrophytes (e.g., Potamogeton *sp*., hornwort, spiked water milfoil) cover the majority of the wetted area.

During field investigations in July of 2007, water flow through the gated culvert at the existing tramway crossing was minimal to non-existent.

Tramway crossing downstream to the Winnipeg River

This section of Moose Creek (approximately 1.5 km in length) can be most accurately described as a shallow, elongated bay of the Winnipeg River. At the uppermost end of this reach, near the tramway crossing, Moose Creek is a wide (100.0 m) shallow (0.3 to 1.5 m) bay with shorelines of mixed deciduous trees, grasses and sedges. Substrates are predominantly organic with thick mats of aquatic macrophytes, cattails, sedges, rushes, and wild rice. Moving in a downstream direction, Moose Creek narrows with generally bedrock shorelines and adjacent stands of mixed deciduous and coniferous forest. Water depths in the lower end of the reach typically range from 2.0 to 5.0 m, over a predominantly hard substrate of boulder, cobble, gravel, and some fines.

4.2.1.3 Fish Community and Movements

Stewart and Watkinson (2004) indicate that the Winnipeg River may host a fish community of up to 61 native freshwater species. Many of these species (if present in the Winnipeg River between Pointe du Bois and Slave Falls) may potentially utilize Moose Creek, especially near its confluence with the Winnipeg River. However, fisheries investigations conducted in the vicinity of Moose Creek at the Winnipeg River and near the tramway crossing (within 200 m) during the spring, summer, and fall of 2007 captured only ten of these species. Yellow perch, northern pike, mooneye, walleye, and white sucker were the species most often recorded. Lake whitefish, smallmouth bass, spottail shiner, sauger, and cisco were also captured, but in limited numbers.

Sport fish utilization of Moose Creek is likely restricted to the habitat downstream of the tramway crossing as a gated culvert and small beaver dam likely prevents the upstream migration of fish during most flow conditions. However, the wetland area upstream of the crossing may be utilized by smaller, forage fish species (e.g., cyprinids, sticklebacks). At the road crossing site, Moose Creek does not provide fish habitat for other than forage fish species on a seasonal basis.

Spring fisheries investigations conducted in 2007 (April 27, May 2, 10, and 11, and June 6) revealed that the portion of Moose Creek downstream of the tramway crossing was being used as a staging/spawning area for at least four species of fish: northern pike; walleye; white sucker; and yellow perch. All spring spawners, these species were captured in various stages of maturity (i.e., preparing to spawn, ripe, and spent).

Two fall spawning species (eight lake whitefish and one cisco) were captured downstream of the tramway crossing on October 23 and November 9, 2007. Sex and state of maturity were determined on three females and two males (all were immature). Although these two species could spawn within Moose Creek, it is considered unlikely that they do as both species prefer hard or stony bottoms for spawning, rather than the soft substrate found near the crossing.

4.2.1.4 Threatened and Endangered Species

Lake sturgeon is designated by the Committee on the Status of Endangered Wildlife Species in Canada (COSEWIC) as *"endangered"* in the Winnipeg River. Lake sturgeon have specific life history requirements, are long-lived, and are susceptible to habitat alterations. Historically, lake sturgeon populations are known to have existed throughout the Winnipeg River, including areas both upstream and downstream of Pointe du Bois. Lake sturgeon have been captured near the mouth of Moose Creek at its confluence with the Winnipeg River. However, no lake sturgeon (at any life stage) have been captured along Moose Creek proper (i.e. at or near the existing tramway crossing or the road crossing site).

The carmine shiner is listed under the Canada Species at Risk Act as *"threatened"*. This species has been recorded as occurring in the Whitemouth-Birch river systems, the Lee River, and the Bird River, all of which are tributaries to the Winnipeg River downstream of Slave Falls. The carmine shiner prefers clear, fast-flowing larger streams and small rivers with clean gravel bottoms and is often found in clear pools in the lower portions of streams near where they join with larger streams or rivers. The carmine shiner has not been found during any fisheries investigations conducted in and near the Moose Creek area.

The northern brook and chestnut lamprey are listed under the Canada Species at Risk Act as *"special concern".* In Manitoba, the northern brook lamprey has been collected from the Whitemouth River watershed (i.e., Whitemouth, Birch, and Bog Rivers and Hazel Creek) and the Winnipeg River (at the mouth of the Whitemouth River) (Stewart and Watkinson, 2004). No chestnut lamprey were found during fisheries investigations conducted in and near the Moose Creek area.

4.2.2 Terrestrial Resources

4.2.2.1 Habitats and Ecosystems

Habitat is the place where a plant or animal lives and is described by the attributes that collectively determine why the organism uses the place. Different attributes are important to different species. In general, attributes that are important for terrestrial plants and animals include soils, permafrost, surface materials, topography, surface water, ground water, vegetation type, vegetation age and disturbance or instability regime (e.g., large fires, water fluctuations). Essentially, terrestrial habitat includes all ecosystem components except for animals and the atmosphere.

Terrestrial habitat can provide numerous benefits such as: food and shelter for terrestrial animals; cultural, social, spiritual and economic benefits to people; and, ecological services such as clean air and water for all people and animals. Some components of terrestrial habitat are of special interest because they are highly valued by people (e.g., berries as a food source or trees as a timber source), are highly sensitive to disturbance, play a key role in ecosystem function, or they are rare and are in danger of disappearing in some areas. Some rare plants are protected by legislation (e.g., Manitoba Endangered Species Act; Canada Species At Risk Act).

Habitat is the foundation for understanding and predicting the potential effects of a project on the terrestrial environment. Plants and animals use habitat for their life history needs. Indicators for some components of ecosystem function are derived from terrestrial habitat maps and descriptions.

The habitat study area is a 5 km band centered on the existing tramway and proposed road and borrow areas. The existing tramway, proposed road, proposed borrow and immediately adjacent areas (i.e., a 100 m buffer) are referred to as the tramway and proposed road area in this section. The habitat study area is entirely within the Pinawa Ecodistrict (376) which is referred to in this section as the surrounding region. (Figure 4.2)

4.2.2.2 Mapping

Habitat

Habitat maps for the project study area and surrounding region were derived from forest land inventory (FLI) data obtained from Manitoba Conservation. FLI polygon boundaries and attributes such as species composition were photo-interpreted by Forestry Branch staff from 1:15,840 stereo photography acquired in 1996 and 1997.

A number of vegetation variables were derived from the FLI attributes. Most of these derived variables were more general classifications of species composition. The generalized classifications were based on results from other studies conducted in the surrounding region (c.f., Ehnes 1998, 2001; Manitoba Conservation, 2002).

Two types of changes were made to the polygons intersected by the tramway and proposed road area based on field data. Updates were made to species composition, height and age. Polygons were classified to wetland type and split where necessary.

Surface Materials and Soils

The FLI includes a landform variable but this is only typed for polygons that are suitable for commercial forestry. These data supplemented those provided in reconnaissance soil surveys completed by Canada/ Manitoba Soil Survey (referred to as the “ELC” in this document). These soils surveys were conducted over a number of years at different map scales with different database structures. Surface material texture was the attribute most easily derived on a consistent basis for the entire surrounding region from the available GIS datasets.

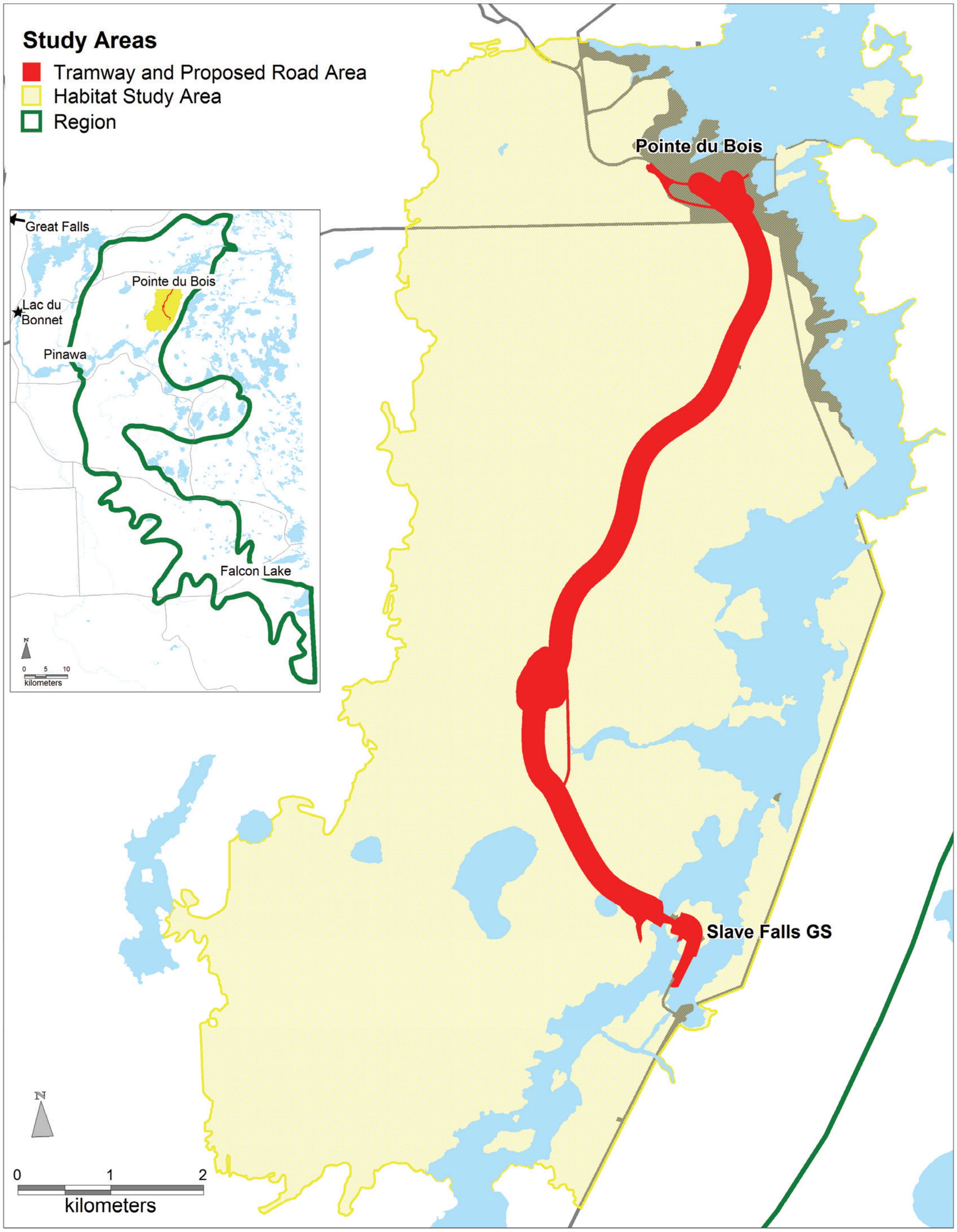


Figure 4.2: Habitat Study Area, Tramway and Proposed Road Area and Surrounding Region

4.2.2.3 Habitat Characterization and Rare Plant Survey

Habitat was sampled in 18 plots and along 6 wetland transects in the tramway and proposed road area (Figure 4.3). These plots and transects were located in a range of habitat types with particular focus on the uncommon habitat types. Vegetation, soils, woody material, groundwater, permafrost, disturbance and other relevant environmental data were collected at these sample locations.

To quantify habitat diversity, the number of non-water and non-human FLI vegetation types were tallied in a 5 by 5 km grid overlain on the FLI for the surrounding region. An analogous approach was applied to the southern third of Ecoregion 90 to provide some context for the surrounding region.

The number of plant species found during field studies is affected by a number of factors. Areas that contain a high number of species can yield a low species count if, for example, only a small proportion of the area is surveyed, only one survey is conducted during the growing season, or surveys are conducted very early or very late in the growing season.

Rare plant searches were conducted in the habitat plots/ transects, along five transects, along the tramway, and in 22 search areas. Searches in habitat plots, habitat, and transects were conducted in mid-August 2007. Tramway and area searches were conducted in June, July, and August 2007.

4.2.2.4 Habitat Characterization

Water covers 8% of the surrounding region, 21% of the habitat study area and 1% of the tramway and proposed road area (Table 4.3). Relative to the surrounding region, water coverage is much higher for the habitat study area due to the inclusion of the Winnipeg River and much lower in the tramway and proposed road area due to the presence of the existing tramway.