

MANITOBA HYDRO

BIPOLE III TRANSMISSION PROJECT

FORESTRY TECHNICAL REPORT

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Executive Summary

The Forestry Technical Report, Environmental Assessment has been developed to assess the environmental effects of the Manitoba Hydro Bipole III Transmission Project on the commercial aspect of the forestry resources and private land forest and tree values.

Forestry Valued Environmental Components (VEC) were defined as productive forestlands, high value forest sites, forestry research and monitoring sites, and private land managed woodlots and afforestation sites. The productive forestland VEC represents the environmental indicators Annual Allowable Cut (AAC), Forest Management License (FML) areas and volume of standing timber.

Forest resource inventory data was compiled for the Project Study Area and updated to reflect current conditions and include forest fire history, timber harvesting and forest renewal activities on crown lands. Deforestation/afforestation activities on private lands, within the Project area footprint, were updated using supplemental imagery. Geo-referenced data sets were obtained for the Bipole III Transmission Project from Manitoba Conservation, the forest industries, Manitoba Agriculture, Food and Rural Initiatives, Manitoba Forestry Association and through the Aboriginal Traditional Knowledge (ATK) data collection process. These data sets represented reforestation and afforestation initiatives, ATK forest value areas, forestry research and monitoring sites, managed woodlots and shelterbelts on private land.

The effects of the Bipole III Transmission Project were quantified for each of the forestry valued environmental components affected. Manitoba Conservations' Forest Damage Appraisal and Valuation guide was used to estimate compensation for productive forestland loss, dues on standing timber affected and effects on forest management investments. Environmentally sensitive sites that may be at risk of being damaged during the construction, operation and maintenance phases of the project have been identified and mitigation measures prescribed. In addition, it is recommended that they be included in the Environmental Protection Plan that will be developed for the construction, operations and maintenance, and decommissioning phases of the Project.

All Project specific environmental effects on forestry values were identified, mitigation measures prescribed, and residual effects quantified, where possible. Residual environmental effects were assessed according to Canadian Environmental Assessment Act (CEAA) protocols.

The effects of the Bipole III Transmission Project development on commercial forest resources, from a forest management perspective, are primarily limited to the conversion of productive forestland to non-productive land. Although the effects are semi-permanent (life of the project)

in nature, the amount of productive forestland lost in proportion to total forestlands under management is small.

Similarly, the effects on sustainable Annual Allowable Cut levels are minimal and land withdrawals from Forest Management License areas are limited in extent. Although there will be a slight reduction in standing timber volume within the affected Forest Management Units, merchantable timber will be salvaged and utilized, where practical. This salvaged volume will also form part of the allowable timber harvest for the respective FML and/or Timber Sale holders. Additional mitigation measures to be applied include compensation to Manitoba Conservation for lost forest resources as per the Forest Damage Appraisal and Valuation policy, and Manitoba's adherence to land withdrawal clauses in FML Agreements # 2 and # 3. Project effects should not have any perceivable negative effects on current annual harvest levels within any FMU.

Positive effects can be achieved by making non-merchantable timber available to local and First Nation communities in proximity to the Project during clearing activities. This may satisfy the annual local domestic demand for fuelwood particularly in areas identified during the Aboriginal Traditional Knowledge gathering process.

Some high value forest sites (forest renewal) will be impacted by the Project but the effect will be limited in spatial extent. There will be no effect on research and monitoring sites as all identified sites have been avoided in siting the Project footprint through the Site Selection and Environmental Assessment process. For additional protection, high value forest sites, research and monitoring sites and private land forest values have been identified as environmentally sensitive sites. Those located within 500 meters of the Project footprint have been identified and are recommended to be included in the environmental protection plans to ensure their protection during the construction, maintenance and decommissioning phases of the Project.

The effect on private land managed woodlots and afforestation projects are limited and mitigable through one-on-one discussions and negotiations with affected landowners. Mitigation measures may include off-site forest replacement/enhancement initiatives and/or compensation that are reflective of the landowners' specific woodlot management objectives and investments.

A cumulative effects assessment was conducted where the boundaries of the Forest Management Units (FMUs) affected by the Project form the spatial assessment area. Temporal boundaries generally include the period 1990 to 2030 consistent with forest management plan windows and data reliability and availability. The cumulative effects assessment considers the residual effects of the Bipole III Project and all other actions/activities within the same spatial and temporal boundaries that affect the same VECs. The cumulative environmental effects were quantified, where possible, relative to Forest Sections/Forest Management Units and Forest Management License areas.

Cumulative effects of all deforestation activities, including the Bipole III Transmission Project, were minor and more than offset by natural and artificial afforestation actions. The most pronounced cumulative effect to productive forestlands stems from past and future reclassification of lands through Manitoba's protected areas program and Treaty Land Entitlement settlements with Manitoba's First Nations. These lands will be removed from the commercial land base within the Commercial Forest Zone, Forest Sections and Forest Management License areas. The forestland reclassifications will substantially exceed the limits specified in the FML Agreements and invoke compensation clauses specified within those agreements.

As Manitoba government initiatives are responsible for the bulk of the cumulative effects to productive forestlands, it is also up to the provincial government to address these effects. Potential mitigation measures have been identified; however, excluding those applicable to the Bipole III Transmission Project, most are beyond the authority of Manitoba Hydro.

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List of Acronyms

AAC	Annual Allowable Cut
ac	Alternating current
AESB	Agri-Environment Services Branch
ASI	Areas of Special Interest
ATK	Aboriginal Traditional Knowledge
CEAA	Canadian Environmental Assessment Agency
CFS	Canadian Forest Service
dc	Direct current
DED	Dutch elm disease
DUC	Ducks Unlimited Canada
EA	Environmental Assessment
EIS	Environmental Impact Statement
EnvPP	Environmental Protection Plan
EODS	Earth Observation Satellite Data
EPA	Environmental Protection Agency
ESS	Environmentally Sensitive Sites
FDA&V	Forest Damage Appraisal and Valuation
FLI	Forestlands Inventory
FML	Forest Management License
FMLA	Forest Management License Agreement

FMU Forest Management Unit

FP Fire Protection

FRC Forest Renewal Charge FRI Forest Resource Inventory

FRIEB Forest Resource Inventory Enhanced for Bipole

FS Forest Section

GEPP Generic Environmental Protection Plan

GHG Green House Gas

GIS Geographic Information System

GLACIER Global Aerospace Centre for Icing and Environmental Research

GS Generating station

Ha Hectares

HVdc High voltage direct current

IPCC Inter-governmental Panel on Climate Change

IR Indian Reserve

kV kilovolt

LSA Local study area

LCC Land Cover Classification

LCCEB Land Cover Classification - Enhanced for Bipole

LP Louisiana Pacific Canada Ltd.
LTM Landsat Thematic Mapper

m³ Cubic meters

MAFRI Manitoba Agriculture Foods and Rural Initiatives

MAI Mean annual increment

MFA Manitoba Forestry Association

MHHC Manitoba Habitat Heritage Corporation

MWF Manitoba Wildlife Federation
NCC Nature Concervency of Canada
NTS National Topographic System
O&M Operations and Maintenance

PAI Protected Areas Initiative

PFRA Prairie Farm Rehabilitation Association

PPR Preliminary Preferred Route

PSA Project study area

PSP Permanent sample plots

PTH	Provincial Trunk Highway
RMA	Resource Management Area
ROW	Right-of-Way
SSEA	Site Selection and Evaluation Assessment
SSVT	Stand Stock Volume Table
SWS	Sustainable Wood Supply
TLE	Treaty Land Entitlement
TSA	Timber Sale Agreement
USDA	United States Department of Agriculture
VEC	Valued Environmental Components
WMA	Wildlife Management Area
WSA	Wood Supply Analysis

Glossary of Terms

Glossary terms appear in bold print in the report at their first occurrence.

afforestation – The establishment of a forest or stand of trees by sowing, planting or natural regeneration on an area not previously forested, or in areas where forests were cleared long ago and other land-use patterns have dominated the landscape for many generations (Dunster et al, 1996).

berm – A raised bank of soil or rock constructed in the path of flowing water to divert its direction (Dunster et al, 1996) or a raised bank of soil or rock constructed for access control on a trail or road bed.

biomass – Weight of organic matter.

bog – A wetland ecosystem made up of in-situ accumulations of peat, either moderately or slightly decomposed, derived primarily from sphagnum moss. Bog water is acidic, usually at or very near the surface and unaffected by the nutrient-rich groundwater found in the adjacent mineral soil. (Dunster et al, 1996).

borrow area – A small quarry or excavation beyond the limits of road or dam construction, which provide material for use in the construction project (Dunster et al, 1996).

calcarious soils – Soils high in calcium or magnesium carbonate, derived from limestones. Often leached out in acidic soils, the absence of calcium or magnesium leads to chlorosis and stunting of plant growth (Dunster et al, 1996).

cambium – A layer of actively dividing cells situated between the xylem and phloem. As the cells develop, they add a new layer of woody material on the inner side of the root or stem and a new layer of bark on the outer side (Dunster et al, 1996).

carbon sequestration - To remove atmospheric carbon and store in the elemental form, as in wood or wood products.

climax - The culminating, self-replacing seral stage in plant succession that is relatively stable and persists for long periods relative to other seral stages. The climax succession theory remains a subject of debate (Dunster et al, 1996).

Commercial Forest Zone - The geographic area, defined by Manitoba Conservation, Forestry Branch, that is capable of producing trees large enough for commercial harvesting. The Commercial Forest Zone includes most of the Prairie, Boreal Plains and Boreal Shield ecozones. It is also referred to as the Productive Forest Zone.

covertype - Four broad cover types are recognized – Softwood 'S', Softwood-Hardwood 'M', Hardwood-Softwood 'N', Hardwood 'H'. The first number of the sup-type code indicates the type aggregate (0 to 3 - Softwood; 4 to 7 – Softwood/Hardwood Mixed; 8 - Hardwood/Softwood Mixed; 9 – Hardwood) (Manitoba Conservation, 2007C).

crown closure - Crown closure will be estimated from the photographs by the photo-interpreter. Four classes will be recognized and entered onto the stand description sheet for each township as part of the photo-interpreter type aggregate. Changes of this estimate can be made only under exceptional circumstances (0 - 0 % - 20 % crown closure; 2 - 21 % - 50 % crown closure; 3 - 51 % - 70 % crown closure; 4 - 71 % and over) (Manitoba Conservation, 2007B).

Crown "open" – Forest Resource Inventory crown land classified as available for commercial forest utilization.

Crown "restricted" - Forest Resource Inventory crown land classified as available for commercial forest utilization but with specific restrictions, applied by Manitoba Conservation during the Work Permit process.

cutting class - Cutting class is base on size, vigour, state of development and maturity of a stand for harvesting purposes (Manitoba Conservation, 2007B).

deforestation – the long-term removal of trees from a forested site to permit other site uses. Cutting of trees followed by reforestation is not deforestation (Dunster et al, 1996).

environmental assessment – The actual technical assessment work that leads to the production of an environmental impact statement. The technical methodologies used must be scientifically sound, and explainable and defendable in a court of law. The scope of the assessment is typically

outlined at the start of the project so that the project has some well-defined boundaries (Dunster et al, 1996).

ericaceous shrubs – Plants in or related to the heather family (Ericaceae), typically found on acid soils. (Dunster et al, 1996).

feller buncher - is a self propelled machine designed for mechanical harvesting that fells standing trees and arranges them in bunches on the ground (Dunster et al, 1996).

fen – A landscape of low-lying peat land, made up partly of well decomposed sedge (occationally moss) materials, where the water is at or near the surface and fed by relatively fast-moving, nutrient-rich groundwater that is usually neutral or alkaline and rich in calcium (Dunster et al, 1996).

forest succession – A series of dynamic changes in ecosystem structure, function, and species composition over time as a result of which one group of tree species succeeds another through stages leading to a potential natural community or climax stage (Dunster et al, 1996).

Geographic Information System – The use of a computer system to overlay large volumes of spatial data of different kinds. The data are referred to a set of geographical coordinates and encoded in computer (digital) format so they can be sorted, selectively retrieved, statically and spatially analyzed (Dunster et al, 1996).

glaciolacustrine – Glaciolacustrine materials are sediments deposited in or along the margins of glacial lakes; primarily fine sand, silt and clay settled from suspension or from subaqueous gravity flows (turbidity currents), and including coarser sediments (e.g., ice-rafted boulders) released by the melting of flowing ice; also includes littoral sediments (e.g., beach gravels), accumulated as a result of wave action (Dunster et al, 1996).

grubbing – To grub out, or otherwise remove a stump or root systemby exposing and cutting the roots (Dunster et al, 1996).

Ingress – The establishment of natural regeneration in an opening (Dunster et al, 1996).

marsh – An area of low-lying land, poorly drained, periodically or permanently inundated with standing or slow moving, nutrient-rich water, and subject to seasonal fluctuations. Marshes usually have a mineral soil base, as opposed to bogs and fens, which have a peat base (Dunster et al, 1996).

merchantability – A tree or stand of trees is considered to be merchantable once it has reached a size, quality, volume or a combination of these that permits harvesting and processing. Merchantability is independent of economic factors, such as road accessibility or logging feasibility (Dunster et al, 1996).

mesic – Describes an environment that has moderate moisture levels, neither too wet or too dry. (Dunster et al, 1996).

non-productive forestlands - Includes all forest land not capable of producing merchantable timber due to very low productivity (Manitoba Conservation, 2007C).

Non-Commercial Forest Zone - The geographic area, defined by Manitoba Conservation, Forestry Branch, that is predominately not capable of producing trees large enough for commercial harvesting. The Non-Commercial Forest Zone lies north of the Provincially designated by forest management administrative boundary areas (Forest Sections and Forest Management Units).

productive forestland - Includes all forest land capable of producing merchantable wood regardless of its existing stage of productivity (Manitoba Conservation, 2007C).

seed orchard – A plantation of trees either proven by analysis to be genetically superior, or a plantation of plus trees that are being tested for superior genetic traits. The seed orchard is isolated to reduce cross-pollination from potentially inferior, outside sources, and is intensively managed to improve the geno-type and produce frequent, abundant, and easily harvestable seed crops (Dunster et al, 1996).

shade intolerant species – Plant species that require open, sunny conditions for optimal growth, and will grow poorly, if at all, in shady conditions, although they may colonize gaps (Dunster et al, 1996).

shade tolerant species – Plant species that have evolved to grow well in shade. Typically, these species grow in the understory, thus shade tolerant species often dominate a climax forest type (Dunster et al, 1996).

species composition – The component tree species in a stand, assessed in descending order of occurrence (major through to minor), expressed as a percentage of either the total number, basal area, or volume of all tree species in a stand (Dunster et al, 1996).

stand density – A quantitative measure of the number and size of trees on a forest site. Can be expressed as number of trees per hectare, basal area (m²/hectare), stand density index, or weight. Unless specified, stand density would include all trees regardless of age (Dunster et al, 1996).

Stand Stock Volume Tables – Compiled from provincial volume sampling data, the table is comprised of forest stand volume estimates by type aggregate, diameter at breast height (DBH) class and species for specific areas throughout the Province. Volumes are provided at various utilization levels for cutting classes 3, 4 and 5 stands.

strata – A subdivision of the forest area or population to be inventoried. Sample populations are usually stratified (divided into strata) to obtain separate estimates (volume yield curves) for each stratum (Dunster et al, 1996).

subtype - This term indicates the species composition in broad groups within the cover type. Subtype is determined by the proportion of basal area of two or three main species in the stand as found on sample plots to the total basal area of all species. To determine the subtype, the basal area of individual species must be computed and rounded off to the nearest ten percent.

The percentage range marked after the species symbol indicates the proportion of the basal area of this particular species in comparison to the total basal area of all species in the type. The second number of the type aggregate code identifies the subtype. Subtype will include non-productive forested land and non-forested land codes. Subtype will also include the Non-Productive Forested Land and Non Forested Land codes (Manitoba Conservation, 2007C).

Timber Dues - Crown Timber harvested in Manitoba is measured in cubic metres (m³). For each cubic metre of timber harvested, specific dues and charges must be paid. Commercial users must pay three specific charges as per The Forest Act, which include Crown Timber Dues, Forest Renewal Charge and Forest Protection Charge (Manitoba, Government of (K) website, 2011).

Timber Permit - Means any forest management licence, timber sale agreement or timber permit granted under this Act or the regulations, authorizing the cutting and removal of Crown timber (Manitoba, Government of (O), The Forest Act, 2011)

Timber Sale Agreements - Means any forest management licence, timber sale agreement or timber permit granted under this Act or the regulations, authorizing the cutting and removal of Crown timber (Manitoba, Government of (O), The Forest Act, 2011)

type aggregate - This tem is used in reference to all productive stands or potentially productive areas in a Forest Management Unit or Forest Section which have common characteristics as to cover type, subtype, site, cutting class and crown closure (Manitoba Conservation, 2007C).

wind throw – A tree uprooted by the wind. It is synonymous with blowdown (Dunster et al, 1996).

working group - This term indicates the grouping of subtypes, where the dominant or leading species in the species composition forms the working group (i.e., the jack pine working group contains all the subtypes where jack pine is the leading species in the subtype species composition) (Manitoba Conservation, 2007C).

yield curves – In its simplest form, a plot of expected fibre yield in terms of volume per unit area, against the stand age (Dunster et al, 1996).

1.0 Introduction

1.1 Background

This Forestry Technical Report, **Environmental Assessment** (EA) has been developed for the Manitoba Hydro Bipole III Transmission Project (the Project). The Project proposes to develop a new 500 kiloVolt (kV) high voltage direct current (HVdc) transmission line from the lower Nelson River to Winnipeg, around the west side of Manitoba. The siting of the Project (particularly the Bipole III transmission line) is the result of Manitoba Hydro's Site Selection and Environmental Assessment (SSEA) process, which is designed to minimize project effects through avoidance, where possible, during the routing process. It achieves this by:

- ➤ Defining a broad Project Study Area (PSA) (Map 1);
- > Identifying routing constraints and opportunities within the PSA;
- ➤ Identifying alternative routing options;
- Analyzing and evaluating the alternative routes based on 28 criteria including public, stakeholder and government consultation (Manitoba Hydro, 2010C) to determine a preferred route, and
- ➤ Conducting an environmental assessment on the preferred route to determine Project effects and their significance.

The result is the identified route for the Bipole III transmission line and Project component footprint that represents the lowest potential environmental and socio-economic effects within the PSA.

This forestry EA assesses the potential effects of the Project specific to the actual project footprint location. This report considers the Valued Environmental Components (VECs) identified early on in the study process (Plus4 Consulting et al, 2009A), the Alternative Routes Evaluation Report (Plus4 Consulting, 2009B) and the Forestry Existing Environment Report (Plus4 Consulting et al, 2010) that have been developed for the Bipole III Transmission Project.

1.2 Scope

The proposed Bipole III Transmission Line originates at a new northern converter station (Keewatinoow) proposed to be located on the lower Nelson River. The Project terminates at a proposed new converter station at the Riel site, located east of Winnipeg. The transmission line connects the two new converter stations and traverses over 1,380 km of provincial crown and private land across the northern, western and southern portions of Manitoba. Additional Project specific detail is provided in Section 4.0.

This Forestry technical report describes the environmental assessment conducted on the commercial aspect of the forestry resources, domestic timber use and private land forest/tree values relative to the Project. The assessment of the ecological aspects of the forest resource is addressed in the *Terrestrial Ecosystems and Vegetation Assessment of the Bipole III Transmission Project* report (Szwaluk Environmental Consulting Ltd. et al, 2011).

The Bipole III Transmission Project encompasses the following components:

- ➤ The northern converter station (Keewatinoow), the associated ground electrode and electrode line connecting the two;
- ➤ The construction power station and workers camp;
- ➤ The construction power transmission line from Limestone generating station to the construction power station;
- ➤ Five 230 kV collector lines connecting Long Spruce generating station and Henday Converter station to the Keewatinoow converter station;
- ➤ The southern converter station (Riel), the associated ground electrode and electrode line connecting the two;
- ➤ The Bipole III 500 kV HVdc transmission line connecting Keewatinoow and Riel converter stations;
- Access routes/trails required for project construction and maintenance; and
- **Borrow areas** and storage/marshalling yards required for project construction purposes.

Some uncertainties remain related to the northern and southern ground electrode sites. Therefore, secondary sites are identified in both locations; however, only one site is required for each converter station. Although the southern converter station site is identified as a project component, it was previously assessed under the Riel Sectionalization Project. This site is currently under development by authority of Manitoba Hydro's Environment Act License No. 2873.

As part of the Project affects assessment discussons various study areas are considered. These are the:

- ➤ <u>Project Study Area (PSA)</u> the very broad regional area within which the Bipole III Transmission Project (all components) was to be located (Map 1);
- ➤ Local Study Area (LSA) the 4.8 km (3 mile) wide assessment area centered on the Bipole III transmission line, all northern collector lines, the construction power line and the northern ground electrode line; it includes 2.4 km (1.5 mile) radius assessment areas centered on all ground electrode sites, converter station sites, construction camp, and construction power station (Map 2); the LSA therefore encompasses all of the Project components;

- <u>Right-of-way (ROW)</u> describes the Project footprint for all transmission and ground electrode lines;
- Footprint describes the areas directly affected by all project components, including all transmission and electrode ROWs, converter station sites, ground electrode sites, construction power station, construction camp, borrow areas, storage/marshalling yards and access routes/trails, etc. required for Project construction purposes.

The Forestry EA determines the effects of the proposed Bipole III Transmission Project on the following components of the forest environment:

- Productive forestland;
- Forested private land;
- > Commercial and domestic forest utilization;
- > Forest research and monitoring activities;
- Forest management activities on crown and private land; and
- Forestry related values and investments on municipal and private lands.

A detailed project description for the Bipole III Transmission Project has been prepared entitled *Bipole III Transmission Project: A Major Reliability Improvement Initiative - Project Description* (Manitoba Hydro, 2011B). A summary description of project components that affect the forestry assessment is provided in Section 4.

1.3 Purpose

The purpose of the Forestry Technical Report, Environmental Assessment is to describe all forestry related land use activities and quantify forest resource use levels. It determines the environmental effects of the Bipole III Transmission Project on the forested environment (see Section 1.2) and specifically quantifies the effects on productive forestlands. It quantifies secondary effects to annual allowable cuts (AAC), the affected Forest Managemment License forested land base and standing timber volume. It also assesses Project effects on forest/tree values on private and municipal lands.

The results of the forestry assessment are summarized and included in the *Manitoba Hydro Bipole III Transmission Project: A Major Reliability Improvement Initiative, Environmental Impact Statement* (2011B) which Manitoba Hydro will submit to provincial and federal (if required) regulators for review and licensing.

1.4 Report Outline

Section 1 of this report describes the physical components that make up the Bipole III Transmission Project and defines the geographic extent of its footprint. It discusses the purpose for conducting the environmental effect assessment of the forestry environment and references technical reports previously developed in preparation for this EA.

Section 2 provides a general description of the forest resources for the PSA that encompasses the Bipole III Transmission Project area. The forest resources are described in terms of Manitoba's ecozones and ecoregions (Smith et al, 1998), and the Manitoba Conservation, Forestry Branch classification of the **Commercial Forest Zone**. The forest resource inventory systems for the Commercial Forest Zone are discussed along with the federal governments' land cover classification (Earth Observation Satellite Data), which has been enhanced by Manitoba Hydro with various complimentary data layers to describe and assess the Non-Commercial Forest Zone. The private land forest values are also discussed.

Section 3 encompasses the methodology of the forestry assessment. It describes the Manitoba Hydro Site Selection and Environmental Assessment (SSEA) process used in siting the various project components on the landscape and identifies the Valued Environmental Components (VECs) defined for the forestry assessment. It discusses the data upgrades, analysis and evaluations used to conduct the assessments. It also defines the environmental effects identification process and the effects assessment approach (Canada, Government of (B) website, 2011 and Appendix D) used in the assessment.

Section 4 describes the project components, their geographic locations and the construction, operations and maintenance activities, as defined by Manitoba Hydro (2011), that may potentially affect the forestry environment.

Section 5 describes the forestry existing environment including data available, data deficiencies and gaps, and actions taken to address those deficiencies. It describes in detail the forestry environmental components, including valued ecosystem components, assessed in Section 6.

Section 6 contains the environmental effects assessment for each component defined in Section 5 as defined in the CEAA framework (Section 3.4.1). Mitigation measures are proposed and follow up monitoring requirements identified to determine if mitigation measures were applied and effective. Residual effects following mitigation are defined and environmentally sensitive sites for inclusion in the Environmental Protection Plan (EnvPP) are specified. A cumulative effects assessment is conducted and discussed.

Section 7 summarizes the conclusions drawn from the forestry assessment, discusses mitigation measures and resultant residual effects as they relate to the VECs. It also summarizes the results of the cumulative effects assessment.

Section 8 contains all references cited, personal communications and websites sourced for relevant information.

2.0 Forest Resources in the Project Area

2.1 General Regional Area Description

The proposed Bipole III Transmission Project overlays a broad variety of terrestrial sites on the landscape. Manitoba consists of 65 million hectares of prairie, lake and forest between the 49th and the 60th degree of latitude. Forests make up about 26.3 million hectares of the provinces 54.8 million hectare land base. The Project overlays five of Manitoba's six Terrestrial Ecozones, including the Hudson Plains, Taiga Shield, Boreal Shield, Boreal Plains, and Prairie Ecozones (Map 3). Section 2.1.1 describes the location and forestry related characteristics for each Ecozone and Ecoregion, from north to south, relative to the PSA.

For forest management purposes, Manitoba Conservation, Forestry Branch has divided the Commercial Forest Zone within the Province into administrative units of Forest Sections (FS) and Forest Management Units (FMU) (Manitoba, Government of (H) website, 2011), as depicted in Map 4. The Forestry Branch maintains a Forest Resource Inventory (FRI) for all FMUs and the newer Forestlands Inventory (FLI) for some FMUs. The FRI and the FLI are a spatial and tabular database product of aerial photograph interpretation, maintained and managed within a Geographic Information System (GIS) environment. They are generally updated on a 15 to 20 year cycle for areas with significant forestry activities. Areas that sustain large-scale fire damage are also re-photographed and re-interpreted. For areas in which there is very little commercial forestry activity or disturbance, the re-inventory interval period may be as long as 25 to 30 years. The forest inventory type and year of update is provided in Table 2-1. The table reflects the FS and FMU that are affected by the Project. The FRI spatially stratifies the landscape into commercially productive and non-productive forestlands. Detail on productive forestlands includes tree species composition, growing site, cutting class (a representation of age and merchantability), and stand density, on a stand-by-stand basis. The FRI database also includes information on non-productive forest areas such as fens, bogs, marshes and rock outcrops, some of which support tree growth but are not capable of producing merchantable timber within a reasonable time frame due to very low productivity (Manitoba Conservation, 2007C). The FRI provides baseline information to other resource-specific managers including biologists, botanists and ecologists. The FRI has been used to characterize the forestry resources for the Project area in Section 2.2.1 and 2.2.3 (Appendix J). The FLI provides even more detailed information and replaces cutting class with forest stand age and incorporates dominant stand heights. Unfortunately, it has limited coverage and has limited compatibility with the FRI.

A concern with the FRI is its effective date for the Churchill River, Nelson River and to a lesser extent Saskatchewan River FS's. As described in Table 2-1, the FRI for most of these FMUs is over 20 years old and in some cases as old as 35 years. This static condition of the inventory

does not accurately reflect the dynamic nature of the forest resource base. The effective date of the FRI in the Aspen Parkland FS is also 30 years old. This area is dominated by private land and any afforestation and deforestation that has occurred since the inventory was generated are not currently reflected in the data. In order to provide an updated characterization of LSA, centered on the Project, Manitoba Hydro has obtained supplementary aerial photography. Photo interpretation was used to update the Project footprint area for forestry values (Sections 3.3.1.1). The forestry resources for the Project area in the Commercial Forest Zone are classified in Sections 2.2.1 and 2.2.3.

Table 2-1 Manitoba Conservation Forest Inventories

Forest Section	FMU	FRI	FRI Most Recent Update	FLI	FLI Most Recent Udate
Non-commercial	76	N/A	N/A	N/A	N/A
Forest Zone*					
Churchill River	74	FRI	1975		
Nelson River	83	FRI	1986		
	84	FRI	1986		
	85	FRI	1986		
	87	FRI	1986		
	88	FRI	1991		
Highrock	61	FRI	1987 & 1988	FLI	2007 & 2008
Saskatchewan	52	FRI	1995		
River	54	FRI	1996		
	55	FRI	1995		
Mountain	10	FRI	1980 & 1981		
	11	FRI	1980 & 1981	FLI	2001
	12	FRI	1980 & 1981	FLI	2001
Aspen Parkland	1	FRI	1979		
	2	FRI	1979 & 1980		
	4	FRI	1977 & 1980		
	5	FRI	1980 & 1981		

Source: Manitoba, Government of (I) website, 2011

Manitoba Hydro has developed the Land Cover Classification-Enhanced for Bipole (LCCEB), which is more fully described in the Forestry Technical Reports, Alternative Routes Evaluation (Plus4 Consulting Inc., 2009B) and Existing Environment (Plus4 Consulting Inc. et al, 2010). The LCCEB represents an enhancement of the national land cover spatial database (the Land Cover Classification (LCC)) developed by the federal government. It facilitates the harmonization of existing data sets and addresses gaps in land cover classification in the far northern part of the PSA. The Forestry Branch does not maintain a forest inventory for the Non-Commercial Forest Zone, known as FMU 76 (Table 2-1 and Map 4). The LCCEB, 2009 aerial photography and supplementary low level aerial video coverage of the route were used to

^{*} No forest inventory exists for the Non-Commercial Forest Zone.

characterize the forestry resources for the Project Footprint in the Non-Commercial Forest Zone where FRI coverage does not exist. This is further described in Section 2.2.2.

Manitoba's crown lands are also designated according to their different uses and management mandates and includes Provincial Parks, Wildlife Management Areas (WMA), Ecological Reserves and Provincial Forests. Ecological Reserves and WMAs are discussed in detail in the vegetation, wildlife and birds Technical Reports (Szwaluk Environmental Consulting Ltd. et al, 2011; Joro Consultants Inc., 2011; Wildlife Resource Consulting Services MB, 2011). Provincial Forests are designated lands set aside for the sustainable production of wood fibre, environmental protection and recreational pursuits. In south-western portions of the PSA, numerous smaller parcels of crown land also exist, many of which are leased out for agricultural purposes (e.g. grazing, hay production). The Manitoba forestry administrative units overlapping the Bipole III Transmission PSA are shown in Map 4.

2.1.1 Ecozone and Ecoregion Description for the Project Study Area

The following describes the location and forestry related characteristics for each Ecozone and Ecoregion in the Bipole III Transmission PSA.

Hudson Plains Ecozone

In Manitoba, The Hudson Plains Ecozone is located in the northeast corner of the Province and only the Hudson Bay Lowland (216) Ecoregion is overlain by the PSA (Map 3). The Hudson Plains Ecozone is within the designated Non-Commercial Forest Zone (Table 2-1, Maps 2-1 and 2-2). Due to the stunted, open grown nature of the forest in this Ecozone, there is no commercial forest utilization and personal use is limited to fuelwood use.

The Ecozone is characterized by the Precambrian Shield with its shallow soils and many lakes. The forests are open with the dominant cover being stunted conifer (Smith et al, 1998). The vegetation cover is governed by latitude and changes are significant as it represents the transition from the extensively forested Boreal Shield Ecozone to the south and the Taiga Shield and Southern Arctic Ecozones to the north. The northern half of the ecozone is found to have very open stands of black spruce (Picea mariana) and tamarack (Larix laricina), with white spruce (Picea glauca) often part of the community. Ground cover is dominated by dwarf birch (Betula glandulifera), willows (Salix spp.), and Labrador tea (Ledum groenlandicum), cotton grass (Eriophorum spp.) as well as various species of moss and lichen (Smith et al, 1998). Drier sites have stands of white spruce with a ground cover of **ericaceous shrubs**, dwarf birch as well as various species of moss and lichen with the Cladina species dominating the lichen community. Areas of tree cover are often intermixed with areas of low-shrub tundra vegetation as found in the Southern Arctic Ecozone. Along rivers, and especially in sheltered valleys, stands of white spruce, balsam poplar (Populus balsamifera) and paper birch (Betula papyrifera) are found reaching merchantable size (Smith et al, 1998).

In the southern half of the ecozone, the forest cover becomes increasingly denser with taller trees as the latitude decreases. Paper birch becomes more common, especially in recently burned areas, while stands of white spruce, paper birch and trembling aspen (Populus tremuloides) may be found in warmer, protected sites. Lowland areas have bog-fen complexes. The bog vegetation is composed of small black spruce, Labrador tea, Vaccinium species, bog rosemary (Andromeda glaucophylla) and cloudberry (Rubus chamaemorus), while fens are dominated by sedges and brown mosses (Smith et al, 1998).

Taiga Shield Ecozone

The Taiga Shield is a large ecozone covering the northwest corner of Manitoba with rolling uplands and lowlands. Only the extreme southeast corner of the Selwyn Lake Upland (71) Ecoregion is overlaid by the PSA (Map 3). The Taiga Shield Ecozone is within the designated Non-Commercial Forest Zone (Table 2-1, Maps 2-1 and 2-2). Due to the stunted, open grown characteristic of the forest in this ecozone, there is no commercial forest utilization and personal use is limited to fuelwood.

This ecozone forms the transition from the extensively forested Boreal Shield Ecozone to the south and the Southern Arctic Ecozone to the north. In the northern portion, normal or **mesic** sites generally support very open stands of black spruce and tamarack, with white spruce often part of the community. Black spruce is generally stunted with alder (Alnus spp.), willow, and tamarack in the fens and bogs. Ground cover is dominated with dwarf birch, willows, northern Labrador tea, cotton grass, mosses and lichens. The Cladina species dominate the lichen community (Smith et al, 1998). Open, mixed wood stands of white spruce, trembling aspen, balsam poplar, and white birch occur on the upland sites and along rivers (Zoladeski et al, 1995).

In the southern half of the ecozone, the forest cover becomes increasingly dense with taller trees as latitude decreases (Smith et al, 1998). In recently burned areas paper birch is commonly found and on protected sites stands of white spruce, paper birch and trembling aspen can be found. Bog-fen complexes are found in lowland areas with black spruce, Labrador tea, Vaccinium species, bog rosemary, with cloudberry in bogs while sedges and brown mosses are more common in fens.

Boreal Shield Ecozone

The Boreal Shield is the largest ecozone in Canada stretching from northeastern Alberta across Saskatchewan and Manitoba to Ontario, Quebec, Labrador and Newfoundland. In Manitoba, it stretches east and north of Lake Winnipeg from the Ontario border to the Saskatchewan border, north of The Pas, and is the largest ecozone in the province. Closed stands of conifers, mostly white and black spruce, jack pine (picea banksiana) and tamarack are dominant. Broadleaf species including white birch, trembling aspen and balsam poplar are found to be more abundant towards the south (Zoladeski et al, 1995). The Hayes River Upland (89) Ecoregion and east and

southeast portions of the Churchill River Upland (88) Ecoregion are overlain by the PSA (Map 3).

The Boreal Shield has extensive commercial forest utilization commitments across Canada. In the Bipole III Transmission PSA, commercial commitments exist to FML #2 and numerous **Timber Sale Agreements** (TSA) in the Highrock and Nelson River Forest Sections (Map 4). Personal use, through the provincial **Timber Permit** system, is high, especially in the Nelson River Forest Section where the city of Thompson and numerous smaller communities are located. Domestic consumption consists primarily of fuelwood but other uses include rough sawn lumber and timber-based crafts.

The Churchill River Upland (88) Ecoregion is located along the southern edge of the Precambrian Shield and extends westward from the Grass River to the Saskatchewan border (Map 3). The forest species composition is heavily influenced by forest fires and typically consists of medium to tall closed stands of black spruce and jack pine. White spruce, white birch and trembling aspen are significant stand components but infrequently dominate. Understory vegetation consists of feather moss (Pleurozium schreberi), rock cranberry (Vaccinium vitisidaea L.), blueberry (Vaccinium spp.), Labrador tea (Ledum groenlandicum) and lichen (Cladina & Cladonia spp.). Well to rapidly drained sandy sites support pure or mixed open stands of jack pine and black spruce whereas bedrock outcrops support only patchy tree cover. Peat plateaus and bogs are typically covered with open or closed stands of stunted black spruce with under story species that include Labrador tea, blueberry (Vaccinium angustifolium), bog rosemary and sphagnum mosses (Sphagnum spp.). Fens are typically dominated by tamarack, sedges (Carex spp.), dwarf birch and sphagnum mosses (Smith et al, 1998).

The Hayes River Upland (89) Ecoregion is located northeast of Lake Winnipeg and extends east into northwestern Ontario (Map 3). Forests consist predominantly of medium to tall, closed stands of black spruce and jack pine with a scattering of white birch. The shrub layer is dominated by ericaceous shrubs (Ericaceous spp.), willow, and alder. The ground cover consists of mosses and lichens, low ericaceous shrubs, and some herbs. Where drainage, soil conditions and local climate are favourable, trembling aspen, white birch, white spruce and to a lesser extent balsam fir (Abies balsamea), occupy significant areas, particularly in the southern portions (Rowe, 1972). Bedrock exposures have fewer trees and are covered with lichens. Closed to open stands of stunted black spruce with ericaceous shrubs and a ground cover of sphagnum moss dominate poorly drained peat-filled depressions. Permafrost is found throughout the ecoregion, but is only widespread in northern organic deposits (Smith et al, 1998).

Boreal Plains Ecozone

The Boreal Plains ecozone is situated south and west of the Boreal Shield ecozone and extends as a wide band from the Peace River country of British Columbia in the northwest to the

southeastern corner of Manitoba (Ecological Stratification Working Group, 1995). This ecozone has 2 distinct ecoregions in Manitoba that include the Mid-Boreal Lowland (148) and the Interlake Plain (155) Ecoregions, which are overlain by the PSA (Map 3). The Boreal Plains Ecozone has commercial forest utilization commitments to both FML #2 & #3 in the Saskatchewan and Mountain Forest Sections (Map 4). Commercial utilization includes pulpwood, saw logs, and engineered building products. There are extensive TSAs in place that supply timber to the FML holders and also support small to medium sized production facilities in the area. Personal use, through the Provincial Timber Permit system, is high, especially in the Mountain Forest Section where the populations are higher. Domestic consumption consists primarily of fuelwood but other uses include rough sawn lumber and timber-based crafts.

The Boreal Forest or Northern Coniferous Forest is found across this ecozone and is the largest forest zone in Canada. It covers a broad swath across the north-central and central part of the province, dipping down to extend across its eastern border into Ontario. Black spruce is common in the lowland bogs and fens, while jack pine, poplar and white spruce are dominant on the uplands.

The Mid-Boreal Lowland (148) Ecoregion is the northern most ecoregion within the Boreal Plains Ecozone in Manitoba. The ecoregion skirts the west side of Lake Winnipeg from Riverton north and includes the northern two thirds of Lake Winnipegosis and areas north of the Porcupine Mountain to the southern boundary of the Boreal Shield Ecozone (Smith et al, 1998). Well to imperfectly drained clayey and loamy tills and **glaciolacustrine** deposits support closed stands of black spruce, jack pine, trembling aspen and balsam poplar, where black spruce is dominant in late-succession stands. Fire-induced regeneration on well drained sites typically results in very dense jack pine, while on better sites trembling aspen dominates. Lake shores and alluvial deposits along rivers support mixed stands of black spruce, white spruce, balsam fir and trembling aspen. Poorly drained sites are more suited to black spruce. Black spruce, ericaceous shrubs and mosses are typical in bogs while fens are dominated by sedges, dwarf birch, tamarack and sphagnum mosses (Smith et al, 1998).

The Interlake Plain (155) Ecoregion extends in a broad arc from the USA-Canada border at the southeastern edge of the Manitoba Plain, northwestward across the southern Interlake/Westlake region to the Saskatchewan border at Red Deer Lake (Map 3). It is a mosaic of farmland and forest, marking the southern limit of closed, mixed boreal forest and northern and eastern extent of commercial agriculture (Smith et al, 1998). A closed cover of trembling aspen of varying quality with secondary quantities of balsam poplar and an understory of mixed herbs and tall shrubs is predominant. In the Interlake, trembling aspen stands are often of poor growth with poorly formed trees, likely due to the extreme **calcareousness** of the soils. White spruce and balsam fir are the **climax** species but are not widely represented because of fires. However they do exhibit moderate to good growth through most of the ecoregion except on very dry sites or sites with very shallow soils. Open stands of medium to tall jack pine occur on dry, sandy sites.

Water filled depressions and poorly drained sites are usually covered with sedges, willow, some black spruce and tamarack (Smith et al, 1998).

Prairie Ecozone

The Prairie Ecozone extends from the United States border to the Red River in eastern Manitoba. The Bipole III Transmission PSA only overlays the Lake Manitoba Plain (162) Ecoregion in this Ecozone (Map 3). The Prairie Ecozone is dominated by private land but the northern portion of the ecozone does have commercial forest utilization commitments to FML #3 in the Mountain Forest Section (Map 4). Hardwood species dominate with the principal species being Trembling Aspen. Commercial scale timber harvesting also occurs on private land and is often used in land clearing to expand agricultural production. Registered private land woodlots are found throughout the central and southern portion of the ecoregion. They are managed for various objectives including timber production, wildlife habitat enhancement and aesthetic purposes. Personal timber use, through the Provincial Timber Permit system, is high in the Mountain Forest Section where there is considerable crown land, but much lower in the Aspen Parkland, which is dominated by private land. Domestic consumption consists primarily of fuelwood but other uses include small-scale lumber production for personal construction projects throughout the agricultural zone.

In the southwest, the ecozone is comprised of groves of trembling aspen and balsam poplar on Black Chernozemic soils, within the grassland matrix (Zoladeski et al, 1995). The northern and eastern areas of this ecozone are associated with groves of trembling aspen and balsam poplar. In the most eastern sector, bur oak (Quercus macrocarpa) groves become part of the mix. This vegetation characterizes the Aspen Parkland Ecoregion, which forms the transition between the Boreal Forest and the grasslands. This transition zone has expanded southward into the grasslands, since settlement, and is likely due to the control of natural grassland fires in this ecozone (Smith et al, 1998).

The Lake Manitoba Plain (162) Ecoregion stretches northwestward from the International Boundary to Lake Dauphin in southern Manitoba. The Manitoba Escarpment marks its western boundary. Before settlement this ecoregion was a mosaic of trembling aspen/oak groves and rough fescue grasslands (Smith et al, 1998). In Manitoba, trembling aspen and shrubs occur on moist sites, while bur oak and grassland communities occupy increasingly drier sites. Dominant grasses include fescue grasses, wheat grasses, June grass and Kentucky bluegrass. A wide variety of deciduous shrubs and herbs are abundant. Poorly drained sites support slough grasses, marsh reed grass, sedges, cattails and shrubby willow (Smith et al, 1998).

2.2 Forest Resource Description

This section describes the forest resources, specific to the FMUs overlain by the Bipole III Transmission Project, as classified by the FRI for the Commercial Forest Zone and the LCCEB for the Non-Commercial Forest Zone.

The determination of crown land and private land is based solely on the Ownership code within the Manitoba Conservation FRI (Appendix J). This information may be dated as it has not been updated since the original interpretation of the FRI (Table 2-1).

2.2.1 Crown Land Forest Resource Inventory

Crown lands dominate the northern portion of the Bipole III Transmission PSA (north of Bellsite; FMU 12 and north) and decrease in prevalence moving south through the Mountain Forest Section (FS) and into the Aspen Parkland Forest Section (Map 4), the latter being principally under private ownership (Section 2.2.3). Table 2-2 describes the crown land forest resources within the Commercial Forest Zone, by **covertype**, for those FMUs affected by the Project.

Table 2-2 Crown Land Forest Resources

		Non	Productive Land (ha)			Total
Forest Section	FMU	Productive (ha)	Softwood	Hardwood	Total	Area (ha)
Churchill River	74	48,694	240,455	681	241,136	289,830
Nelson River	83	298,056	232,371	54,531	286,902	584,958
	84	159,596	184,598	30,708	215,306	374,902
	85	118,271	150,691	23,468	174,159	292,430
	87	187,057	185,316	21,110	206,426	393,483
	88	189,856	67,552	7,100	74,652	264,508
Highrock	61	150,701	75,968	11,781	87,748	238,450
Saskatchewan River	52	330,094	43,175	14,040	57,215	387,308
	54	289,686	71,999	4,272	76,271	365,956
	55	198,808	42,632	7,482	50,113	248,921
Mountain	10	173,647	3,088	162,442	165,530	339,177
	11	152,771	71,545	108,746	180,291	333,062
	12	328,932	120,388	66,641	187,029	515,961
Aspen Parkland	1	97,893	3,622	21,313	24,934	122,828
	2	85,980	1	13,873	13,873	99,854
	4	58,979	2,974	23,055	26,029	85,009
	5	73,248	293	22,943	23,237	96,484
	Total	2,942,269	1,496,668	594,186	2,090,854	5,033,123

Source: Manitoba Conservation 2010 Includes ownership codes 0, 1, 2

The non-productive land classification accounts for 58% of the total land area and includes all non-forested, wetlands and those lands coded other than productive forestland (e.g., agriculture). Specific to the productive forestland, the softwood dominant types represent 72% of the total reflecting the northern dominance of the conifer species. The trend shifts in the more southern reaches of the PSA (Mountain and Aspen Parkland Forest Sections) where hardwoods are more dominant in those FSs affected by the Project.

2.2.2 Crown Land Non-Commercial Forest Zone

The Land Cover Classification – Enhanced for Bipole (LCCEB) has been used to characterize the Non-Commercial Forest Zone (Map 4). The Non-Commercial Forest Zone covers a large landmass and, although forest resources of commercial quality exist in the area, volume concentrations are limited and scattered with considerable distance between them. The area is deemed Non-commercial in terms of forestry due to lack of infrastructure, distance to mills and markets, and environmental conditions (climate) that limit tree growth rate and size.

Table 2-3 describes the forest resources on crown land in the Non-Commercial Forest Zone, for the Bipole III Transmission Project Local Study Area defined in (Map 2). The non-forested classifications represent 52% of the LSA, much of which consists of wetlands. The conifer component makes up another 39% while 9% are classed as mixedwood and tall shrub on mineral soil. The latter was added to the mixedwood category as it was found to represent re-growth on recently burnt areas.

Table 2-3 Crown Land Forest Resources - Non-Commercial Forest Zone

Forest	Non	Forested Land				Total	
Section/FMU	Forested (Ha)	Coniferous (Ha)	Broadleaf (Ha)	Mixedwood* (Ha)	Total (Ha)	Area (Ha)	
Non-Commercial Forest Zone FMU 76	54,810	40,950	0	10,272	51,222	106,032	

Source: Land Cover Classification - Enhanced for Bipole. 2010

2.2.3 Private Land Forest Resources

Very few private land forest resources are found in the northern portions of the PSA (north of the Mountain FS). Manitoba Conservation, Forestry Branch, includes private land forests in their inventory updates north of the Aspen Parkland FS, where such forests meet the minimum inventory specifications. It typically does not include small clumps of trees, single trees, yard and field shelterbelts.

^{*} Includes "tall shrub" on mineral soil classification as it represents recent burns.

Table 2-4 describes private land forest resources within the Commercial Forest Zone, on an FMU basis, as classified by the provincial FRI. Of the private land area, the vast majority are classified as non-productive (86%). As expected 96% of the productive forestlands are hardwood dominant with the bulk of those found within the Mountain and Aspen Parkland FSs.

Table 2-4 Private Land Forest Resources

		Non	Productive Land (ha)			Total
Forest Section	FMU	Productive (ha)	Softwood	Hardwood	Total	Area (ha)
Churchill River	74	0	0		0	
Nelson River	83	2,771	1,933	1,001	2,935	5,706
	84	267	5	5	10	277
	85	1,279	541	517	1,058	2,338
	87	5,480	6,895	1,035	7,930	13,410
	88	10,698	5,755	102	5,857	16,555
Highrock	61	398	19	4	23	421
Saskatchewan	52	31,331	947	1,941	2,888	34,219
River	54	198	65		65	263
	55	599	4	56	60	659
Mountain	10	692,015	2,042	178,656	180,698	872,712
	11	250,961	2,281	51,587	53,868	304,829
	12	9,262	1,430	3,704	5,133	14,395
Aspen Parkland	1	935,783	2,300	141,265	143,565	1,079,348
	2	1,002,449	9	104,938	104,947	1,107,396
	4	809,379	726	99,132	99,858	909,236
	5	604,243	784	80,442	81,226	685,469
	Total	4,357,114	25,735	664,385	690,120	5,047,234

Source: Manitoba Conservation 2010 Includes ownership codes 4, 5, 6, 9

3.0 Methodology

3.1 Site Selection Environmental Assessment Process

Manitoba Hydro transmission projects utilize a Site Selection and Environmental Assessment (SSEA) process to better understand the potential issues and concerns associated with the routing and siting of the transmission line and components, to assess the potential for adverse effects and identify appropriate mitigation measures to manage the overall effect of the proposed Project on the environment. This approach was taken for the Bipole III Transmission Project.

The specific objectives of the SSEA were to:

- > Provide a description of the proposed transmission facilities to all stakeholders and the public;
- > Select alternate routes and sites for transmission lines and associated facilities in a technically, economically and environmentally sound manner;
- Assess the potential impacts of the proposed transmission line and its' associated facilities;
- ➤ Conduct the SSEA with consideration of local input from potentially affected First Nations and other aboriginal communities, other communities and municipalities, land and resource users, interest groups, resource managers, and the public at large, in a responsive, documented and accountable fashion;
- > Find practical ways to mitigate potential negative effects and enhance benefits; and
- ➤ Prepare an Environmental Impact Statement (EIS) that documents the results of the SSEA.

Through PSA characterization, the locations of sensitive biophysical, socio-economic and cultural features, technical (engineering) and cost considerations for transmission line routing were identified. The SSEA utilized data from existing published sources, supplemental field studies, and incorporated feedback from public and government involvement consultation, including aboriginal traditional and local knowledge.

Through the SSEA, three alternative route corridors were identified. The selected alternative routes avoided significant sensitivities, where possible, and sought to minimize potential effects where avoidance was not possible or practical. A route selection matrix was used to facilitate the evaluation of alternative routes on a segment-by-segment basis. The alternate routes were separated into 13 sestions and evaluated and compared, by segment, considering geographic features, potential opportunities, technical considerations and professional judgment. During the course of the route selection process, several adjustments were made to the original alternative

route segments based on additional input provided by the Environmental Assessment study team and various stakeholders (e.g., mining and agricultural interests).

A total of 28 factors were identified to evaluate the alternative routes. These factors included a full range of biophysical, socio-economic, land use, technical and stakeholder considerations. Evaluation criteria were identified for each factor that would facilitate three-tier (high, medium and low) ranking. Biophysical, socio-economic and land use rankings were based on the degree to which the factor is affected. Technical rankings were based on the degree to which the factor is a constraint while stakeholder rankings were based on the nature and degree of response. A four-tier ranking (very high, high, medium and low) was used for several biophysical factors where potentially significant implications on protected species and habitats were identified.

Stakeholder factors were applied to the segment rankings after the ratings were determined. Stakeholder response criteria were based on both a numeric count and a general expert assessment of the negative or positive commentary provided for certain segments. General commentary provided (e.g., diagonal routes on intensively managed agricultural lands are not preferred) was considered in the evaluation of relevant segments. The objective of the stakeholder evaluation was to select route segments with the lowest level of concerns or most favoured as expressed by Aboriginal groups, municipal governments, stakeholder groups, and the general public. A three-tiered ranking system (fair, good, or poor) was based on numeric counts of comments provided and expert assessment of feedback from all sources.

Aboriginal Traditional Knowledge (ATK) was considered separately under the various applicable biophysical, socio-economic, land use and stakeholder factors. Where ATK confirmed a scientific finding, no change in ranking was made, but a note to that effect was included for that particular segment. Where ATK provided additional information about any of the 28 factors, it resulted in a higher ranking than what was determined previously.

The conclusion of the route evaluation and analysis process resulted in the selection of a Preliminary Preferred Route (PPR) for the Bipole III transmission line. The PPR was further refined to mitigate potential effects, after the last round of consultation, based on very specific stakeholder input and study team findings. The resultant Final Preferred Route is shown in Map 2. The route selection process is described in detail in the *Bipole III Transmission Project Alternative Route Summary Evaluation Report* (Draft) (MMM Group, 2010).

3.1.1 Forestry Specific Alternative Routes Evaluation

An assessment of forestry values was conducted on the three alternative routes (Section 3.1, Map 1), identified by Manitoba Hydro for the Bipole III Transmission Project, in the *Alternative Routes Evaluation, Forestry Technical Report* (Plus4 Consulting Inc., 2009B). The report assessed the potential effects on productive forestland, long term research and monitoring sites established by the forest industry, the Province of Manitoba and Federal agencies, and private

land forest management and afforestation programs. The report identified and used forestry specific Valued Environmental Components (VEC) and their related constraints in the assessment (see Section 3.2).

The information from the forestry alternative routes evaluation was incorporated into the *Bipole III Transmission Line Project: Preferred Route Selection Process* report (Manitoba Hydro, 2010C). The selection process used a multi-disciplinary, interactive process to review all alternative routes, on a segment-by-segment basis, weight all of the values and constraints (including all consultation input (Landmark Planning et al. 2011) and Aboriginal Traditional Knowledge collected (MMM Group et al, 2011)) and select the LSA for the Bipole III Transmission Project. Tataskweyak Cree Nation also reviewed the proposed alternative routes within their Resource Management Area and provided their input to Manitoba Hydro in the report entitled *Bipole III Preferred Route Selection* (Tataskweyak Cree Nation, 2010) and through follow-up meetings and correspondence.

3.2 Valued Environmental Components

The Alternative Routes Evaluation, Forestry Technical Report (Plus4 Consulting Inc., 2009B) conducted the forestry evaluation relating specifically to forest management from the perspectives of Manitoba Conservation, Forestry Branch, the forest industry and private landowners. It considers the potential effects the Bipole III Transmission Project may have on such values. All ecological aspects relating to forestlands are dealt with under the vegetation and habitat (wildlife) studies (Szwaluk Environmental Consulting Ltd. et al, 2011; Joro Consultants Inc., 2011; Wildlife Resource Consulting Services MB Inc., 2011).

Forestry Valued Environmental Components (VECs) identified in the Alternative Routes Evaluation report include:

- > Productive forestlands;
- ➤ High value forest sites;
- Forestry related research and monitoring sites, and
- Private lands with forestry values (e.g., woodlots, shelterbelts etc.).

The above VECs were selected based on the following potential issues and linkages to the Bipole III Transmission Project:

Productive forestlands form the basis for all forest management planning for both Manitoba Conservation, Forestry Branch and the forest industries that use the resources from them. Annual allowable cuts (AAC) are calculated based primarily on productive forestlands. Where the land use on productive forestlands changes from forest management to alternative use, such as a transmission project, these lands are withdrawn

- from the productive forestland base. The withdrawal consequently affects all future AAC calculations. Forestry Branch passes on such reductions in the wood supply to the forest industry resulting in reduced annual timber volumes available for harvest.
- Forest Management Licenses (FML) are awarded by the Province of Manitoba with specific quantities of productive forestlands needed to support the fiber requirements of the license holder. When such lands are converted to uses other than forest management, they are withdrawn from the respective FML. License agreements stipulate withdrawal limits (Appendix A) of lands over specific time frames. Where these are exceeded, Manitoba must compensate the FML holder.
- As part of sustainable forest management, Forestry Branch and the forest industry reforest all harvested areas. This requires substantial capital investment; hence such sites are considered high value forest sites and are assigned greater emphasis from a protection perspective (e.g., fires, development, etc.). The invested value is reflected in the Forest Damage Appraisal and Valuation policy (Manitoba Conservation, 2002).
- There are numerous, active federal, provincial and forest industry research and monitoring initiatives underway within the forested zone of Manitoba. Many of these initiatives have been established for long-term monitoring purposes. The investment of time and resources, and the data already collected makes it important not to disturb/disrupt these initiatives.
- Private land owners throughout much of Manitoba have invested in and developed managed woodlots, often with assistance from the provincial and federal governments. These serve both as sources of wood fibre, carbon storage and provide multiple environmental benefits. Although shelterbelts are not usually associated with fibre supply, they are established for purposes of environmental benefits.

Table 3-1 identifies the forestry VECs and includes a description, justification, environmental indicators and measurable parameters for each.

Table 3-1 Bipole III Transmission Project – Valued Environmental Components

Valued Environmental Component	Environmental Indicator	Measurable Parameter/ Variable
Productive forestland	Productive forestland contributing to the sustainable AAC	Forested area (ha)
	Forest Management License	Area withdrawn from license areas
	Areas	(ha)
	Standing timber	Wood fibre volume (m3)
High value forest sites	Forest management investments	Area under development (plantations, assisted regeneration) (ha)
Research/monitoring sites	Site(s) integrity	Number of sites affected
Private land	Woodlots	Area under management (ha)
enhancements	Shelterbelts	Area/number affected (ha/m)

3.3 Desktop Impact Assessment

The identification and compilation of the forest resource and site-specific forest values, potentially affected by the Bipole III Transmission Project, forms the basis for the forestry EA. The following describes the data and methodology that has been used in the assessment.

3.3.1 Forestry Data

3.3.1.1 Forest Inventory Data

Manitoba Conservation, Forestry Branch, maintains a forest inventory for the Commercial Forest Zone in Manitoba (Map 4). A number of forest inventory vintages exist across the PSA, which vary in detail and standard (Table 2-1). There are two main types of inventory; the Forest Resource Inventory (FRI) dating back to the 1970's and the more recent Forestland Inventory (FLI). Within the vintages of FRI, ecological attributes within the data were expanded over time. FRI versions 1.0 & 1.1 (Manitoba Conservation, 2007A) expanded codes for nonproductive forestland, non-forested land and water over the original FRIs developed prior to 1975. FRI version 1.2 (Manitoba Conservation, 2007B and Appendix J) further added year of origin, vegetation and soil type (Forest Ecosystem Classification) while FRI version 1.3 (Manitoba Conservation, 2007C) added moisture class, landform, height and 10% crown closure classes. Throughout the PSA, for all vintages of the FRI, the interpreted standard of forest type aggregate and cutting class remained unchanged and comparable. The original Stand Stock Volume Tables (SSVT), developed from volume sampling data throughout the province in the 1980's, remains valid and forms the basis for the AAC determination throughout the PSA. The inventory type and year of development or update are provided in Table 2-1 and are more fully described in the Forestry Technical Report, Existing Environment (Plus4 Consulting Inc. et al, 2010).

The more recent FLI inventory includes a vast array of vegetation, ecological and forest structure attributes that include age. It excludes the forest type aggregate classification making it incompatible with the FRI. Newly designed volume sampling programs accompany the FLI inventories. The changeover resulted in a radically different approach to calculating standing volumes and sustainable harvest levels (AACs). For those FMUs that were re-inventoried to the new FLI standard, the SSVTs of the previous FRI were abandoned and age-based **yield curves**, by forest **strata**, based on newer volume sampling data, were introduced.

Within the Bipole III PSA, yield curves by strata type presently exist for the Saskatchewan River FS and part of the Mountain FS (FMUs 11 & 12). The Saskatchewan River FS is currently undergoing Wood Supply Analysis (WSA) work and will soon have a new sustainable wood supply (SWS) based on FLI data and accompanying volume sampling data (pers. comm. Carlson, 2010). The SWS will, when completed, replace the AACs calculated using old FRI

data. The WSA work in the Saskatchewan River Forest Section also includes changes to existing FMU and the FS boundaries. These boundary changes are problematic in ascertaining effects on present day AACs. In the Mountain FS, yield curves have been constructed for the newly inventoried area but they have yet to be used to calculate new SWS levels. The Project footprint encounters two vintages of inventory in FMU 11, posing a problem for GIS processing and merging of tabular data. In addition, the land ownership codes in the FLI for FMUs 11 and 12 are unreliable and presently undergoing revision.

In consideration of the issues associated with the use of the FLI in conjunction with the FRI, the limited extent to which FLI exists across the PSA (Table 1-1), the methodology differences used in calculating annual allowable cut (FRI) and sustainable wood supply (FLI) levels, and the lag in applying new SWSs in some FMUs, the FRI was chosen to describe the forest resources within the Commercial Forest Zone (Map 4) and for the effects assessment of the Bipole III Transmission Project on SSVT derived AACs. Manitoba Conservation endorsed this approach as the assessment reflects an estimated effect rather than precisely calculated reductions to annual allowable cut (AAC) levels (pers. comm. Carlson, 2010).

The Ownership field from the FRI attribute table was used to compile crown and private lands in Section 2.2.1 and 2.2.3 respectively (Appendix J). Ownership codes for Provincial Crown Land Closed, Open and Restricted (0, 1 & 2 respectively) were used to define crown lands (Section 2.2.1) and ownership codes for Municipal Land, Patented Land, Local Government District and Other (4, 5, 6 & 9 respectively) were used to define private lands (Section 2.2.3). Non-productive lands, as related to forestry, include FRI classification codes 700 to 900 series. These codes include all non-forest types, wetlands and water. The productive forestland codes 1 – 699 series have been grouped into two broad classifications; softwood leading covertypes (codes 1-77), and hardwood leading covertypes (codes 80-98) (Manitoba Conservation, 2007C) (Appendix J).

The forest inventory data for the Bipole III Transmission Project ROW in the agricultural zone (between the Riel Converter Station and Mafeking as well as a three kilometer stretch near The Pas) was updated through photo interpretation of the August 2009 aerial photography and the geo-referenced, color, low-level, aerial, Red Hen video. The photography was overlain with the existing FRI data in a GIS environment and changes in forest cover (forest to non-forest and vice versa) were noted. Polygon line work was adjusted to reflect all changes including shelterbelts where these were affected by the Project. Existing FRI attribute information was retained, where applicable, and interpreted from the photography and video for new polygons. Revisions resulting from the video/orthophoto assessment were incorporated into the FRI.

3.3.1.3 The Land Cover Classification Enhanced for Bipole

For the Non-Commercial Forest Zone (Table 1-1 & Map 4), located in the northern portion of the PSA, no forest inventory has been developed. The Land Cover Classification Enhanced for Bipole (LCCEB) was developed using the Canadian Forest Service Landsat based Earth Observation for Sustainable Development (EOSD) (Canada, Government of (E) website, 2011) classification system with the addition of value added data such as the Manitoba Wetland Classification (1:1,000,000), National Framework Layer (to Ecodistrict scale, 1:1,000,000) and the Manitoba Conservation fire history (Joro Consultants, 2011B). This was used to describe the forest resources in the Non-Commercial Forest Zone. The Project footprint was further assessed using the August 2009 high resolution, black and white, aerial photography that was acquired for the project and low level, forward looking, geo-referenced Red Hen color video.

3.3.2 FRI Update

Prior to undertaking the forest damage appraisal and valuation, the FRI was updated for wildfires, forest renewal activities and depletions (i.e., plantations, fire, harvests, etc.) and age.

For untreated depletion areas and plantations, a **subtype**, reflective of the activity and/or expected forest transition, was assigned and the cutting class component of the type aggregate was updated to present day (2010). For all other productive forested polygons, unaffected by depletion or renewal, the cutting class and crown closure components of the type aggregate are updated from year of photography (interpretation) to present day (2010).

The methodology employed to update cutting class required the determination of cutting class midpoint age from the cutting class age range tables, provided in the FDA&V guideline document (Manitoba Conservation, 2002) (Appendix F). Current year (2010) was then used to calculate the number of years each forest stand has aged since initial interpretation or depletion. This value was added to the original cutting class midpoint age, thereby arriving at a current age (2010). The cutting class age range tables were again used to update the cutting class attribute of the type aggregate to reflect its current age (2010). Crown closure was then updated to reflect the change in age or cutting class. An algorithm was introduced that moved crown closure in step with changes to cutting class. When cutting class moved up one class so did crown closure. Conversely if the cutting class moved down one class so did crown closure. The update to crown closure estimates the probable change in stand density over time. For the purpose of this exercise, the subtype and site attributes of a type aggregate remain unchanged from the year of photography/interpretation. The results of this update process are reflected in the attribute data and what is referred to as the Forest Resource Inventory Enhanced for Bipole (FRIEB).

3.3.4 Annual Allowable Cut Effect

Manitoba Hydro's Bipole III Transmission Project is over 1,380 km in length. The ROW encounters a variety of forest stand types across an expansive forest land base, crossing six (6) different Forest Sections en route from the proposed Keewantinoow converter station, northeast of Gillam, to Winnipeg. Within the Project area, there are different vintages of forest inventories dating back to the 1970s (Table 2-1 and Section 3.3.1.1). The more recent inventories differ from the older inventories in interpretation standards and volume estimation methods.

While the provincial forest inventory process has evolved through time and has improved volume estimates with the enhancement of technology and knowledge, the AAC calculations associated with the newer inventories have lagged behind. The challenge, in this analysis, with using stand level volume estimates from different inventories is that each inventoried area will have been collected at a different point in time and at different standards, making it difficult to assess volumes and impacts on existing AACs that are based on old FRI data. Therefore, to avoid these complexities and those involved with an update and GIS merge process, the original FRI, upon which the current AACs are based, is used for the entire Project within the Commercial Forest Zone. It is used only after undergoing the update process described in Section 3.3.1.1 and 3.3.2. This updated FRI database was used to model the potential effects of the Bipole III Transmission Project on FMU net merchantable annual allowable cut levels, provided by Manitoba Conservation.

Mean Annual Increment (MAI) is proposed as the standardized unit for assessment purposes. MAI is a forest productivity unit that describes the potential capacity/expected growth of a particular forest type through to the rotation age of a stand and is commonly used for AAC estimation (pers. comm. East, 2011). MAI is expressed as m3/ha/year and, when multiplied by the total area removed by the Bipole III Transmission Project, will provide an indication of potential effects to AAC (m3/yr) without the consideration of other operational/forest practice limitations (i.e., operability, **forest succession**, etc.).

This analysis undertook the calculation of softwood and hardwood MAI for each productive forest type aggregate within the proposed Bipole III footprint. The SSVT, stratified by FS and type aggregate (subtype, site, cutting class and crown closure), provides estimates of volume (m3/ha) at various utilization levels for commercial softwood species (spruce, pine, fir) and hardwood species (aspen, poplar, birch). The MAI, assigned to a type aggregate, was calculated by dividing the hardwood and softwood volume (net merchantable utilization level) found within the type aggregate's mature cutting class (CC4), by the rotation age of the leading species (subtype) within the aggregate. The rotation ages for species working group, site and Forest Section are outlined in the Manitoba Conservation FRI Manual attached as Appendix J. Type aggregate rotation ages are closely approximated (within one year) by the midpoint age of cutting class 4. To facilitate an estimate of growth and potential (AAC), the calculated MAI

values for cutting class 4, within a type aggregate, was assigned to all cutting classes of the type aggregate.

For each FMU affected by the proposed Project, the softwood and hardwood MAI values of type aggregates (subtype, site and crown closure), within the Bipole III Transmission Project footprint, of an FMU were multiplied by the area of the type aggregate. The resulting totals (m3/yr) for each type aggregate were then summed for each FMU to arrive at an estimated reduction to the existing AAC of an FMU. The results are shown in Table 6-2, Section 6.1.2.1.

3.3.5 Damage Appraisal and Valuation of the Forest Resource

Manitoba Conservation applies the Forest Damage Appraisal and Valuation Policy (Manitoba Conservation, 2002) whenever productive forestland is removed from the land base. It is a compensatory form of mitigation that the province levies on the project proponent. It accounts for the volume of timber in cutting class 3, 4 and 5 stands within the Project footprint as well as the loss in growth potential of timber within immature cutting classes (1 and 2) at the time of clearing. It also accounts for the investments in forest management such as forest renewal, forest protection, and research and monitoring sites.

3.3.4.1 Forest Damage Appraisal

In undertaking the forest damage appraisal, the area of productive forestlands falling within the Bipole III Transmission Project footprint were identified and summarized by Forest Section, FMU and type aggregate (subtype, site, cutting class and crown closure).

Within a type aggregate there are 6 cutting classes (0-5). Type aggregates within cutting class 3, 4 and 5 were assigned the softwood and hardwood gross merchantable volumes (m3/ha), presented in the SSVT, appropriate to the FS/FMU within which they were located. The total softwood and hardwood volumes/ha within these type aggregates were then multiplied by their respective areas to derive the total hardwood and softwood volumes, which are subject to the forest damage appraisal fee calculation.

Type aggregates, within immature cutting classes (1 and 2), are not represented in the SSVT. For type aggregates in these cutting classes, MAI was used to ascertain their contribution toward total volume loss. In accordance with the procedures outlined in the FDA&V guidelines, the MAI value (Manitoba Conservation, 2002) (Appendix F), appropriate to the subtype, site and Forest Section, within which the type aggregate is located, is assigned. The total gross merchantable softwood and hardwood volumes for a type aggregate are then calculated by multiplying the MAI value with its mid-age of the cutting class and area. The derived volumes are subject to the forest damage appraisal fee calculation.

Type aggregates within cutting class 0 are considered recently disturbed sites (harvest, fire, etc.) and are considered to have no associated standing timber volume and therefore are not subject to forest damage appraisal.

The FDV&A has been conducted on the proposed Transmission Project footprint. Additional productive forestland may be cleared for access development, borrow/deposition areas or bypass routes necessitated by terrain features encountered during ROW clearing. These areas will be very localized, small in extent and minimally incremental to the Transmission Project footprint. A new FDV&A assessment will be required following construction to determine the exact effect on the productive forestland base.

The results of the FDA&V are summarized in Section 6.7.3.

3.3.4.2 Valuation

Effective January 1, 2008, the application of crown timber dues moved from a strictly volume based timber pricing system to a more comprehensive system (Manitoba, Government of (K) website, 2011). The valuation system accounts for the intended end product, current market value of that product and distance to the mill or processing facility. Timber dues are set monthly, based on the previous months average commodity reference price. The new system determines dues for hardwood and softwood timber and an associated forest product class. There are four main product classes (Kraft, Lumber, Oriented Strand Board and Newsprint) and personal use classes, such as, fuelwood and posts and rails. Charges, in addition to the crown timber dues, include a forest renewal charge (FRC) and fire protection charge (FP). The FRC is collected to offset the cost of forest renewal throughout the province and the FP charge is collected to offset the firefighting/prevention costs the province undertakes to protect forests. Both of these additional charges are volume based. The FRC charge for softwood is \$5.75/m3 and \$0.50 for hardwood. The FP charge is \$0.17/m3 for softwood and hardwood. Forest plantations or high value forestry sites such as seed orchards and research plots are subject to an additional charge by the Province. The Province establishes a charge that reflects the value or investment into these sites. Presently the provincial average establishment cost for plantations is \$882.35/ha.

In order to undertake the calculations needed to arrive at a valuation of the timber removed from the Bipole III Transmission Project footprint, a determination of market destination for the timber was required as well as an estimate of a fluctuating market value (commodity price index) of an as yet to be determined timber product. The uncertainty that would be associated with such determinations prompted the need for a composite dues table more suited for this valuation. The timber dues table needed to be re-structured in such a way as to provide a reasonable presumption of product end use and market index price. This involved considerable consultation with Manitoba Forestry Branch staff (pers. comm. Epp, 2011) and Branch regional

staff (pers. comm. Thorpe and Swanson, 2011) along with an extensive examination of historical and present market pricing indices, mill demand and area specific historical trends for forest products and future market opportunities.

A composite timber dues table was prepared and structured to provide an estimate of timber dues likely to be incurred on softwood and hardwood volumes cleared within the Bipole III Transmission Project footprint at the time of construction. The composite timber dues table is presented in Appendix G.

The Forest Damage Appraisal and Valuation (Appendix F) has been completed for productive forestlands that will be cleared from the Bipole III Transmission Project footprint. High value sites such as plantations, research/monitoring sites and tree improvement program sites have been avoided, where possible, in siting the Project. However, any high value sites that could not be avoided have also been accounted for in the damage appraisal. The work sheets for the FDA&V determination are contained in Appendix H.

3.3.6 Commercial Forest Resource Utilization

Commercial forest resource utilization commitments on crown lands were compiled for the Project area. These include Forest Management License Agreement (FMLA) areas, an area known as the INCO Strip (Vale Inco timber allocation within FML #2) and timber sale and permit holders. The area of productive forestlands within the two FMLs overlain by the Project footprint was determined using the FRIEB. Timber harvest level records were obtained from Manitoba Conservation and compared to AAC levels at the FMU level. This provides an understanding of provincial timber commitments to the forest industry and actual harvest levels relative to the AACs (Section 5.2.2.3).

3.3.7 Domestic Forest Resource Utilization

The domestic use of the forest resource was estimated by FMU (Section 5.2.2.4, Table 5-4). Manitoba Conservation administers domestic forest utilization through the issuance of Timber Permits. The majority of Timber Permits are issued for procuring fuelwood but the Timber Permit system allows for personal or commercial forest utilization of under 300 cubic meters. Manitoba Conservation compiled timber permits for the three-year period 2006 to 2008 for the FMUs intersected by the Project. The permitted volumes were averaged to provide an annual use estimate. First Nation treaty rights allow for forest utilization for personal use. First Nation peoples are required to secure a Timber Permit to exercise their treaty rights but are exempt from all fees.

As not all First Nation peoples, exercising their treaty rights to gather fuelwood, understand that a Timber Permit is required, the First Nation permitted volume documented by Manitoba Conservation appears to be underestimated. Additional fuelwood use by First Nations was

therefore estimated (pers. comm. Kuzdak, 2011). The additional First Nations Reserve fuelwood use estimates were based on the number of dwellings, identified in the Statistics Canada 2006 and 2001 census data (Canada, Government of (I) website, 2011; Canada, Government of (A) website, 2011), multiplied by an estimate of an additional 10 percent of dwellings using wood as a heat source, multiplied by an estimate of 5 m3/year (M3/FNR/Yr = # dwellings X .1 X 5). Appendix E provides the Statistics Canada Reserve census dwelling data and additional estimated fuelwood use by FMU.

3.3.8 High Value Forest Sites

Reforestation of harvest areas is performed through natural or assisted regeneration. Manitoba Conservation, Forestry Branch and the forest industries have identified harvest areas, regenerated through tree planting or site scarification to promote natural regeneration, as high value sites. The locations of these silviculture sites are recorded and tracked by the Forestry Branch and the FML holders within a GIS environment. The data was acquired from the various organizations, compiled and overlaid with the Bipole III Transission Project footprint to determine location and extent of effects (Section 5.2.3.2, Map Series 100).

3.3.9 Aboriginal Traditional Knowledge and Use of the Forest Resource

Manitoba Hydro engaged in a process of collecting Aboriginal Traditional Knowledge (ATK) by hosting a series of ATK study-team led workshops with Aboriginal communities within the PSA between September 2009 and November 2010. Communities included are: Barrows, Barrows Area (which includes the communities of Powell, Westgate, Red Deer Lake, National Mills and Baden), Camperville, Chemawawin First Nation, Cormorant, Dakota Plains First Nation, Dakota Tipi First Nation, Dawson Bay, Duck Bay, Easterville, Herb Lake Landing, Pelican Rapids, Pikwitonei, Pine Creek First Nation, Thicket Portage, and Waywayseecappo First Nation.

Manitoba Hydro also encouraged self-directed studies to collect Aboriginal Traditional Knowledge (ATK). These were provided from Fox Lake Cree Nation, Long Plain First Nation, Opaswayak Cree Nation, Swan Lake First Nation, Tataskweyak Cree Nation, Wuskwi Sipihk First Nation and the Manitoba Metis Federation.

Oral history and mapping interviews were conducted by the ATK study team based on a series of questions that were developed to include aspects of the biophysical and socio-economic environment associated with the Project. The questions developed were designed to be quantifiable and comparable to scientific data gathering methods and involved the following categories:

- ➤ Waterbodies/Fish, Amphibians and Reptiles, Clams and Crustaceans;
- Soils and Terrains (Landforms, Rocks and Minerals, Soils);
- > Forestry and Vegetation;

- ➤ Birds (Importance, Hunting, Bird Populations and Habitat, Access);
- ➤ Mammals:
- Cultural and Heritage Resources;
- ➤ Health and Social Connectivity; and
- ➤ Income/Economy.

Similarly, the self-directed studies that were conducted provided ATK that best reflects the overarching worldview of the community.

The intent of the interviews and self-directed studies was to assist in the characterization of the existing biophysical and socio-economic environment for the purposes of evaluating alternative routes, to select the preliminary preferred route and, for the overall assessment of biophysical and socio-economic components along the preferred route. Environmental values, including forestry values, within the PSA were identified on a series of 1:50,000 National Topographic System maps. Of the 90 output maps produced, 23 were found to contain forestry related values. These values are summarized in Appendix C. As a number of the identified values relate to non-timber forest products, a further filtering process identified timber related values whose areas are intersected by the Bipole III Transmission Project footprint. These are further discussed in Section 5.2.2.5.

Areas of concern were also received and recorded during meetings with First Nation and Metis leaders as well as their regional organizations such as the Manitoba Keewatinowi Okimakanak, Southern Chiefs Organization, Swampy Cree Tribal Council, Treaty One and the Manitoba Metis Federation. Not all invitations to meet with Manitoba Hydro representatives were accepted.

3.3.10 Research and Monitoring Programs

Manitoba Conservation, Manitoba's forest industry, the Canadian Forest Service (CFS) and other federal government agencies, have established forest research and monitoring programs across Manitoba's forested areas. Site-specific information has been obtained from the various agencies and entered into Manitoba Hydro's Bipole III database. This data was used during the SSEA process as constraint information ensuring that these sites would be avoided. Those in proximity to the Project footprint have been documented, including their precise location and required buffers, to ensure their protection.

The following research and monitoring programs, along with their establishing agencies, have been compiled for the forestry assessment and are further described in the *Forestry Technical Report, Existing Environment* (Plus4 Consulting Inc. et al, 2010) and in Section 5.2.3.3.

- ➤ Trees for Tomorrow Program Manitoba Conservation
- ➤ Forest Resource Inventory Permanent Sample Plots Manitoba Conservation
- ➤ Tree Improvement Program Manitoba Conservation

- Ecosystem Monitoring Manitoba Conservation
- ➤ Forest Management Research Plots Natural Resources Canada, Canadian Forest Service
- Forest 2020 Natural Resources Canada, Canadian Forest Service
- ➤ Acid Rain National Early Warning System Plots Natural Resources Canada, Canadian Forest Service
- ➤ Boreal Ecosystem Atmosphere Study University of Manitoba
- ➤ Growth and Yield Program Plots Tolko Industries Ltd.
- Ecological Monitoring Plots Louisiana Pacific Canada Ltd.

3.3.11 Forest Resource Management on Private Lands

Numerous projects have been established in Manitoba to promote reforestation/afforestation and forest management on private and municipal lands. The Woodlot Management Program, delivered by the Manitoba Forestry Association (MFA) and Manitoba Agriculture, Food and Rural Initiatives (MAFRI), is the principal private land program that may potentially be affected by the Bipole III Transmission Project. Woodlot location information was obtained from the aforementioned agencies that assist private landowners with the development of woodlot management plans and maintain a registry system (Section 5.2.3.4, Map 5-10).

The Agri-Environment Services Branch (AESB), formerly the Prairie Farm Rehabilitation Administration (PFRA), provides planting stock and technical support to landowners for the establishment, maintenance and improvement of farmstead and field shelterbelts. The AESB does not document the location of such planting projects; therefore, these afforestation projects were noted through photo and video interpretation of the Bipole III Transmission Project footprint in the southern agricultural zone of Manitoba.

The Manitoba Conservation District Associations provide support programs to municipalities that focus on management and rehabilitation of riparian areas, establishment and maintenance of field shelterbelts, triple row wildlife belts and block plantings. Similar to the AESB, these initiatives have not been geo-referenced and have been noted through photo and video interpretation where affected by the Project.

Manitoba Hydro promotes and offers support to communities through its Forest Enhancement Program. These community-based projects are usually located within the boundaries of towns, communities or First Nation Reserves, which are avoided by the Bipole III Transmission Project. Projects outside of the community boundaries are recreational or education based and identified through the constraints identification process and therefore avoided by the Project.

3.4 Environmental Assessment

The environmental effects assessment for the Bipole III Transmission Project was conducted on the following forest resource environment components:

- Productive forestland
 - o Annual Allowable Cut volumes
 - o Withdrawals from Forest Management License Areas (Appendix A)
 - o Standing timber
- > Research and monitoring sites
- > Private land forested values

3.4.1 Environmental Effects Assessment

The environmental effects assessment is guided by the Canadian Environmental Assessment Act (CEAA) Reference Guide: Determining Whether a Project is Likely to cause Significant Adverse Environmental Effects (Canada, Government of (B) website, 2011). The significance of residual environmental effects is assessed using the following eight assessment factors as identified in the Bipole III Transmission Project, Environmental Assessment Scoping Document (Manitoba Hydro, 2011B):

- 1. Direction
- 2. Ecological importance
- 3. Societal importance
- 4. Magnitude
- 5. Geographic extent
- 6. Duration
- 7. Frequency, and
- 8. Reversibility

Detailed directions for conducting the effects assessment on each of the environmental effects identified as part of this study are provided in Appendix D.

4.0 Basic Bipole III Transmission Project Description

The major components of the Bipole III Transmission Project are:

- ➤ A 500 kV HVdc transmission line;
- A new northern converter station, the Keewatinoow converter station, a construction camp and construction power station;
- ➤ A new southern converter station located at the Riel site in the Rural Municipality of Springfield;
- New 230 kV transmission lines linking the Keewatinoow converter station to the northern collector system at the existing 230 kV switchyards at Henday Converter Station and Long Spruce Generating Stations; and
- ➤ New ground electrode sites for each converter station, connected to the station by a low voltage feeder line.

4.1 500 kV HVdc Transmission Line

The Bipole III 500 kV HVdc transmission line will originate at the Keewatinoow converter station and terminate at the new southern converter station on the Riel site. The length of the line is over 1380 km, located on a 66 m wide right-of-way.

Two basic tower types will be used for the straight-line sections of the transmission line. In northern Manitoba and forested/pasture areas in the south, the line conductors will be suspended from guyed lattice steel towers. In the more densely developed areas of southern Manitoba, self-supporting lattice steel towers will be used to minimize potential effects on farming practice (i.e., to reduce the tower footprint) and to reduce the land acquisition requirement. Typical tower dimensions will be 45 m in height with a 7.8 m square base footprint for self-supporting towers. Towers will be spaced approximately 480 metres apart in most areas.

Prior to construction, the right-of-way and required easements will first be surveyed and flagged to establish the line alignment. Clearing and disposal of trees on the proposed right-of-way will be undertaken in advance to facilitate construction activities. Clearing requirements for the new transmission line rights-of-way will also require selective clearing of "danger trees" beyond the right-of-way. Such trees could potentially affect the function of the transmission line or result in safety concerns, and are normally identified during initial right-of-way clearing activities and removed.

A variety of methods are available for right-of-way clearing. Typically, these include conventional clearing done by tracked bulldozers, mulching by rotary drums, selective tree removal by **feller bunchers** (e.g., for removal of danger trees with minimal adverse effect to

adjacent vegetation and trees) and hand clearing with chain saws in environmentally sensitive sites. The transmission line ROWs will not require "**grubbing**" except at tower sites to facilitate foundation installation and to allow unencumbered access for equipment and safe walking areas for workers.

4.2 Keewatinoow Converter Station & Ground Electrode Facility

The new Keewatinoow converter station will be located about 5 km southwest of the Conawapa generating station site on the Nelson River. The principal components of the converter station are a converter building, a high-voltage ac switchyard and a high voltage dc switchyard required to terminate the 230 kV transmission line connections to the northern collector system, to convert the ac power from the collector system to dc power, and to provide the HVdc switching facilities necessary for termination of the new Bipole III transmission line. The converter station site is estimated to require a roughly rectangular site area, approximately 500 x 600 m in dimension for a total area of 24.5 hectares.

Construction activities for the converter station development will typically involve site preparation (e.g., removal of existing vegetation and organic topsoil from the site; addition and compaction of inorganic fill material, installation of station surface material) and initial infrastructure development (e.g., installation of station access roads and associated drainage, followed by installation of perimeter fencing and gates). Once general site improvements have been completed, other necessary civil works and systems will be installed (e.g., foundations for building and equipment, grounding arrangements, water supply, oil spill containment, site services and buildings). Station apparatus and equipment installation will follow, including filling of equipment with insulating oil, construction clean-up and commissioning.

The ground electrode required for the converter station will be located approximately 10 km south of the converter station site on the west side of the Conawapa access road. On the assumption of a shallow land ring electrode (similar to the electrodes used at the existing Henday and Radisson converter stations), the electrode will be a buried iron ring approximately 500 m in diameter and will require a site area in the order of one mile square, together with an access road for construction and ongoing maintenance. There will also be a low voltage (12 kV) overhead distribution line connection between the ground electrode site and the converter station. The low voltage line will be supported on guyed single wood poles and routed along an existing right-of-way.

A temporary construction camp will be established at the future Conawapa Generating Station site to house workers involved in the Keewatinoow converter station and ground electrode.

Construction power for the construction camp, converter station and electrode site will be provided by extending the existing 138 kV transmission line that runs from Kelsey Generating

Station to the Limestone construction power substation about 31 km to a new construction power substation located near the Keewatinoow converter station site.

4.3 Connections to the Northern Collector System

The proposed connections include one 230 kV transmission line about 55 km in length, from the existing 230 kV switchyard at Long Spruce Generating Station to a new 230 kV switchyard to be developed at the site of the new Keewatinoow converter station. In addition, four 230 kV transmission lines, each about 27 km in length, will be constructed from the existing 230 kV switchyard at Henday converter station to the new 230 kV switchyard at the new Keewatinoow converter station. The lines will share a common right-of-way 310 m in width. Guyed lattice steel towers will be used for the collector lines.

4.4 Riel Converter Station and Ground Electrode Facility

The new southern converter station will include the HVdc switchyard facilities necessary to terminate the new Bipole III transmission line, together with the converters and the ancillary facilities required to convert the dc power from the Bipole III transmission line to ac power at the 230 kV level necessary for injection into the southern receiving system. The southern converter station will be located at the existing Riel station site in the RM of Springfield, just east of Winnipeg, which is now under construction for sectionalization purposes. Site development under the sectionalization project will include the portion required for the converter station site.

Construction activities for the converter station development will involve necessary civil works and installation of systems (e.g., foundations for building and equipment, grounding arrangements, water supply, oil spill containment, site services and buildings). Station apparatus and equipment installation will follow, including filling of equipment with insulating oil, construction clean-up and commissioning.

The ground electrode required for Riel converter station will be located approximately 10 km from the station site. On the assumption of a shallow land ring electrode (similar to the electrodes used at the existing Henday and Radisson converter stations), the electrode will be a buried iron ring approximately 500 m in diameter and will require a site area in the order of one mile square, together with an access road for construction and ongoing maintenance. There will also be a low voltage line connection between the ground electrode site and the converter station. The line will be an overhead line supported by single wooden poles routed on a right-of-way on Manitoba Hydro property or within existing road allowances.

Construction power from the Riel sectionalization portion of the Riel station will be used for the Riel converter station and electrode site.

4.5 Connections to the Southern Receiver System

The Bipole III transmission line terminates at the Riel Station converter site, where the connections to the southern receiver system occur. The southern receiver system, serving Winnipeg and southern Manitoba, is fed from a network of 230 kV transmission lines originating at Dorsey Station and at a number of existing substations in the Winnipeg area. The Riel Sectionalization project includes sectionalization of several of these existing transmission lines, in order to enable injection of power from the sectionalized D602F at Riel. Although the resultant capacity of the 230 kV connections at Riel facilitates injection of power from Bipole III, additional transmission capacity will be required. The additional capacity will be provided by sectionalization of the existing Ridgeway-Richer 230 kV transmission line R49R at Riel Station.

4.6 Access

For Bipole III Transmission Project construction and maintenance purposes, Manitoba Hydro will use existing highways, municipal and forestry roads, trails and man-made linear features where possible, thereby minimizing the need to develop new access routes to the ROW. Access is required along the ROW and will be restricted to the ROW as much as possible, with deviations from the ROW limited to natural terrain features such as rock outcrops, excessively steep slopes, and where ingress and egress to stream crossings are logistically challenging and/or environmentally risky.

Where possible, Manitoba Hydro will limit all-weather access development to spur roads extending from existing roads to: the converter station sites, the northern work camp, the construction power station site and, the ground electrode sites. Access related to the construction and maintenance of the ground electrode lines, the construction power line (KN36), collector lines (L61K, K61H, K62H, K63H, K64H) and the Bipole III transmission line will be limited to existing infrastructure and the development of seasonal trails for winter work as much as possible. The access trails on transmission ROWs will be limited to seasonal trails.

4.7 Project Development Activities

The development of the Bipole III Transmission Project requires the permanent removal of the forested environments from the Keewatinoow converter station, the ground electrode sites and associated connecting line ROWs, the 66-meter Bipole III transmission line ROW, the five collector line ROWs connecting the new northern converter station to the existing Henday Converter Station and Long Spruce Generating Station and the construction power line ROW. Similarly, temporary and permanent access routes that may be required for the construction and maintenance of the project will result in loss of forest cover and productive forestland under forest management.

Harvesting, clearing and construction equipment and activities used for clearing the Project footprint have the potential to cause site disturbance that may affect the surrounding aquatic and terrestrial environments including damaging adjacent forest resources. During the maintenance phase of the Project, mechanical and chemical vegetation management practices also have the potential to negatively affect the surrounding aquatic and terrestrial environments through site disturbance and chemical drift where pesticides are used.

Prior to construction, the entire Project footprint will be cleared. Equipment and methods of clearing may vary but required results are that all trees are removed. This involves the removal of the above ground portion of the trees except in areas of towers and infrastructure components. In most areas of transmission line ROWs tree stumps are left in place to minimize disturbance to the environment. Merchantable timber, where practical and feasible, will be salvaged and utilized by the forest industry. Additionally, some timber in specific areas may be used for domestic purposes. All other organic debris, including timber not feasible to salvage, accumulated from the clearing process will be disposed of by burning, burying or other method approved by Manitoba Conservation. Where burning is the disposal method of choice, the debris will be piled well removed from the ROW edge to minimize damage to the adjacent vegetation communities.

5.0 Existing Environment

The existing forest resource environment for the Bipole III PSA (Map 1), which generally included three alternate routes, is more fully described in the *Manitoba Hydro*, *Forestry Technical Report*, *Existing Environment* (Plus4 Consulting Inc. et al, 2010). The following descriptions focus on the Bipole III Transmission Project footprint and its associated 4.8 km (3 mile) wide Local Study Area (LSA) (Map 2).

5.1 Data/Information Sources, Gaps and Deficiencies

5.1.1 Major Data Sources

Provincial legislation and policies related to the administration of the forest resource along with applicable agreements established between Manitoba and the forest industry are listed under Manitoba Legislation, Policies and Agreements below. The information used to characterize the forest resources and describe their management and utilization is listed under Available Information Sources below.

Manitoba Legislation, Policies and Agreements

- The Environment Act (Manitoba, Government of (O) website, 2011)
- > The Forest Act (Manitoba, Government of (O) website, 2011)
- The Wildfires Act (Manitoba, Government of (O) website, 2011)
- ➤ Crown Timber Allocation Policy (Manitoba, Government of (B) website, 2011)
- Forest Damage Appraisal and Valuation Policy (Manitoba Conservation, 2002)
- > Manitoba Crown Timber Pricing Policy (Manitoba, Government of (K) website, 2011)
- ➤ Forest Fire Priority Zones and Community Assessment Areas (Manitoba, Government of (D) website, 2011)
- ➤ Forest Management Guidelines for Terrestrial Buffers (Manitoba, Government of (G) website, 2011)
- > Timber Quota Policy (Manitoba, Government of (L) website, 2011)
- ➤ Louisiana Pacific Canada Ltd. Forest Management License Agreement (Manitoba, Government of (F) website, 2011)
- ➤ Tolko Industries Ltd. Forest Management License Agreement (Manitoba, Government of (F) website, 2011)

Available Information Sources

➤ National Ecological Framework for Canada (Ecological Stratification Working Group, 1995)

- ➤ Forest Resource Inventory, Manitoba Conservation (Manitoba, Government of (J) website, 2011)
- ➤ Forestlands Inventory, Manitoba Conservation (Manitoba, Government of (J) website, 2011)
- Land Cover Classification-Enhanced for Bipole, Manitoba Hydro (Joro Consultants, 2011B)
- ➤ Aboriginal Traditional Knowledge developed for the Bipole III Transmission Project (MMM Group Ltd. et al, 2011)
- ➤ Forest Management License Agreements (Manitoba, Government of (E) and (F) website, 2011)
- ➤ Manitoba Forestry Association Woodlot Program (Manitoba Forestry Association website, 2011)
- ➤ Manitoba Agriculture, Food and Rural Initiative Woodlot Program (Manitoba, Government of (A) website, 2011)
- ➤ Manitoba Conservation, Trees for Tomorrow (Manitoba, Government of (N) website, 2011)
- ➤ Manitoba Conservation growth and yield permanent sample plots
- ➤ Manitoba Conservation Tree Improvement Program (Manitoba, Government of (M) website, 2011)
- ➤ Manitoba Wildlife Habitat Management and Ecosystem Monitoring program (Manitoba, Government of (P) website, 2011)
- Canadian Forest Service research plots
- Acid Rain National Early Warning System permanent sample plots
- Natural Resource Canada Forest 2020 program (Canada, Government of (F) website, 2011)
- ➤ Boreal Ecosystem Atmosphere Study sites (Boreal Ecosystem Atmosphere Study website, 2011)
- Tolko Industries Ltd. growth and yield permanent sample plots
- Louisiana Pacific Canada Ltd. Ecological Monitoring Program permanent sample plots (Louisiana Pacific Manitoba (B) website, 2011)

5.1.2 Data Gaps and Deficiencies

A number of data gaps and deficiencies have been identified in the Forestry Existing Environment Report (Plus4 Consulting Inc. et al, 2010), as follows.

There are concerns regarding the Manitoba Conservation forest inventory data. As described in Table 2-1, the FRI in the Churchill River, Nelson River, Highrock, Aspen Parkland and, to a lesser extent Saskatchewan River FS's are between 20 and 35 years old. This static condition of the inventory does not accurately reflect the dynamic nature of the forest resource base. Although the Forestlands Inventory would close the age gap in some areas, its' area of coverage

is limited and its limitations in compatibility with the FRI, precludes its use for this assessment (see also Section 3.3.1).

An effort was made to address the static condition of the aged FRI through an update process that addressed obvious changes in stand attributes such as age and crown closure (Section 3.3.2). The update process also updated the FRI for fire, depletion and forest renewal activities that have occurred since inventory date. However, the update process only captures some (albeit important) components of the dynamic nature of forest stand development over time. The everchanging species composition, which change the stand area makeup of the forested land base, were not updated.

The Aspen Parkland FS is dominated by private land and any **afforestation** and **deforestation** initiatives that have occurred since the inventory was generated are not currently reflected in the FRI. Additionally, private land values attributed to the natural and artificially regenerated trees, shelterbelts and forest areas are not adequately reflected. Many of these initiatives have been implemented by successive generations of landowners and are deemed part of the heritage of the land. Environmental values are landowner specific and may not equate to the mere market value of the timber resource. Valuation guidance may be gained from the International Society of Arboriculture and will need to be considered on a case by case basis (International Society of Arboriculture website, 2011).

Of note also, particularly in the Forest Management Units 5, 10 and 11 there has been considerable migration of land ownership from **crown "open"** to **"restricted"** and to private ownership over the length of the inventory. The updates to FRI land use codes that reflect these developments have not been made.

Limited documented information exists regarding the domestic utilization of timber resources by Aboriginal people. First Nation peoples are required to secure a Timber Permit to exercise their treaty rights but are exempt from all fees. As not all First Nation peoples exercising their treaty rights to gather fuelwood understand that a Timber Permit is required, fuelwood use by First Nations may not be accounted for adequately within the Timber Permit system.

Limited data exists regarding environmental management and rehabilitation programs undertaken by the Manitoba Conservation Districts as this information has not been spatially recorded. Any changes, in terms of afforestation on municipal lands since the effective date of the forest inventories (Table 2-1), are not reflected in the forest inventories nor is the value or purpose of such investments readily available.

Forest renewal data was obtained from Manitoba Conservation and the forest industry. The data is challenging to work with as it was provided in numerous files with numerous duplications of records. Efforts were made to obtain all available information but because no single entity has a complete set of records, Manitoba Hydro has no guarantee that all forest renewal data was

acquired. In cross-referencing the data with aerial photography, it does appear that the vast majority of the data has been acquired.

Difficulties also exist in the application of the Provincial guidelines for determining timber dues needed for the FDA&V. The complex procedure involves product type, distance from mill and commodity pricing index (Manitoba, Government of (K) website, 2011). Timber dues tables are structured to reflect market value of a timber commodity at the time of harvest. This information is not available when timber salvage is projected several years into the future.

Manitoba Conservation has not developed a forest inventory for the Non-Commercial Forest Zone (Table 2-1, Map 4) which requires that this assessment utilize the Land Cover Classification Enhanced for Bipole (LCCEB) for the northern portion of the Project area.

Data Gap and Limitations Summary

- ➤ Effective date of the Forest Resource Inventory;
- ➤ Limitations of the Forestlands Inventory;
- ➤ Changes in land cover on private lands;
- ➤ Value of private land forest resources;
- ➤ Changes from "open" crown to crown land with restrictive development codes and private ownership;
- > Domestic timber utilization;
- > Complex and dynamic timber dues structure;
- > Potentially incomplete forest renewal records; and
- Lack of forest inventory data for the Non-commercial Forest Zone in northern Manitoba.

5.1.3 Implication of Gaps and Deficiencies

The effective date of the FRI data limits the ability to accurately assess the effects of the Bipole III Transmission Project on the Annual Allowable Cut (AAC) levels and in conducting the Forest Damage Appraisal and Valuation (FDA&V) (Manitoba Conservation, 2002, Appendix F). It is very difficult to assess timber dues for the volume of timber affected (part of the FDA&V) without definitively knowing the end use of the timber.

The lack of forest inventory data for the Non-Commercial Zone (Table 2-1, Map 4) makes it more difficult to identify forested areas that may be merchantable within this area. It also requires that two very different land cover data bases are used in this assessment. Lack of updating the FRI for private land forestry initiatives limits the ability to know where such initiatives took place and under what management objectives. Similarly, the valuation of afforestation projects implemented by Manitoba Conservation Districts and landowners cannot be readily identified and assessed. The poor accounting of changes to crown land development

codes compromises the FRI update process. Some codes limit the use of development and therefore suitability for inclusion into AAC effect calculations.

Where forest renewal records are missing in the Bipole III Transmission Project LSA, direct impacts to such sites may be inadvertently caused. Such effects would also not be reflected in the pre-project Forest Damage Appraisal and Valuation.

Because some First Nation people may not secure a Timber Permit when exercising their treaty right to gather fuelwood, may result in a misrepresentation of the current domestic use of forest resources within the Bipole III Project LSA.

5.1.4 Actions Taken

In order to estimate losses to the AAC and to conduct a Forest Damage Appraisal and Valuation (Manitoba Conservation, 2002) estimate, the FRI data needed to be updated (Section 3.3.1.1, Section 3.3.2). Ancillary data, including fire history, forest harvest, renewal and access development that have taken place since the effective inventory date have been acquired from Manitoba Conservation, Forestry Branch and the forest industry, and used to update the FRI. The methodology used to determine estimated AAC losses, timber volume loss and compensation using the FDA&V policy are provided in Section 3.3.3 and 3.3.4 respectively.

The determination of timber volume subject to crown dues is based on an estimate of standing volume and not an actual scale of wood. The valuation of timber dues in the damage appraisal process will be based on an estimated rate developed through the preparation of a composite dues table that reflects the most probable end use of the timber affected and the most probable commodity price index (Appendix G). The implications of using estimates of volume and dues rates will likely mean an adjustment will be required at the actual time of Project footprint clearing.

In order to address forest inventory gaps on private and municipal lands where forest cover change has occurred, the Project footprint was overlain with the 2009 orthophoto imagery and the cover change was noted, digitized and interpreted to update the FRI. Low-level, georeferenced, aerial, color video footage was used to supplement the interpretation. The methodology used to update the forest inventory on private and municipal lands is provided in Section 3.3.1.1.

The Land Cover Classification Enhanced for Bipole (LLCEB) was chosen as the primary land cover classification system for the Non-Commercial Forest Zone (Table 2-1, Map 4). The Non-Commercial Forest Zone was assessed for any commercial forest values using aerial photography and low-level, geo-referenced, aerial, color video footage taken from a helicopter flying along the transmission route. Summary results of the video/photo assessment are contained in Appendix B.

5.2 Existing Environment Description for the Bipole III Transmission Project

5.2.1 Overview

A general forest description and classification of the forest area, overlain by the Bipole III Transmission Project, is provided in Section 2.0. Section 4.0 provides a more specific, detailed description of the proposed Bipole III Transmission Project footprint. The following sections describe the environmental components that may be affected by the Project, including: the forest resource as classified by the FRI and LCCEB, domestic forest resource utilization, timber values as identified by Aboriginal Traditional Knowledge (ATK), sustainable wood supply, commercial forest resource allocations on crown lands, forest renewal initiatives, ongoing research and monitoring activities, and private land forest values.

5.2.2 Environmental Components

Base line information has been compiled below and forms the basis for conducting the environmental effects assessment of the proposed Bipole III Transmission Project on the forest resources.

5.2.2.1 Forest Resources on Crown Lands

Table 5-1 summarizes the area of productive forestland within the Commercial Forest Zone by FMU and FS for those FMUs intersected by the Bipole III Transmission Project. The largest proportion of the land base falls into the non-productive land category (59%). The majority of the productive forestlands (68%) are softwood and softwood dominant covertypes, which reflects the softwood dominated northern forest zone.

Table 5-1 Bipole III Transmission Project Footprint - Crown Land1 Forest Area

		Non-productive	Product	ive Forestland	(ha)	Total Area
Forest Section	FMU	(ha)	Softwood	Hardwood	Total	(ha)
Churchill River	74	14.1	120.0		120.0	134.1
Nelson River	88	406.2	208.8	17.7	226.5	632.7
	87	18.4	77.1	11.6	88.7	107.1
	85	85.2	148.6	65.1	213.7	298.9
	84	101.5	173.8	35.9	209.7	311.2
	83	293.7	117.4	23.9	141.3	435.0
Highrock	61	169.6	47.4	3.9	51.3	220.9
Saskatchewan River	55	309.0	218.0	6.5	224.5	533.5
	54	203.4	159.0	3.8	162.8	366.2
	52	453.9	26.9	6.4	33.3	487.2
Mountain	12	392.8	117.6	59.5	177.0	569.8
	11	253.3	75.0	175.0	250.0	503.3

		Non-productive	Product	Productive Forestland (ha)		
Forest Section	FMU	(ha)	Softwood	Hardwood	Total	(ha)
	10	260.8		253.0	253.0	513.8
Aspen Parkland	5	92.5		29.4	29.4	121.9
	4	3.3		0.5	0.5	3.7
	2	44.4		0.7	0.7	45.1
	1	48.2		5.1	5.1	53.3
Total		3,150.2	1,489.5	697.9	2,187.4	5,337.6

Source: Manitoba Conservation FRI 2010

The aerial photo assessment of forest resources intersected by the Bipole III Transmission Project footprint (Section 3.3.1.2) within the Non-commercial Forest Zone identified several sites where timber is of sufficient size for utilization under normal forest harvesting criteria. However, the sites are scattered, small in size and contain very small diameter, short wood that would, under normal circumstances, only be harvested within the context of a much larger stand of timber where a high proportion of that stand has larger diameter stems with greater length (Appendix B). Given the remoteness of this zone and distance to any processing facilities (The Pas), it is highly unlikely that it will be economically feasible to salvage any wood fibre from within the Non-commercial Forest Zone, other than for domestic purposes.

Table 5-1A Bipole III Transmission Project – Non-Commercial Forest Zone

	Non-productive	ve Forested Land (ha)				Total Area (ha)
	(ha)	Softwood	Broadleaf	Mixedwood	Total	
LSA	54,810.1	40,949.7	0.0	10,272.2	51,221.9	10,6032.0
Proj. Footprint	1,252.0	1,464.4	0.0	262.3	1,726.7	2,978.8

Classified using the Land Cover Classification Enhanced for Bipole (Joro Consulting, 2011B)

5.2.2.2 Forest Resources on Private Lands

Those forested private lands that are inventoried by the FRI are classified in the same manner as crown forestlands with the exception of ownership. Table 5-2 summarizes the land area on private lands by FMU and FS for those FMUs intersected by the Bipole III Transmission Project. Of the total Project footprint of 11,609 ha, 28% or 3,292 ha consist of private lands according to the provincial FRI. Private lands are virtually non-existant in the northern portions of the Project area but coincide with the agricultural zone in Manitoba; i.e. the Mountain and Aspen Parkland Forest Sections (Table 5-2).

Of the total Project footprint private lands, 2,706 ha (82%) consist of non-productive forestlands, while most of the productive forestlands (91%) are hardwood and hardwood dominant.

¹ Includes FRI ownership code 0, 1, 2

Table 5-2 Bipole III Transmission Project Footprint - Private Land Area

		Non-productive	Productive Forestland (ha)		Total Area (ha)	
Forest Section	FMU	(ha)	Softwood	Hardwood	Total	
Churchill River	74				0	0.0
Nelson River	88				0	0.0
	87				0	0.0
	85	0.3			0	0.3
	84	0.3			0	0.3
	83				0	0.0
Highrock	61	0.3			0	0.3
Saskatchewan River	55				0	0.0
	54	1.0	7.35		7.35	8.4
	52	7.8		3.2	3.2	11.0
Mountain	12	43.8	3.5	13.5	17.0	60.8
	11	189.8		34.6	34.6	224.4
	10	276.7	0.1	171.1	171.2	447.9
Aspen Parkland	5	365.7		96.3	96.3	462.0
	4	115.2		28.1	28.1	143.3
	2	670.6		75.1	75.1	745.7
	1	1,034.6	39.8	113.6	153.4	1,188.0
Total		2,706.1	50.8	535.5	586.3	3,292.4

Source: Manitoba Conservation FRI 2010

5.2.2.3 Commercial Forest Resource Utilization

In support of timber management and production, Manitoba Conservation, Forestry Branch, has provided long-term timber commitments to industry under the Timber Permit (Quota) system and under Forest Management License Agreements (FMLA) (Section 3.3.5). Such commitments are made to the industry to support their investments in processing facilities (e.g. sawmills, pulp mills, etc.). Existing long-term timber allocations within the FMUs affected by the Bipole III Transmission Project are shown in Table 5-3. The largest existing allocations are with the FML holders Tolko Industries Ltd. (for softwood) and Louisiana Pacific Canada Ltd. (for hardwood).

¹ Includes FRI ownership codes 4, 5, 6, 7, and 9.

Table 5-3 Bipole III Transmission PSA – Commercial Forest Resource Allocation

Forest Section	FMU	Allocation Type/Company	Softwood (m³)	Hardwood (m³)	Total (m³)
Non-Commercial Forest Zone	76	N/A	0	0	0
Churchill River	74	N/A	0	0	0
Nelson River	83, 85, 87	Quota	11,652	0	11,652
	84	Quota	1,578	251	1,829
	84	FMLA 2/Tolko ¹	215,982 ³	0	215,982
	83, 85, 87	FMLA 2/Tolko	555,908 ³	0	555,908
Highrock	61	FMLA 2/Tolko	51,250 ³	0	51,250
Saskatchewan River ⁴	52	Quota	356	0	356
	52	FMLA 2/Tolko	33,184 ³	0	33,184
	54	FMLA 2/Tolko	15,830 ³	0	15,830
	55	FMLA 2/Tolko	39,980 ³	0	39,980
Mountain	11	Quota	3,426	2,084	5,510
	12	Quota	16,421	2,000	18,421
	10	FMLA 3/LP ²	210	136,070	136,280
	11	FMLA 3/LP	114,014	142,116	256,130
Aspen Parkland	4	Quota	286	0	286

Source: Manitoba Conservation 2010.

5.2.2.4 Domestic Forest Resource Utilization

Manitoba Conservation administers domestic timber utilization through the issuance of Timber Permits. The estimation of First Nation Reserve fuelwood use is described in Section 3.3.6. Appendix E provides the Statistics Canada Reserve census dwelling data (Canada, Government of (A) and (I) websites, 2011) and estimated fuelwood use by FMU. Table 5-4 shows the average annual domestic timber utilization, by FMU, as compiled from the Manitoba Conservation Timber Permits and estimated fuelwood use on Reserves, which is not accounted for in the permitting process.

¹ Tolko Industries Ltd.

² Louisiana Pacific Canada Ltd.

³ Approximate AAC commitment at the net Merchantable utilization level.

⁴ Due to on-going FML #2/FMU/FS boundary changes, volume allocations for the FML #2 portion of FMU 12 (Map 6) are reported within the Saskatchewan River FS.

Table 5-4 Bipole III	[Transmission PSA -	Annual Domestic	Timber Utilization ((m3)
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Forest Section	FMU	Personal Use Timber Permits ¹	First Nation Use Timber Permits ¹	Est. First Nation Fuelwood Use	Total Domestic Timber Use
Non-	76	147	34	26	207
commercial					
Forest Zone					
Churchill River	74	0	0	0	0
Nelson River	83	193	80	173	446
	84	126	3	0	129
	85	0	30	143	173
	87	1,140	81	210	1,431
	88	0	0	58	58
Highrock	61	161	14	0	175
Saskatchewan	52	250	17	95	362
River	54	0	5	0	5
	55	105	24	0	129
Mountain	10	1,157	88	248	1,493
	11	1,138	174	103	1,415
	12	865	334	108	1,307
Aspen	1	63	3	78	144
Parkland	2	2	0	20	22
	4	256	43	75	374
	5	229	0	255	484
Total All		5,832	930	1,592	8,354

¹ Source: Manitoba Conservation. 2010

5.2.2.5 Aboriginal Traditional Knowledge and Use of the Forest Resource

Aboriginal Traditional Knowledge (ATK) for the Bipole III Transmission Project was secured through a separate process, and compiled and documented in the *Aboriginal Traditional Knowledge for the Bipole III Transmission Project* report (MMM Group et al, 2011). The report and supporting maps identified 79 forestry related values documented through the ATK process (Appendix C). In reviewing these 79 forestry values, 9 were found to be intersected by the Bipole III Transmission Project (Map 5, Section 6.1.1.4). The identified forestry values and their locations are summarized, by FMU from north to south, as follows:

- In FMU 86, an industrial sawmill site, no longer in use, was identified east of Arnot. No other sites were identified in FMU 86 that might be affected by the Bipole III footprint.
- In FMU 85, there was a small sawmill site identified beside Pikwitonie and four sites used for fuelwood collection adjacent to and northwest of Pikwitonie. Another fuelwood collection area, overlain by the Bipole III footprint (ATK_2), was identified on the west side of Partridge Crop Lake along with a trail from Pikwitonie to the fuelwood area (ATK_1). This area and trail are further discussed in Section 6.1.1.4.

- In FMU 84, a number of old sawmill sites that supplied timbers to Inco, were identified in the Thicket Portage area. There were two (2) fuelwood collection sites identified south of Landing Lake and two (2) industrial harvesting areas identified around Wintering and Landing Lakes. There were no sites identified in FMU 84 that would be potentially affected by the Bipole III footprint.
- ➤ In FMU 61, a winter road used for harvesting and hauling logs and lumber was identified on Wekusko Lake. There were no sites identified in FMU 61 that would be potentially affected by the Bipole III footprint.
- ➤ In FMU 57, an island was identified for timber harvesting in Cormorant Lake and a logging chute was identified on the eastern shore of the lake. There were two (2) sites identified, between Cormorant and Clearwater Lakes (ATK_4 & ATK_5), with a logging value, which are intersected by the Bipole III footprint. These sites are further discussed in Section 6.1.1.4.
- ➤ In FMU 55, an area with a logging value was identified between North Moose Lake and Cormorant Lake that is overlain by the Bipole III footprint (ATK_3). This site is further discussed in Section 6.1.1.4.
- ➤ In FMU 52, a logging area was identified on the southwest shore of Cedar Lake. There were no sites identified in FMU 52 that would be potentially affected by the Bipole III footprint.
- ➤ In FMU 14, logging roads were identified west of Mafeking. There were no sites identified in FMU 14 that would be potentially affected by the Bipole III footprint.
- FMU 12 contained the majority of the forestry values identified through the ATK process (Appendix C). There were 25 forestry values identified around Red Deer Lake. The majority of the Red Deer Lake areas are located on the western and southern areas of the lake and away from the Project footprint that is located on the east side of the lake and west of PTH 10. These areas included numerous old sawmill and commercial timber harvesting sites from the 1930s to the 1980s as well as areas identified for fuelwood gathering. There were also sites used for the collection of non-timber forest products like maple sap for syrup production and ash trees for craft work. Maple sap was also collected in the Dawson Bay area as well as ash trees for making sleds. There were two (2) fuelwood gathering areas identified that are overlain by the Bipole III footprint (ATK_6, ATK_7). These sites are further discussed in Section 6.1.1.4.
- FMU 11 also had numerous sites identified with forestry values. A number of old saw mill sites and fuelwood gathering sites were identified around Camperville. Red Deer Point on Lake Winnipegosis was also identified for fuelwood gathering and maple sap production. Areas south of PTH 20 and intersected by the Bipole III footprint were identified as historic harvest areas for fuelwood, spruce rails and tamarack fence posts (ATK_8). These sites are further discussed in Section 6.1.1.4.

Straddling FMUs 2 and 4 along the Assiniboine River valley, historic forestry values were identified as primarily non-timber forest products. Some fuelwood was also gathered (ATK_9). These areas are intersected by the Bipole III Transmission Project footprint. These sites are further discussed in Section 6.1.1.4.

Table 5-5 lists the forestry value areas identified by the ATK process and that are intersected by the Bipole III Transmission Project (Map 5).

Table 5-5 Bipole III Transmisison PSA - Aboriginal Traditional Knowledge Forestry Areas

FMU	Map #	Value Identification	Location
85	ATK_1	Winter trail for accessing fuelwood for domestic use. Incorporate location into EnvPP (Section 6.6)	A winter trail developed across land and lakes from Pikwitonei to commercial harvesting area identified in Map ID # 2
85	ATK_2	Commercial timber harvesting area for Tolko authorized under the 1997-2009 Forest Management Plan.	A very large area intersected by Bipole III that is located north east of Paint Lake and Wintering Lake and mid way between Pikwitonei and Thompson
55	ATK_3	Commercial timber harvesting area for Tolko and Duncan Waugh authorized under Tolko's 1997-2009 Forest Management Plan.	A very large area located between North Moose Lake and Cormorant Lake and is intersected by Bipole III
55	ATK_4	Commercial timber harvesting area for Tolko and Duncan Waugh authorized under Tolko's 1997-2009 Forest Management Plan.	A large area situated between Cormorant, Clearwater and Mawdesley Lakes that is bisected by Bipole III. This area overlays the southern portion of ATK_5
55	ATK_5	Commercial timber harvesting area for Tolko and Duncan Waugh authorized under Tolko's 1997-2009 Forest Management Plan.	A very large area situated between Cormorant, Clearwater and Mawdesley Lakes, intersected by Bipole III at the extreme southern extent of the area
12	ATK_6	Fuelwood area for own use and local sale. Predominately Tamarack. Incorporate location into EnvPP (Section 6.6)	A very large area located south and east of Red Deer lake with a portion of the area intersected by Bipole III
12	ATK_7	Fuelwood area for own use and local sale. Predominately Tamarack and Birch. Incorporate location into EnvPP (Section 6.6)	An area oriented north and south located west of PTH 10 which is intersected by Bipole III
11	ATK_8	Historic timber harvest area including fuel wood, rails and fence posts	Areas 96 & 97 south of PTH 20, oriented east—west and intersected by Bipole III
2, 4	ATK_9	Primarily non-timber forest products with some fuelwood	Areas 22 & 32 flanking the banks of the Assiniboine River and its valley; now primarily private lands

Source: (MMM Group Limited. et al, 2011)

In addition to site specific forestry values, the ATK and consultation process identified the following forestry interests/concerns pertinent to the Bipole III Project study area:

Communities have traditionally and continue to gather fuelwood for heating purposes;

- Communities would like the timber that is cleared from the Project footprint provided to them to be used as fuelwood or sold;
- Concern that cleared timber is not utilized;
- Concern that areas are not reforested;
- Members gather wood for artistic/craft purposes;
- The disposal of organic matter by burning;
- Provincial timber allocation practices;
- Concern over the use of herbicides for ROW maintenance, and
- Cumulative effects of forestry activities and Manitoba Hydro projects.

The above are further discussed in sections 6.1.1.6, 6.2.1, 6.2.2, 6.2.4, and 6.8.

5.2.3 Valued Environmental Components

Forestry specific Valued Environmental Components (VECs) were identified in the *Alternative Routes Evaluation*, *Forestry Technical Report* (Plus4 Consulting Inc., 2009B) and are further discussed here as they relate to the existing environment.

5.2.3.1 Productive Forestland

Productive forestlands form the basis for all forest management planning for Manitoba Conservation, Forestry Branch and the forest industries that use the resources. It is the basis from which Manitoba Conservation determines sustainable harvest levels for all crown lands, including FML areas allocated to the forest industry. Summaries of the amounts of productive forestlands by FMU on crown and private lands are provided in Tables 5-1 and 5-2. Important environmental indicators that provide the measurable parameters for the effects assessment for this VEC include the Annual Allowable Cut (AAC), area allocated under FMLAs, and standing volumes of timber. These are further discussed below.

Sustainable Harvest Levels

Manitoba Conservation determines sustainable harvest levels, represented as Annual Allowable Cut (AAC), by FMU. It considers all crown-owned productive forestland that is classified for forest management purposes. When determining the sustainable AAC levels, Manitoba Conservation Forestry Branch takes into consideration numerous environmental and operational factors to ensure sustainable levels of resource utilization are not exceeded. AACs are also reflective of the age class distribution of the forest stands across the productive forest area and their calculation may be periodically influenced by large wild fire events.

Manitoba Conservation calculates various levels of AAC using different utilization standards. For this Project effects assessment the "net merchantable" utilization level is used, which includes the volume of all species with a breast height diameter of 9.1 cm and larger, less the respective cull factors. It is the volume derived from theoretical AAC where the total area of the working group is used. The net merchantable utilization standard reflects the most optimistic

level of utilization of the forest resource. The Provincial AAC values on open crown land for FMUs affected by the Bipole III Transmission Project are listed in Table 5.6.

The Project will remove productive forestland from the land base. The extent to which productive forestland will be withdrawn and unavailable for consideration in AAC calculations is detailed in Section 6.1.2.1.

Table 5-6 Bipole III Transmission PSA - Provincial AAC Values1 for Open Crown Land

50411	Net Merchantable ² (m ³ /yr)			
FMU	Softwood	Hardwood		
1	1,010	24,530		
2	410	18,870		
4	1,410	21,050		
5	550	19,210		
10	1,730	112,290		
11	20,480	138,870		
12	93,350	118,130		
52	33,540	31,090		
54	15,830	1,410		
55	39,980	13,660		
61	51,250	19,400		
74	3,060	0		
83	246,710	93,040		
84	217,560	72,420		
85	156,220	46,690		
87	164,630	46,740		
88	14,560	8,720		
Total	1,062,280	786,120		

¹ AAC based on old inventory (FRI).

A valid and widely used estimator of AAC is the mean annual increment (MAI) of timber volumes on productive forestlands, represented as m3/ha/yr. The use of MAI to measure the effect on AAC resulting from a reduction to the forestland base is discussed in Section 3.3.3. and determined in Table 6.2.

² Net Merchantable volumes do not consider operational constraints.

Forest Management License Areas

Forest Management Licenses (FML) are awarded by the Province of Manitoba to forest companies with specific quantities of productive forestland, capable of supporting AAC levels, that can supply the fibre requirements of manufacturing facilities. Manitoba commits such long-term, sustainable land use designation to the investing industry, within the Forest Management License agreement, which stipulates limits of productive forestland withdrawal from the license area over 10 year periods. Where land withdrawal limits are exceeded, Manitoba must provide alternative sources of equal quality/cost resource and/or compensate the company for the withdrawals and any investments the company may have upon those lands. For a more detailed description of the land withdrawal conditions within FML #2 and #3 see Appendix A.

The Bipole III Transmission Project intersects the FML areas of Tolko Industries Ltd. (FML #2) and Louisiana Pacific Canada Ltd. (FML #3) (Map 6). The total productive forestlands within these license areas and the potential Project footprint withdrawal areas are shown in Table 5-7. The Bipole III Transmission Project footprint represents 0.1% and 0.13% of the productive forestlands within the affected FMUs of FMLs # 2 and # 3 respectively.

Standing Timber

The Bipole III Transmission Project footprint will be cleared of all trees. The volume of wood standing on productive forestland distributed over all age classes is considered under standing volume. Some of this wood volume may be merchantable, meaning that it is of sufficient size for utilization, is found in concentrations of sufficient volume, accessible and within reasonable distance to markets to make it economically practical and feasible to salvage. Forest Management License holders have first right to all merchantable timber within their license areas. The total volume of timber found on productive, crown-owned forestland and intersected by the Project is taken into account for the Forest Damage Appraisal and Valuation (Section 6.2.3, Appendix H).

5.2.3.2 High Value Forest Sites

Manitoba Conservation, Forestry Branch, requires that all commercially harvested forest sites be regenerated to specific Forest Renewal Standards (Manitoba Conservation, 2001). Silvicultural treatments that are implemented to achieve the Forest Renewal Standards require significant investments of time and resources. Such sites are therefore considered high value forest sites under Manitoba Conservations' Forest Damage Appraisal and Valuation Policy (Manitoba Conservation, 2002). Because of the economic investment in these sites and the related compensation when they are disturbed, high value forest sites are identified as VECs and considered in the Environmental Effects Assessment (Section 6.1.2.2).

Table 5-7 Bipole III Transmission PSA - Productive Forestland by FML Area

FML	Forest Section	FMU	Pre-Project Productive Forestland (ha)	Productive Forestland Withdrawal (ha)
		83	286,902	141
	Nelson River	84	215,036	210
	Neison River	85	174,159	214
		87	206,426	89
	Sub-Total Nelson R.		882,523	654
Tolko	Highrock	61	87,748	51
Industries	Sub-Total Highrock	87,748	51	
Limited	Saskatchewan River	52	57,215	33
FML #2		54	76,271	163
		55	50,113	225
	Sub-Total Saskatchewan R.	183,599	421	
	Mountain 12		40,426	39
	Sub-Total Mountain		40,426	39
	Total Tolko Industries Limited - FN	ЛL #2	1,194,296	1,165
		10	165,530	248
	Mountain	11	180,273	217
LP Canada		12 ¹	10	0
Ltd. FML #3	Sub-Total Mountain		345,813	465
	Total LP Canada Ltd FML #3		345,813	465
	TOTAL ALL		1,540,109	1,640

Source: Manitoba Conservation, 2011.

Forest harvesting activities have occurred within many of the FMUs intersected by the Bipole III Transmission Project. Generally speaking only the northern and southern most FMUs, which include the Non-Commercial Forest Zone, FMUs 74, 88, 2 and 1, have not seen forest harvesting on a commercial scale. Over the last decade some hardwood harvesting was seen on private land holdings in southern Manitoba with much of that wood flowing to mills in the United States.

Forest renewal became mandatory in 1984 to prescribed provincial standards. Factors such as site type, original species present, season of harvest and accessibility influence the type of forest renewal activities that need to be undertaken to re-stock the site to acceptable standards. There are three (3) general types of treatment prescriptions: natural regeneration (no treatment), assisted regeneration (scarification only), and planting (hand planting or site preparation and

¹GIS data error related; FML #3 does not officially extend into FMU 12.

planting). The highest concentrations of high value forest sites, in proximity to the Bipole III Transmission Project footprint, are located in FMUs 83, 84 and 85 in the Nelson River FS.

All known forest renewal sites on crown lands within the Project 4.8 km (3 mile) wide LSA are summarized in Table 5-8. Of the 8,072 ha within the LSA, 81% are located within the Nelson River Forest Section between Partridge Crop Lake and Ponton (Map Series 100).

Table 5-8 Bipole III Transmission Project LSA - High Value Forest Sites

Forest Section	FMU	# of Sites	Area (ha)
	87	49	1,034
	85	78	2,057
Nelson River	84	89	2,585
	83	54	835
	Subtotal	270	6,511
Highrock	61	17	226
Highlock	Subtotal	17	226
	55	9	522
Saskatchewan	54	4	57
River	52	31	391
	Subtotal	44	970
	12	42	362
Mountain	11	3	3
	Subtotal	45	365
	Total	376	8,072

Source: Manitoba Conservation, (2010).

Tolko Industries Ltd., (2010).

Louisiana Pacific Canada Ltd., (2010).

Mountain Forest Renewal Company, (2010).

Note: Number of sites provided may include multiple counting of individual renewal sites (as provided by Manitoba Conservation and the forest companies) where multiple polygons make up one plantation. Forest renewal sites prior to 1984 may not be represented in the data as records may not have been kept.

5.2.3.3 Research and Monitoring Programs

Research and monitoring sites have been established through Provincial and Federal programs as well as by Manitoba's forest industry. These sites have been identified as VECs (Section 3.2) and are described in Section 3.3.9 and assessed in Section 6.1.2.3.

Research and monitoring sites within the Project LSA are displayed in Map 7 and listed in Table 5-9. Sites within 500 meters of the ROW are listed in the table and are included in the Environmental Protection Plan (EnvPP) (Section 6.6) because they may be at risk to damage

during clearing, construction and maintenance activities. These include two Forest 2020 sites and one permanent sample plot. Mitigation measures are further discussed in Section 6.2.7. There are no research and monitoring sites identified that will be directly affected by the Bipole III Transmission Project footprint.

Table 5-9 Bipole III Transmission Project LSA - Research and Monitoring Sites

Activity	Agency / Descriptor	Location	Overlain by Project Area
Forest 2020	Private landowner. Legal description NW27-08-06E.	Plantation on opposite side of road from ROW. Adjacent to below	No
	Private landowner. Legal description NE27-08-06E.	Plantation on opposite side of road from ROW. Adjacent to above	No
Permanent Sample Plots	Manitoba Conservation	Plot center 206 m from edge of ROW. UTM: (14) 535490E 6084222N	No

5.2.3.4 Managed Woodlots on Private Land

Manitoba Conservation, Forestry Branch, through the Manitoba Forestry Association (MFA), and Manitoba Agriculture, Food and Rural Initiatives (MAFRI) promote private woodlot management (Manitoba Forestry Association website, 2011). They administer the program and assist landowners with the development of management plans for the woodlots, provide educational information and maintain a registry. Because of their importance and value to landowners these sites have been identified as VECs (Section 3.2) and are further described in Section 3.3.10 and assessed in Section 6.1.2.4.

Woodlots identified within the Project LSA are displayed in Map 8. Those within 500 meters of the ROW have been selected for inclusion in the EnvPP (Section 6.6) in order to identify those sites that may be at risk of damage from the Project clearing, construction and maintenance activities.

There are three (3) woodlots that are intersected by the Bipole III Transmission Project (Table 5-10). The ROW skirts the outside edge of all three (3) registered plan areas. The largest of these, in the vicinity of Alonsa, encompasses a full section. The ROW skirts the western edge for 1.6 kilometers (1 mile). Available information for the other two (2) affected woodlots indicates that they encompass a ½ section and ½ section oriented such that 0.8 kilometers (0.5 mile) of the ROW intersects each plan area.

The value of woodlots will vary depending on the investments made by the owner, the market value of the timber and/or the environmental and aesthetic values that the woodlot may be managed for. There are four (4) additional woodlots located within 800 meters of the Project footprint (Table 5-10).

Table 5-10 Bipole III Transmission Project LSA – Private Land Woodlots

Registering Agency	Municipality/Legal Description	Location
	South Norfolk	Southern edge of ¼ section
	SW 15-09-08W	overlain by ROW
	Alonsa	Western edge of section
Manitoba Agriculture Foods and Rural Initiatives	16-21-11W	overlain by ROW
riarai initiatives	Alonsa	Western edge of SW section
	S 21-21-11W	overlain by ROW
	South Norfolk	730 m from edge of ROW
	NW 15-09-08W	
	Springfield	610 m from edge of ROW
	NW 30-10-6E	
Manitoba Forestry Association	Westbourne	725 m from edge of ROW
	SW 1-14-10W	
	Ritchot	740 m from edge of ROW
	NW 9-7-3E	

5.2.3.5 Enhancement Projects in the Agricultural Zone

Aside from woodlot management (Section 5.2.3.4), the establishment of shelterbelts is the predominant forest enhancement activity on private land in the agricultural zone. Manitoba Conservation's *Forest Inventory Field Manual* (1998) provides one classification code for shelterbelts (99734). The forest inventory updating process, described in Section 3.3.1.1, defined additional shelterbelt classifications that reflect their establishment objectives within the agricultural zone. Shelterbelts are often established along roads and around yard sites for aesthetic values and protection from the elements, in fields for snow retention and soil protection and around wetlands or adjacent to waterbodies for wildlife habitat purposes.

Shelterbelts identified within the Project LSA are shown in Map Series 200. Information on shelterbelts is limited to what is within the dated FRI. The land cover update process (Section 3.3.1.1) for the agricultural zone was only applied to the 66 meter transmission ROW. Shelterbelts directly affected by the Bipole III Transmission Project are quantified and discussed in Section 6.1.2.5. Table 5-11 summarizes the shelterbelts, by classification, within the Project footprint. Privately owned shelterbelts are included as environmentally sensitive sites in Section 6.6. A total of 125 shelterbelts are intersected by the Bipole III Transmission Project in the agricultural zone.

Table 5-11 Bipole III Transmission Project Footprint - Agricultural Zone Shelterbelts

	Shelterbelt Classification ¹							-	otal
99735		99736		99737		99	738	iotai	
#	ha	#	ha	#	ha	#	ha	#	ha
1	0.02	82	12.16	38 6.38 4 0.53				125	19.09

Source: Manitoba Conservation FRI 2010 Enhanced for Bipole

¹ Additional shelterbelt classifications developed for the agriculture zone FRI reclassification (Sec. 3.3.1.1). 99735 = farmyard shelterbelt; 99736 = field shelterbelt; 99737 = road shelterbelt; 99738 = wildlife shelterbelt **Note: area (ha) is approximate.**

6.0 Environmental Effects Assessment

This section of the Forestry Technical Report presents the results of the effects assessment on the forest environment determined through literature review and the quantification of Project effects on the defined Valued Environmental Components. Mitigation measures are proposed to minimize the identified effects and monitoring requirements for the construction and maintenance phases of the Project are defined. Potential cumulative effects including climate change are discussed.

6.1 Environmental Effects Identification and Assessment

The identification and quantification of the effects of the Bipole III Transmission Project on the forest environment has been broken down into two sections. The first section provides a literature review of the potential effects of the Project and quantifies the effect on specific components of the forest environment. The second section addresses the effects on the previously defined Valued Environmental Components (Section 5.2.3).

6.1.1 Literature Review and Assessment of Study Results

6.1.1.1 Bipole III Transmission Project Footprint

Carvell and Johnston (1978) noted that damage and decline of trees adjacent to transmission line ROWs is often the result of scorching from slash burning during clearing or mechanical damage to tree roots and trunks from heavy equipment. Such damage usually does not kill the tree(s) directly, but the wounds can act as access points for insects and disease (Clatterbuck, 2006). The implementation of best operating practices including, limiting clearing operations to frozen ground conditions, and limiting the need to remove stumps to tower locations and other infrastructure sites will minimize soil disturbance and root damage to trees thereby substantially mitigating operational concerns. These protection and mitigation measures will be incorporated into the Bipole III Transmission Project, Construction Phase Environmental Protection Plan (EnvPP).

Although the White Spotted Sawyer Beetle (*Monopchamus scutellatus*) prefers dead and dying conifers, it will attack live trees as well (Ives, 1982). As adults emerge from the larval stage, they feed on the tender bark and twigs of healthy trees (Ontario Ministry of Natural Resources, 2007). Sawyer beetle populations are known to spike in areas of prolonged drought, snow damage, blow-down, fire and in timber harvest areas where slash levels are high. Incidents of damage or mortality to healthy trees in adjacent areas, as a result of adult feeding, are not uncommon (Evans et al, 2007). Row clearing and slash disposal practices will minimize residual

woody debris accumulations that may otherwise attract high sawyer beetle populations. This will minimize the risk of damage to trees adjacent to the Project footprint.

Although slim, the potential exists to encounter elm trees (American and Siberian) in southern Manitoba during the ROW clearing process. Storing dead elm wood is prohibited by law in Manitoba as it contributes to the spread of Dutch Elm Disease (DED) by providing feeding areas and overwintering sites for the elm beetle (Manitoba, Government of (C) website, 2011). The beetle is responsible for transfering fungal spores from infected trees to healthy trees, thereby spreading the disease. All elm wood must be immediately burnt, chipped or disposed of at designated disposal sites.

Risk of wild fire exists where cleared vegetative debris is burnt following ROW clearing. Care must be taken to limit burning activities to winter months and on mineral soils. Monitoring activities must ensure all fires are extinguished prior to spring breakup. Debris piles must be placed well away from the ROW edge to minimize the risk of scorching adjacent trees and vegetation. Alternative methods of vegetative debris disposal may include chipping, mulching, mounding and burying.

MacCrimmon et al (2000) and Carvell and Johnston (1978) attributed forest decline and loss of vigour to climatic changes that are associated with opening a dense forest stand. Studies have indicated noticeable changes in temperature, humidity, light, wind speed and snow depth in ROW corridors. These factors impact edge vegetation along the ROW and may cause blowdown and mortality (United States, Government of (A) website, 2011). This damage may not appear immediately after clearing but rather when wind conditions are right or when trees are stressed from periodic, unfavourable climatic conditions. Less dramatic differences in climatic conditions influence vegetation health and species composition over the long-term as species tolerant to the new conditions become more dominant. Effects include vegetation density and species abundance (MacCrimmon et al, 2000). These ecological changes are also further discussed in the *Terrestrial Ecosystems and Vegetation Assessment of the Bipole III Transmission Project* report (Szwaluk et al, 2011).

Thin-barked tree species (some species of poplars) are subject to damage and mortality when exposed to full sunlight and the increase in temperature fluctuations brought about by ROW clearing. Sunscald to the bark and **cambium** layers of newly exposed trees may result in severe damage or mortality (Canada, Government of (H) website, 2011).

The creation and existence of ROWs may facilitate additional local access. Associated with access are increased fire occurrence risk (human caused) and the introduction and proliferation of vegetation species that do not currently exist within specific ecosites (Szwaluk et al, 2011). Manitoba Hydro, in consultation with stakeholders, will identify areas of concern from an access perspective and develop an access management plan prior to clearing and construction, thereby

reducing the risks and effects of unwanted access. The access management plan will form part of the EnvPP.

Although hazard trees can result in fire occurrence along the transmission lines and in associated forest stands, if they come in contact with the transmission line conductors, this risk is very low as trees are relatively wind firm and ROWs are cleared to ensure trees cannot come in contact with transmission lines. Furthermore, hazard trees are actively identified and removed, even where these exist outside of the cleared ROW (North American Electric Reliability Corporation website, 2011).

Access activities associated with line construction could impede surface drainage (through soil compaction, rutting or **berming**), resulting in mortality in surrounding vegetation, altered vegetation community structure and potential changes in green house gas (GHG) exchange rates (Plus4 Consulting and Agriculture Canada, 2003). The potential is highest in low-lying areas where water tables are usually nearer the surface. Blockage of overland drainage patterns on upland sites could have the same effect. Risk of soil erosion and sediment deposition in nearby water bodies are additional concerns, particularly on mineral soils and undulating topography. These risks must be recognized and considered at all levels of planning and development. Limiting project construction to winter, when the ground is frozen, minimizes the need for soil disturbance and road construction, which minimizes the risk of affecting existing drainage patterns.

Forest fragmentation occurs where plant communities become divided or isolated as a result of man's or nature's interventions (MacCrimmon et al, 2000; United States, Government of (B) website, 2011). It is also recognized that forest fragmentation often takes place in a series of stages where multiple developments over time contribute to the problem. Forest fragmentation contributes to the creation of edge habitat and, in scenarios of human dominated ecosystems, severe fragmentation may ultimately result in the removal of most forest cover with patches or islands of forest remaining (MacCrimmon et al, 2000). Forest fragmentation issues are largely ecology and wildlife related and are further discussed in the Bipole III vegetation and wildlife technical reports (Szwaluk et al, 2011; Wildlife Resource Consulting Services Inc., 2011; Joro Consultants Inc. et al, 2011, Joro Consultants Inc., 2011).

6.1.1.2 Commercial Forest Resource Utilization

The effects of the Bipole III Transmission Project development to commercial forest resource utilization are primarily limited to the conversion of productive forestland to non-productive land. The extent of this effect is further discussed in Section 6.1.2.1 under Valued Environmental Components. Effects extend to sustainable harvest levels, productive forestlands under Forest Management License Agreements and volumes of standing timber.

6.1.1.3 Domestic Forest Resource Utilization

Domestic forest resource utilization is limited primarily to the personal use of fuelwood and, to a limited extent, the production of lumber for personal needs. The preferred fuelwood species are birch, ash and tamarack, which are not commercially utilized species, and to a lesser extent pine and aspen, which are utilized by the forest industry in the Project area. Dead and dry standing trees are often preferred over live trees, as they can be burnt in the year of harvest. Fuelwood is often salvaged from commercial harvest sites, which reduces the overall demand on the forest resource and makes use of some of the woody debris that may otherwise be left on the harvest site.

The Manitoba Conservation Five-Year Report on the Status of Forestry, April 2001 – March 2006 (2006) shows an AAC surplus in all project area FMUs, with the exception of FMU 10 where the softwood AAC is fully utilized. The combined domestic utilization, from Timber Permits and estimated First Nation fuelwood gathering, is less than 8,400 m³ for all of the FMUs overlain by the Bipole III Transmission Project (Table 5-4). There will be little effect from the Project on domestic forest utilization given the relatively small volume harvested, the preference for species that are not commercially utilized, the salvage of non-merchantable timber for fuelwood and an AAC surplus in almost all FMUs.

The effect of Project development on domestic forest resource utilization is limited to the ability of people, residing adjacent to the Project footprint, to access the forest for fuelwood gathering purposes. The potential effect is limited to the duration of construction and maintenance activities at site-specific locations that will move as Project construction progresses. Where demand exists Manitoba Hydro may make salvage timber available as fuelwood to nearby communities as part of clearing activities. The effect on domestic forest resource utilization is minimal and potentially positive.

6.1.1.4 Aboriginal Traditional Knowledge and Use of the Forest Resource

There are 79 forestry related values identified through the Bipole III Aboriginal Traditional Knowledge program (MMM Group Ltd. et al, 2011) described in Section 5.2.2.5 and Appendix C. A review of the ATK forestry values identified nine (9) areas (Table 5-5) that are adjacent to or overlain by the Bipole III Transmission Project footprint.

The ATK map areas identified as numbers ATK_2, ATK_3, ATK_4 & ATK_5, in Table 5-5 and Map 5, are commercial timber harvesting areas authorized under the Tolko 1997-2009 Forest Management Plan. The intersection of the Bipole III Transmission Project with these commercial timber harvesting areas does not constitute an effect on ATK timber interests. Effects of the Project on the commercial allocation of the forest resource are assessed in Section 6.1.2.1.

The ATK map areas ATK_6 & ATK_7 were identified by participants in the ATK process, where fuelwood (tamarack and birch) are gathered for local use. Map area ATK_1 is a winter trail that leads to a commercial harvesting site (Map area ATK_2) that is also used for gathering fuelwood. The ROW overlies these three gathering sites. Map area ATK_8 was indicated as an area for harvesting fuelwood, rails and fence posts. Map area ATK_9, also intersected by the Project footprint, was indicated as an area where fuelwood was harvested. Today this Map area ATK_9 consists primarily of privately owned lands.

The effect of the Project on fuelwood and timber products gathering during the construction, maintenance and decommissioning phases will be minimal; however, site specific access restrictions may apply, from time to time, for safety purposes. The effect is mitigable by maintaining access to areas of the ROW that are not actively under construction and/or by making timber from the Project clearing operation available to local fuelwood users at designated locations, according to local demands.

The effects of Project development to ATK forest values are limited to the ability of communities, in proximity to the Project, to access the forest for fuelwood/craftwood gathering. The effect is limited to the duration of construction and maintenance activities on site-specific locations that will move as the project progresses. Where demand exists Manitoba Hydro may make salvage timber available as fuelwood to nearby communities. The effect on ATK forest values is therefore minimal and possibly positive. Other forestry related aspects of concern (Section 5.2.2.5) are addressed in sections 6.1.1.6, 6.2.1., 6.2.2, 6.2.4 and 6.8.

6.1.1.5 Non-Commercial Forest Zone

The effects of the Bipole III Transmission Project on the forested environment in the Non-Commercial Forest Zone are shown in Table 6-1. The effects are compared to the Project LSA represented as a 2.4 km (1.5 miles) radius geographic area extending as a whole from all project components (Section 4.0). While 2.8 % of the LSA will be affected, 3.4% of the forested land base within the LSA will be affected, most of which will be cleared. A high proportion of that (85%) is classified as softwood. The overall effect on the forest environment in the Non-Commercial Forest Zone is minimal.

Table 6-1 Bipole III Transmission Project - Effects on the Non-Commercial Forest Zone Forest Resources

	Non Productive		Total Area (ha)			
	(ha)	Softwood	Broadleaf	Mixedwood	Total	
LSA	54,810.1	40,949.7	0.0	10,272.2	51,221.9	106,032.0
Proj. Footprint	1,252.0	1,464.4	0.0	262.3	1,726.7	2,978.8
Footprint % of LSA	2.3	3.6	0	2.6	3.4	2.8

Source: Land Cover Classification - Enhanced for Bipole. 2010

6.1.1.6 Right-of-Way Maintenance

Manitoba Hydro (2007), Bramble et al (1983), Munro (1992) and Welch (1984) state that the objective of vegetation management on electricity ROWs is to promote low-growing, relatively stable plant associations which impede growth of tall unwanted woody vegetation. This objective of biological control relies on initial strategies of vegetation control (combination of chemical and mechanical) to take advantage of existing herbaceous and shrub species to produce a stable climax community which represents a barrier to tall woody plant invasion. This strategy also minimizes potential negative effects on forests and trees adjacent to the ROW.

Carvell and Johnston (1978) reported that mechanical damage from line maintenance and vegetation management activities are more frequent on ROWs where heavy equipment is used. Negative risks are associated with potential pollutant spills from mechanized maintenance operations, herbicide drift or errant applications. The risks of these negative effects can be reduced or eliminated where biological vegetation control measures are implemented. Proper, often integrated, vegetation management strategies on ROWs can produce stable yet rich plant communities that are beneficial to local wildlife populations (Geier, 1992; Bramble et al, 1983).

ROW clearing and maintenance activities can also have an impact on understory vegetation in adjacent stands. Regeneration under a forest canopy is dependent on a number of environmental factors including light, soil moisture, temperature and seed source (MacCrimmon et al, 2000). The opening created in a forested environment by the ROW can significantly alter one or more of these factors, thus potentially affecting the species composition, rate of establishment and survival in immediately adjacent forest stands. In most cases, **shade intolerant species** begin to appear along the route edge. This effect is limited to a relatively narrow, parallel adjacent band on both sides of the cleared ROW that are susceptible to climatic changes as a result of the clearing. Most likely to be affected are **shade tolerant species** that have established themselves in a previously shady environment.

The effects of ROW maintenance to commercial forest resources are limited as they apply to a very narrow band (local) along the edge of the ROW. Project induced damage and mortality is limited to single trees and occasionally small clumps of trees where **wind throw** damage may be enhanced by the ROW opening. Wind throw events are usually small scale and infrequent and may not be solely due to the existence of the ROW. Stand age, health, wind direction and speed may be the over riding factors with wind throw. The overall effect of vegetation management on the ROW is minimal.

6.1.3 Assessment of Valued Environmental Components

6.1.2.1 Productive Forestland

The measurable parameters for the effects assessment for this VEC include the annual allowable cut (AAC) levels, area allocated under FMLAs, and volume of standing timber. These are further discussed below.

Annual Allowable Cut Levels

The effects of the Bipole III Transmission Project on AAC, by Forest Management Unit and Forest Section, are very small, as shown in Table 6-2. In terms of volume reductions, the highest effect is on the softwood AAC in the Nelson River Forest Section and the Mountain Forest Section for hardwood. Percentage wise all effects on AAC at the Forest Section level (softwood and hardwood) are fractions of one (1) percent with the exception of softwood AAC in the Churchill River Forest Section (FMU 74), where the effect equates to 1.5% of the existing. Of note is that Manitoba has no timber commitments in FMU 74. Project effects on the AAC are lost when placed in context with the likely error inherent in AAC calculations of plus or minus 10% (pers. comm. East, 2011).

Forest Management License Areas

The effect of the Bipole III Transmission Project on FML #2 and #3 regarding productive forestland withdrawal are shown in Table 6-3. The productive forestland effects on an FMU and FML basis are minimal amounting to a maximum of 0.45% in FMU 55. As a percentage, over the three FMUs in the Saskatchewan River FS, the withdrawal amounts to 0.23%. In terms of area affected at the FML level, reductions will amount to 1,165 ha and 465 ha for Tolko Industries Ltd. (FML #2) and Louisiana Pacific Canada (FML #3) respectively. The aforementioned areas equate to 5.4% of the FML #2 allowable withdrawal limit (21,420 ha or 0.5%) within the 10-year period 2009 to 2019. For FML #3 the Project related reduction amounts to 28.3% of the allowable withdrawal limit (1950 ha or 0.5%) within the 10-year period 2004 to 2014. These effects have to be taken in context with other productive forestland withdrawals occurring on the FMLs and within these time frames. On their own, the effect of productive forestland withdrawal from FML areas is minimal.

Standing Timber

Effects on standing timber volumes in those FMUs intersected by the Bipole III Transmission Project are shown in Table 6-4.

The volume of timber found on the crown-owned portion of the Project footprint will be used in the Forest Damage Appraisal and Valuation assessment to determine financial compensation due to Manitoba Conservation (Section 6.2.3; Appendix H).

Table 6-2 Bipole III Transmission Project - Effect on Annual Allowable Cut Levels

Forest Section			lerchantable ² ³ /yr)	Project Ef	fect (m³/yr)	Project E	Effect (%)
Section	FMU	Softwood	Hardwood	Softwood	Hardwood	Softwood	Hardwood
	1	1,010	24,530	0.175	4.097	0.017	0.017
Aspen	2	410	18,870	0.023	0.509	0.006	0.003
Parkland	4	1,410	21,050	0.004	0.103	0.000	0.001
	5	550	19,210	0.588	14.950	0.107	0.078
Subtotal		3,380	83,660	0.790	19.659	0.023	0.023
	10	1,730	112,290	22.136	223.604	1.280	0.199
Mountain	11	20,480	138,870	67.756	151.552	0.331	0.109
	12	93,350	118,130	106.662	60.458	0.114	0.051
Subtotal		115,560	369,290	196.554	435.614	0.170	0.118
Conto	52	33,540	31,090	21.549	9.083	0.064	0.029
Sask. River	54	15,830	1,410	73.387	8.877	0.464	0.630
	55	39,980	13,660	211.380	24.270	0.529	0.178
Subtotal		89,350	46,160	306.316	42.230	0.343	0.091
Highrock	61	51,250	19,400	30.938	3.901	0.060	0.020
Churchill	74	3,060	0	45.732	0.955	1.495	0
	83	246,710	93,040	136.373	28.121	0.055	0.030
Nalaan	84	217,560	72,420	222.090	42.002	0.102	0.058
Nelson River	85	156,220	46,690	207.419	70.156	0.133	0.150
	87	164,630	46,740	93.086	16.297	0.057	0.035
	88	14,560	8,720	201.319	32.943	1.383	0.378
Subtotal		799,680	267,610	860.287	189.519	0.108	0.071
Grand Total	All	1,062,720	786,120	1,440.617	691.878	0.136	0.088

¹ AAC based on old inventory (FRI)
² Net Merchantable volumes do not consider operational constraints

Table 6-3 Bipole III Transmission Project - Effects on FMLAs

FML	Forest Section	FMU	Pre-Project Productive Forestland (ha)	Productive Forestland Withdrawal (ha)	Productive Forestland Withdrawal (%)
		83	286,902	141	0.05
	Nelson River	84	215,036	210	0.10
Neisc	Nelson River	85	174,159	214	0.12
		87	206,426	89	0.04
	Sub-Total Nelson R.		882,523	654	0.07
Tolko	Highrock	61	87,748	51	0.06
Industries	Sub-Total Highrock	87,748	51	0.06	
Limited		52	57,215	33	0.06
FML #2	Saskatchewan River	54	76,271	163	0.21
		55	50,113	225	0.45
	Sub-Total Saskatchewan R.		183,599	421	0.23
	Mountain	12	40,426	39	0.10
	Sub-Total Mountain		40,426	39	0.10
	Total Tolko Ind. Ltd FML #2		1,194,296	1,165	0.10
		10	165,530	248	0.15
	Mountain	11	180,273	217	0.12
LP Canada		12	10	0	0.00
Ltd. FML #3	Sub-Total Mountain		345,813	465	0.13
	Total LP Canada Ltd FML #3		345,813	465	0.13
	TOTAL ALL		1,540,109	1,640	0.11

Source: Manitoba Conservation, 2011.

The assessment of the Non-commercial Forest Zone (Appendix B) identified small areas of standing timber with potential salvage value. No volume estimates are available for this zone as no inventory, volume tables or MAI values exist for this zone. These areas are deemed to have minimal to no commercial value due to the very small area overlain by the Project footprint, the broad geographic distribution of these areas, the marginal forest stand condition (stem diameter, length and density) and the long distance from any manufacturing facility. Salvage opportunities within the Non-commercial Forest Zone, for fuelwood, may exist if a demand from local communities is identified.

¹ GIS data error related; FML #3 does not officially extend into FMU 12.

Table 6-4 Bipole III Transmission Project - Effect on Standing Timber on Crown Land

FMU	Pre-Project Standing Timber Gross Merchantable (m3)		Project Effect on Standing Timber Gross Merchantable (m3)			Project Effect (%)			
	Softwood	Hardwood	Total	Softwood	Hardwood	Total	Softwood	Hardwood	Total
1	128,966	621,173	750,139	2	245	248	0.00	0.04	0.03
2	50,967	552,753	603,720	0	41	42	0.00	0.01	0.01
4	160,351	696,935	857,286	0	21	21	0.00	0.00	0.00
5	92,142	778,752	870,893	12	955	966	0.01	0.12	0.11
10	1,486,580	4,017,594	5,504,173	243	8,273	8,516	0.02	0.21	0.15
11	2,845,759	3,400,322	6,246,081	4,157	8,123	12,280	0.15	0.24	0.20
12	7,346,246	3,734,744	11,080,990	8,552	3,332	11,884	0.12	0.09	0.11
52	2,118,823	938,554	3,057,377	1,403	659	2,062	0.07	0.07	0.07
54	1,274,538	167,369	1,441,907	2,384	466	2,849	0.19	0.28	0.20
55	2,298,715	581,664	2,880,378	14,028	1,888	15,916	0.61	0.32	0.55
61	3,425,883	1,091,532	4,517,415	3,539	353	3,891	0.10	0.03	0.09
74	487,622	52,895	540,517	1,912	79	1,991	0.39	0.15	0.37
83	14,447,942	4,498,548	18,946,490	9,996	2,182	12,178	0.07	0.05	0.06
84	13,459,202	4,119,344	17,578,546	12,817	2,736	15,554	0.10	0.07	0.09
85	9,774,590	2,888,710	12,663,301	13,964	5,302	19,266	0.14	0.18	0.15
87	8,661,174	2,294,057	10,955,231	5,966	1,076	7,042	0.07	0.05	0.06
88	1,600,461	443,127	2,043,588	9,651	2,198	11,849	0.60	0.50	0.58
Grand Total	69,659,961	30,878,072	100,538,033	88,627	37,928	126,555	0.13	0.10	0.12

¹Gross Merchantable Volume does not consider operational constraints or cull factors. Gross Merchantable volume was used in the FDA&V.

6.1.2.2 High Value Forest Sites

Of the 8,072 ha of high value forest sites found within the Project LSA, 126 ha (1.6%) will be directly affected and therefore lost (Table 6-5, Map Series 100). Although considerable in area, it is small (0.4%) relative to the almost 30,000 ha reported reforested by the two FML holders Tolko Industries Ltd. and Louisiana Pacific Canada Ltd. within the five year period April 2001 to March 2006 (Manitoba Conservation, 2006).

Table 6-5 Bipole III Transmission Project - Effect on High Value Forest Sites

Table 0-3 Dipole III Transmission Project - Effect on Fight Value Polest Sites									
Forest Section	FMU	LSA (ha)	Project Area (ha)	% Affected					
	87	1,034	23.2	2.2					
	85	2,057	35.2	1.7					
Nelson River	84	2,585	49.1	1.9					
	83	835	5.9	0.7					
	Subtotal	6,511	113.4	1.7					
Highrock	61	226	0	0					
riigiii ock	Subtotal	226	0	0					
	55	522	4.2	0.8					
Saskatchewan River	54	57	2.8	4.9					
Suskateriewan kiver	52	391	3.3	0.8					
	Subtotal	970	10.3	1.1					
	12	362	2.3	0.6					
Mountain	11	3	0	0					
	Subtotal	365	2.3	0.6					
	Total	8,072	126.0	1.6					

Source: Manitoba Conservation, (2010).

Tolko Industries Ltd., (2010).

Louisiana Pacific Canada Ltd., (2010).

Mountain Forest Renewal Company, (2010).

Although recognized as important with significant financial investments, the effects on high value forest sites are limited to the construction phase of the Bipole III Transmission Project and will be limited to the extent of the Project footprint. The projected losses and the permanency of the effects are also accounted for in the Forest Damage Appraisal and Valuation process (Sections 3.3.4 and 6.2.3; Appendix H) and under loss of productive forestland.

In addition to the direct effects of the Project on high value forest sites discussed above, the potential exists for damage to adjacent sites from errant equipment. This is accounted for and further discussed under mitigation in Sections 6.2.6 and 6.6.

6.1.2.3 Research and Monitoring Programs

Research and monitoring initiatives within the Bipole III Transmission Project LSA are described in Section 5.2.3.3 (Map 5.4). As a result of considerations during the routing process, no research and monitoring sites are being directly affected by the Project. Therefore, no negative effects are expected as a result of the Project.

Three research and monitoring sites are located in close proximity to the Project footprint. In order to protect these, site mitigation measures are provided in Section 6.2.7.

6.1.2.4 Managed Woodlots on Private Land

Nineteen (19) private woodlot areas have been identified within the Bipole III Transmission Project LSA (Section 5.2.3.4). Three (3) of these, registered through the Manitoba Agriculture, Food and Rural Initiative, are intersected by the proposed ROW (Table 6-6). A total of 21.24 ha of woodlot area will be affected. Given that each landowner may have their own management objectives and perceived value of their woodlot area, it makes it difficult to assess effects in isolation of owner input. Purely from an aerial extent perspective, the effect appears limited. However, the effect to an individual affected woodlot owner is dependant on their specific perspective. To minimize negative effects, it will be important for Manitoba Hydro to discuss and negotiate mitigation measures with each individual woodlot owner. These are further discussed in Section 6.2.8.

Table 6-6 Bipole III Transmission Project – Effect on Private Woodlots

Registering Agency	Municipality Description	Location	Area Affected (ha)
Manitoba Agriculture, Foods and Rural Initiatives	South Norfolk SW 15-09-08W	Southern edge of ¼ section overlain by ROW	5.31
	Alonsa 16-21-11W	Western edge of section overlain by ROW	10.62
	Alonsa S 21-21-11W	Western edge of SW section overlain by ROW	5.31
TOTAL			21.24

Aside from the three (3) woodlots affected, no other woodlots are located within close proximity (500 meters) of the Bipole III Transmission Project footprint.

The effect of the Project on managed woodlots is limited to a direct impact to three (3) of 837 woodlot management plans registered by MAFRI and the MFA. This represents .36 % of the registered woodlots in Manitoba. Of the three impacted woodlots, a total of 21.24 hectares

(Table 6-6) is overlain by the Project footprint, which represents 4.7 % of the total area (453.25 ha) of the three affected woodlots. Although permanent in nature and directly impacting the three affected woodlot owners, the effect is proportionately very small and can be mitigated as discussed in Section 6.2.8.

6.1.2.5 Enhancement Projects in the Agricultural Zone

Approximately 19 ha of shelterbelts within the agricultural zone will be affected by the Bipole III Transmission Project (Table 5-11). Some will be intersected perpendicularly thereby necessitating the removal of only 66 meters of these shelterbelts while other shelterbelts are oriented longitudinally with the Project ROW and will have to be removed for the entire length that the two overlap. Some shelterbelts represent a substantial investment of time and resources while others may be natural hedgerows with varying degrees of locally designed benefits. The effects on shelterbelts are minimal at the provincial level, but may be much more significant at the individual landowner level. Shelterbelts are included as environmentally sensitive sites in Section 6.6. Mitigation measures are discussed in Section 6.2.8.

In some areas of Manitoba, individual trees are recognized and valued for heritage/historical values. No such known values are being affected by the Project.

6.2 Mitigation Measures

Through the Site Selection and Environmental Assessment (SSEA) process (Section 3.1), the careful siting of the Project minimizes adverse effects and disruption to people and the environment. Further management of potential adverse effects and their mitigation is assured through the application of suitable design and construction standards, equipment operating protocols and the application of best management practices. Following the receipt of environmental approvals, a detailed Environmental Protection Plan (EnvPP) will be developed for the construction phase of the Project. Along with general environmental protection measures, it will identify all environmentally sensitive sites noted in Section 6.6 and specify specific mitigation and protection measures to be applied. Most of the clearing activities, particularly in forested portions of the Project area, will be restricted to winter when ground conditions are frozen.

Adherence to all applicable provincial and federal regulations and guidelines and to the Environment Act License to be issued for the Bipole III Transmission Project, potential forestry environmental effects on and off the ROW can be partly mitigated. Detailed advance planning prior to construction and the preparation of the Project-specific EnvPP serve to identify issues and areas of concern in advance of construction. On-site supervision of all activities during the construction phase further reduces potential problems and effects.

A maintenance phase EnvPP will be prepared by Manitoba Hydro for ROW maintenance activities, which includes vegetation management. The Operations and Maintenance EnvPP will identify permanent environmentally sensitive sites on and adjacent to the Project footprint as well as provide detailed operational best practices designed to minimize effects to the environment. Regular patrols will identify and remove hazard trees that may pose a flashover risk from the transmission lines, thereby minimizing the risks of outages and forest fires. The ingress of adjacent tree species and natural succession, combined with afforestation projects on crown and private lands, will follow the decommissioning phase of the transmission Project.

Manitoba Hydro will continue to promote and support reforestation, afforestation and tree planting through its Forest Enhancement Program (Manitoba Hydro website, 2011). Although not designed as an offset mitigation initiative, it does counter some of the effects of clearing for projects such as the Bipole III Transmission Project. Mitigation measures, related to the forest environment, which will be incorporated into the EnvPP, are summarized below.

6.2.1 Bipole III Transmission Project Footprint Clearing

The entire Bipole III Transmission Project footprint needs to be cleared where forest resources exist. As much as possible clearing should be limited to the removal of the above ground organic matter, leaving the root systems in place. This will minimize the risk of root damage to ROW edge trees. Where practical, merchantable timber will be salvaged and brought to market. FML holders have first rights to all merchantable timber (limited to the species under license) within their license areas. Where demand exists, non-merchantable species and timber not practical to salvage, may be made available to local communities as fuelwood, thereby maximizing utilization of the resource where possible.

Where timber is salvaged and utilized, carbon in the form of wood fibre, is tied up in construction materials and paper products. This reduces the carbon footprint of the Project by limiting the volume of cleared biomass that is disposed of by other means.

Timber that cannot be salvaged and other woody debris created through the clearing operation may be disposed of by piling and burning (under frozen conditions), chipping, mulching, mounding or as directed by Manitoba Conservation. The disposal of this dead woody material will minimize the attraction of White Spotted Sawyer Beetles and thereby minimize the risk of their damage to adjacent healthy forest stands. Although chances are slim, some American Elm trees may be encountered during ROW clearing in southern Manitoba. All elm wood must be burnt or chipped immediately or disposed of at approved municipal disposal sites to prevent the potential spread of Dutch Elm Disease (Manitoba, Government of (C) website, 2011). Debris disposal will also reduce the fuel loading which poses an increased risk for wildfires.

Where fire is employed as a method of debris disposal, burning should occur on mineral soil, where possible. Piles must be kept well removed from the ROW edge to minimize the risk of

heat scorching adjacent trees and other vegetation. All buring should be conducted during the winter months. Within the forested zone, all burn sites must be thoroughly examined prior to spring breakup to ensure all fires have been fully extinguished.

6.2.2 Domestic Forest Resource Utilization

As forest resources will be cleared from the Bipole III Transmission Project footprint, opportunity exists for Manitoba Hydro to make timber that is not commercially salvaged, available to local communities, including in the Non-Commercial Forest Zone. Pre-clearing communication with communities, including those that have identified fuelwood gathering through the ATK process, will investigate the demand for fuelwood and endeavour to make timber resources available, within reasonable distance of communities, in a safe manner and with minimal interruption to Project activities. Project activities will not interfere with the collection of wood for artistic/craft purposes.

6.2.3 Forest Damage Appraisal and Valuation of the Forest Resources

The Manitoba Conservation, Forest Damage Appraisal and Valuation (FDA&V) policy stipulates financial compensation for timber values and investments on crown productive forestlands (Manitoba Conservation, 2002) (Appendix F). Manitoba Hydro will compensate Manitoba Conservation for the effects of the Bipole III Transmission Project as specified in the policy. The FDA&V was applied to the Project footprint area in order to quantify the effect on crown forest resources. Table 6-7 summarizes the damage appraisal conducted and estimates the value of compensation payable to Manitoba Conservation.

The composite timber dues applied in the FDA&V and the supporting documentation required to calculate the compensation are provided in Appendix G and H respectively. Clearing, in addition to the productive forestland evaluated in the Transmission Project footprint, may be required for access development, borrow/deposition areas or bypass routes necessitated by terrain features encountered during ROW clearing. The location of these areas are currently unknown however, they will be very localized, small in extent and minimally incremental. It should be noted that this evaluation is an estimate only and that recalculations should occur at the time of timber salvage to ensure timber dues are accurately reflected in the results.

6.2.4 Right-of-Way Maintenance

Manitoba Hydro will prepare an Operations and Maintenance (O&M) EnvPP once the Project has been constructed. Forestry sensitive sites (high value forest sites, research & monitoring, etc.) adjacent to the Project footprint will be identified to ensure they are protected into the future from O&M activities (e.g. errant equipment operation) (Section 6.6). O&M activities will be restricted, as much as possible, to the Project footprint and designated access routes. Manitoba Hydro employs a wide range of practical vegetation management methods, including

the infrequent but periodic use of herbicides, where appropriate. Given the competitiveness of some species (e.g., poplars) the application of herbicides is sometimes the preferred option as tall growing vegetation must be controlled within the Project footprint.

Table 6-7 Bipole III Transmission Project - Crown Land Forest Damage Appraisal and Valuation Summary

FMU	Plantation Cost (\$)	Softwood Dues (\$)	Hardwood Dues (\$)	Forest Renewal Charge (\$)	Fire Protection Charge (\$)	Total Valuation (\$)
1	\$0.00	\$3.47	\$281.79	\$136.78	\$42.08	\$464.12
2	\$0.00	\$0.37	\$47.71	\$22.26	\$7.10	\$77.44
4	\$0.00	\$0.23	\$29.94	\$13.97	\$4.45	\$48.60
5	\$0.00	\$19.21	\$1,289.74	\$639.67	\$192.99	\$2,141.61
10	\$0.00	\$349.26	\$9,842.05	\$5,713.62	\$1,497.32	\$17,402.25
11	\$0.00	\$10,936.28	\$14,754.32	\$40,149.02	\$2,495.66	\$68,335.28
12	\$1,783.32	\$15,714.53	\$6,088.80	\$53,373.10	\$2,118.04	\$79,077.79
52	\$2,915.09	\$2,629.06	\$767.22	\$8,971.91	\$368.81	\$15,652.09
54	\$2,447.24	\$6,116.74	\$592.38	\$20,355.40	\$681.77	\$30,193.52
55	\$3,733.15	\$24,714.66	\$2,173.56	\$82,150.33	\$2,722.16	\$115,493.87
61	\$0.00	\$4,127.17	\$409.11	\$20,813.74	\$670.58	\$26,020.60
74	\$0.00	\$2,907.77	\$126.30	\$14,593.74	\$448.51	\$18,076.33
83	\$5,229.81	\$11,639.74	\$2,525.42	\$59,296.72	\$2,093.98	\$80,785.67
84	\$43,337.62	\$14,939.42	\$3,200.76	\$76,088.73	\$2,681.59	\$140,248.12
85	\$31,062.03	\$16,130.89	\$6,143.05	\$83,325.32	\$3,292.67	\$139,953.95
87	\$20,462.16	\$6,871.31	\$1,238.42	\$34,894.99	\$1,198.83	\$64,665.71
88	\$0.00	\$12,186.16	\$2,619.58	\$62,069.75	\$2,188.68	\$79,064.17
Total	\$110,970.41	\$129,286.27	\$52,130.15	\$562,609.06	\$22,705.22	\$877,701.23

Plantation establishment cost \$882.35/ha; FRC = forest renewal charge (softwood = \$5.75/m3, hardwood = \$0.50/m3); FPC = forest protection charge (\$0.17/m3); Considers Gross Merchantable Volume which does not consider operational constraints or cull factors.

6.2.5 Sustainable Harvest Levels and FMLA Withdrawals

The calculation of the sustainable harvest levels (AAC) and withdrawals from the FMLAs is the responsibility of Manitoba Conservation, Forestry Branch. The AACs will be adjusted by Forestry Branch when they are periodically recalculated for specific FMUs. Similarly, where required, amendments will be made to harvest levels on an FMU and Forest Section basis. Where the opportunity exists, Manitoba Conservation may replace area lost from FMLAs with new areas as per the Forest Management License Agreements. Alternatively, if area withdrawals exceed the periodic limits set forth in the FML Agreements, then the Province must compensate the FML holder (Appendix A).

6.2.6 High Value Forest Sites

The effects of the Bipole III Transmission Project on forest renewal sites will be assessed based on area. Manitoba Conservation, Forestry Branch applies the FDA&V policy to determine financial compensation due where a project proponent requires the conversion of productive forestlands to another land use (non-productive status) (Sections 3.3.4, 6.2.3 and Appendix F and H). As mitigation, Manitoba Hydro will compensate Manitoba Conservation for the effects of the Project on high value forest sites as specified in the policy.

Those high value forest sites intersected by the Project and located within 500 meters of the ROW have been identified as Environmental Sensitive Areas (Section 6.6). The inclusion of these areas into the EnvPP will ensure that their geographic location and value are documented and highlighted. The emphasis is to prevent potential damages to these sites during the construction, maintenance and decommissioning phases of the Project through access establishment and restricting equipment operations outside of the proposed ROW.

6.2.7 Research and Monitoring Sites

Potential Project effects to research and monitoring sites were successfully avoided through the route selection process (Section 3.1) avoiding all of over 1200 such sites scattered throughout the province. Three (3) sites are located within 500 meters of the proposed ROW and include two (2) Forest 2020 sites and one (1) Permanent Sample Plot (PSP) (Table 5-9, Map 7). The Forest 2020 sites are established on adjacent quarter sections and are located on the opposite side of an all-weather gravel road from the proposed ROW. The PSP is located approximately 200 meters from the edge of the ROW, allowing adequate buffering as prescribed in the Forest Management Guidelines for Terrestrial Buffers (Manitoba, Government of (G) website, 2011).

As with high value forest sites, emphasis is placed on adjacent research and monitoring sites to prevent potential damages to them during the construction, maintenance and decommissioning phases of the Project through inadvertent equipment operation outside of the Project footprint. These sites are therefore listed as environmentally sensitive sites and are to be included in the EnvPPs (Section 6.6).

6.2.8 Managed Woodlots and Enhancement Projects on Private Lands

The three (3) woodlots overlain by the proposed ROW have been identified as Environmentally Sensitive Sites (Section 6.6). The inclusion of these areas into the EnvPP will ensure that the value of the woodlot areas adjacent to the proposed ROW are documented and highlighted. This will ensure that potential site damage from equipment during the construction, maintenance and decommissioning phases of the Project is minimized by containing all equipment to the Project footprint.

Manitoba Hydro will meet with landowners whose woodlots, shelterbelts and other forest values are affected by the Project to discuss mitigation measures. These may include off-site replacement/enhancement initiatives and/or compensation reflective of management objectives, investments and site conditions. Manitoba Hydro will endeavour to minimize the effects of the Project on private land forest values.

6.3 Valued Environmental Component - Environmental Effects Expression

The effects of the Bipole III Transmission Project on the Valued Environmental Components of the forest environment are assessed in Section 6.1.2. and proposed mitigation measures are described in Section 6.2. Table 6-8 summarizes the VECs, identifies associated environmental indicators, measureable parameters, environmental effects, mitigation measures and residual effects, which are further discussed and quantified in Section 6.4.

Table 6-8 Bipole III Transmission Project - Valued Environmental Components, Environmental Effects Expression

VEC	Environ- mental Indicator	Measurable Parameter/ Variable	Environ- mental Effect	Mitigation Measures	Residual Environmental Effect
Productive forest land	Productive forest area contributing to the sustainable AAC	Forested area (ha)	Reduced area under forest management	- Limit project footprint size where possible - Place project footprint (e.g. borrow pits, marshalling yards, access routes, etc.) on non-productive forest lands where possible - Rehabilitate productive forestlands if not required after construction phase and at decommissioning phase	- reduction in productive forestland area - reduction in AAC levels - potential reduction in industry annual harvest level
	Forest Management License Areas	Area withdrawn from license areas (ha)	Reduced forest management license areas	- Limit project footprint size where possible - Place project footprint on non-productive forest lands where possible - Rehabilitate productive forestlands if not required after construction phase and at decommissioning phase - Manitoba Conservation may be required to compensate FML holders as per their agreements	- reduction in size of license areas - potential reduction in FML holders annual harvest levels
	Standing timber	Wood fibre volume (m3)	Reduced volume of standing timber	- restrict clearing to defined project footprint - avoid damage to trees along edge of ROW - utilize existing cleared areas for equipment staging and material storage - utilize existing roads, trails	- reduction in standing timber

VEC	Environ- mental	Measurable Parameter/	Environ- mental	Mitigation Measures	Residual Environmental
VEC	Indicator	Variable	Effect	willigation weasures	Effect
	marcator	Variable	Lifett	& linear features for access - apply FDA&V policy & compensate MC	Linear
High value forestlands	Forest management investments	Area under development (plantations, assisted regeneration) (ha)	Reduced area under high value forestlands	- Limit project footprint size where possible - Place project footprint on non-productive & non-high value forestlands where possible - Re-establish high value forestlands on sites not required after construction phase and at decommissioning phase - apply FDA&V policy & compensate MC	- loss of high value forestlands
Research/ monitoring sites	Site(s) integrity	Number of sites affected	Potential reduction in number of sites and/or degradation of sites	- place project footprint to avoid research/monitoring sites, where possible - protect off-site/adjacent sites from construction & maintenance activities	- no loss of research/ monitoring sites
Private land forest values	Woodlots	Area under management (ha)	Reduced area under management	- limit project footprint size where possible - limit all construction & maintenance activities to the limits of the easement - develop and implement an off-set mitigation plan with the landowner, where applicable - determine & provide financial compensation reflective of woodlot management objectives, investments & condition	- potential loss of woodlot area
	Shelterbelts	Area/length affected (ha/m)	Loss of shelterbelts or portions thereof	- place project footprint to avoid shelterbelts, where possible - limit all construction & maintenance activities to the limits of the easement - develop and implement an off-set mitigation plan with the landowner, where applicable - determine & provide financial compensation reflective of shelterbelt management objectives, investments & condition	- loss of shelterbelts or portions thereof

6.4 Residual Effects

Even with the implementation of all of the above mitigation measures, Project-specific residual effects will remain. These include:

- Loss of productive forestland resulting in a reduction in sustainable AAC levels, reduction in FML #2 and #3 areas and loss of standing timber;
- ➤ Potentially reduced harvest levels in the Mountain Forest Section;
- Loss of area in high value forest sites;
- Loss of area in three (3) managed woodlots;
- Loss of portions or entire shelterbelts and other private land forest values, and
- ➤ Potential opportunity to provide fuelwood to interested communities in proximity to the Project footprint.

The environmental effects assessment is guided by the CEAA Reference Guide: *Determining Whether a Project is Likely to cause Significant Adverse Environmental Effects* (Canada, Government of (B) website, 2011). The approach is also described in Section 3.4.1 and Appendix D.

Table 6-9 summarizes and assesses the identified residual environmental effects of the Bipole III Transmission Project. The determination of significance of residual environmental effects of the Project on forestry values, along with all other environmental components, is contained in the Bipole III Transmission Project: A Major Reliability Improvement Initiative, Environmental Impact Statement (Manitoba Hydro, 2011B).

Even though the effects of the Bipole III Transmission Project on the forest and the related VECs will be evident for the life of the Project, residual effects on productive forestland and related valued environmental components identified in this assessment are limited relative to their current state and scope. The Bipole III Transmission Project will not negatively affect current harvest levels in the Nelson River, Highrock and Aspen Parkland Forest Sections. It may marginally reduce harvest levels in FMU 10 where the AAC is fully allocated to Louisiana Pacific Canada Ltd. (FML #3) and Timber Sale Agreement holders; however, this is not certain as numerous variables affect the calculation of sustainable harvest levels including operational variables, forestland ownership, forest age class distribution, etc.

Table 6-9 Bipole III Transmission Project - Residual Environmental Effect Assessment Summary

Residual Environmental Effect	Direction	Ecological Importance	Societal Importance	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Comments
Reduction in productive forest land	Negative	Low	Moderate	Medium	Regional	Medium-	Infrequent	Irreversible	Reversible only at time of
resulting in a reduction in AAC levels	Negative	LOW	Woderate	Wicalam	Regional	term	mrequent	IIICVCISIBIC	decommissioning
Rationale: Mitigation will serve to minimize the reduction in AAC levels. The residual environmental effect of the AAC reduction is negative with low ecological, moderate societal importance, of medium magnitude, regional in extent, medium-term duration, infrequent occurrence and not reversible until project decommissioning.									
Reduction in size of FML areas with a potential reduction in annual harvest levels	Negative	Low	Moderate	Medium	Regional	Medium- term	Infrequent	Irreversible	Reversible only at time of decommissioning
societal importanc	Rationale: Mitigation will serve to minimize FML area loss. The residual environmental effect of FML area loss is negative with low ecological, moderate societal importance, of medium magnitude, regional geographic extent (FML # 2 & #3), medium-term duration, infrequent occurrence and not reversible until project decommissioning.								
Reduction in standing timber from clearing	Negative	Low	Moderate	Low	Project Footprint	Medium- term	Infrequent	Irreversible	Reversible only at time of decommissioning

Rationale: Mitigation will serve to limit the extent of clearing. The residual environmental effect on standing timber is negative with low ecological and societal importance, of low magnitude, is footprint specific, medium-term in duration, infrequent occurrence and not reversible until project decommissioning.

Residual Environmental Effect	Direction	Ecological Importance	Societal Importance	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Comments
Potentially reduced harvest level in FMU 10	Negative	Low	Moderate	Small	Regional	Medium- term	Infrequent	Irreversible	Reversible only at time of decommissioning
is negative with lo	Rationale: Mitigation will serve to minimize the reduction in harvest level in FMU 10. The residual environmental effect of a reduced harvest level in FMU 10 is negative with low ecological, medium societal importance, small in magnitude, regional geographic extent (FMU), medium-term duration, infrequent occurrence and not reversible until project decommissioning.								
Loss of area in high value forest sites (plantations, assisted regeneration)	Negative	Moderate	Moderate	Small	Project Footprint	Medium- term	Infrequent	Irreversible	Reversible only at time of decommissioning
Rationale: Mitigation will serve to minimize area loss in high value forest sites. The residual environmental effect of high value forest area loss is negative, with moderate ecological and societal importance, small in magnitude, project footprint specific, medium-term in duration, infrequent occurrence and not reversible until project decommissioning.									
Loss of private woodlot area	Negative	Moderate	Moderate	Medium	Project Footprint	Medium- term	Infrequent	Reversible	Reversible through off-site mitigation
Rationale: Mitigation will serve to minimize the loss of area in managed woodlots. The residual environmental effect of woodlot area loss is negative with									

Rationale: Mitigation will serve to minimize the loss of area in managed woodlots. The residual environmental effect of woodlot area loss is negative with moderate ecological and societal importance, medium in magnitude, project footprint specific, medium-term in duration, infrequent occurrence and reversible through off-set mitigation measures.

Residual Environmental Effect	Direction	Ecological Importance	Societal Importance	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Comments
Loss of portions or entire shelterbelts	Negative	Moderate	Medium	Medium	Project Footprint	Medium- term	Infrequent	Reversible	Reversible through off-site mitigation
ecological and so	Rationale: Mitigation will serve to minimize shelterbelt area loss. The residual environmental effect of shelterbelt area loss is negative with moderate ecological and societal importance, medium in magnitude, project footprint specific, medium-term in duration, infrequent occurrence but reversible through off-set mitigation measures.								
Timber availability for domestic use purposes; e.g., fuelwood	Positive	N/A	Medium	Medium	Local	Short- term	Infrequent	N/A	Clearing activities facilitate the opportunity to make timber available to local

Rationale: The potential to salvage timber for domestic use from the construction site is a positive effect with medium societal importance to local populations, potentially medium in magnitude to local communities, however, short-term in duration with infrequent occurrence limited to the construction period.

6.5 Environmental Effects Related to Project Phase

Forestry related environmental effects are primarily evidenced during the construction phase of the Project. These are tied to forest clearing and the removal of the productive forestland from forest management. Risk of negative effects on forestry values during the operations and maintenance phase will be low and related only to additional damages that might be caused adjacent to the Project footprint for unforeseeable reasons. These would be very small and localized. At the decommissioning phase of the Project, mostly positive effects are envisioned as land can be rehabilitated to forestry management objectives.

Table 6-10 summarizes the type of effect and level for the construction, operation and maintenance, and decommissioning phases of the Bipole III Transmission Project on the forestry environmental components.

Table 6-10 Bipole III Transmission Project - Environmental Effects Relative to Project Phase

Environmental Value	Construction	Operation and Maintenance	Decommissioning
Bipole III Transmission Project Footprint	L	L	Р
Commercial Forest Resource Utilization	Р	-	Р
ATK and Domestic Use of the Forest Resource	Р	-	-
Sustainable Harvest Level	L	-	Р
FML Areas	L	-	Р
Standing Timber	L	-	Р
High Value Forest Sites	L	L	Р
Research and Monitoring Programs	-	-	-
Private Forest Values	L	L	Р

L – Low; M – Moderate; H – High; P – Positive; – Not Applicable

6.6 Environmentally Sensitive Sites

The VECs identified in sections 5.2.3.2 to 5.2.3.5 are considered environmentally sensitive sites (ESS) where these are either directly intersected by the Bipole III Transmission Project or located within 500 meters of its footprint. They include high value forest sites, research and

monitoring sites, woodlots and private land enhancements (Table 6-11 and Appendix I). In order to provide them protection during the construction phase of the Project, these sites will be included in the Environmental Protection Plan (EnvPP). Sites within 500 meters of the Project footprint are also identified as ESS in order to ensure long-term protection from potential damage during operations and maintenance, and decommissioning activities associated with the Project. Environmentally sensitive site types, the number identified, a brief description, the projected environmental effect and prescribed mitigation measures are provided in Table 6-11. All ESS are shown on Map Series 300 and listed in Appendix I.

The ATK information collection process clearly indicates First Nation communities gathering fuelwood in proximity to their communities. These specific fuelwood gathering sites (Map 5 – Areas ATK_1, ATK_6, ATK_7 and ATK_8) identified through the ATK process are included as ESS. It is recommended that during clearing and construction of the Project, a process be developed to notify local communities along the ROW of the clearing schedule and provide the opportunity to make fuelwood available to them in a manner that is safe and causes minimal interruption to Project activities.

Forest renewal sites intersected by the Bipole III Transmission Project and those immediately adjacent are identified as ESS. Although these sites do not need to be avoided, minimizing damage to them is highly recommended. Similarly, woodlots that are intersected by the Project are identified as ESS, emphasizing the need to keep all clearing and construction activities within the limits of the ROW. Manitoba Hydro Property Department will need to assess these sites, on a case-by-case basis, and develop mitigation/compensation plans reflective of the particular management values of each woodlot.

Two Forest 2020 plantations are located in southern Manitoba adjacent to the ROW. Although not directly intersected by the Project, these sites are recognized as ESS to ensure they are identified and protected. In addition, one forestry permanent sample plot is identified adjacent to the Project ROW. A minimum 100 meter undisturbed buffer is required around this site.

Environmentally sensitive site location information for future incorporation into the Environmental Protection Plan has been provided to Manitoba Hdyro as GIS shape files to ensure correct geo-referencing (Appendix I).

Table 6-11 Bipole III Transmission Project - Environmentally Sensitive Sites

		No.			
Source ID	ESS Name	of Sites	ESS Description	Environmental Effects	Mitigation Measures
PL_1	Plantation	45	Forest plantation; represents considerable financial investment	 Removal in area of ROW intersect; 	 Clearing limited to winter only Complete Forest Damage Appraisal & compensate MB
				 Potential for additional damage outside of ROW 	 Limit all equipment to ROW only where possible Where debris disposal is by burning, pile well away from ROW edge Burn during winter months only Ensure fires are extinguished prior to spring breakup
PL_2	Plantation (adjacent)	78	Forest plantation adjacent to ROW (within 500 meters); represents considerable financial investment	Potential for damage	 Limit all equipment to ROW only where possible Where debris disposal is by burning, pile well away from ROW edge Burn during winter months only Ensure fires are extinguished prior to spring breakup
RM_1	Research & monitoring; Permanent Sample Plot	1	Growth and yield monitoring site; long-term data collection site; high value site	Potential for damage; loss of site integrity	 Limit all equipment to ROW only where possible Maintain a minimum undisturbed buffer of 100 meters Where debris disposal is by burning, burn during winter months only Ensure fires are extinguished prior to spring breakup

Source ID	ESS Name	No. of Sites	ESS Description	Environmental Effects	Mitigation Measures
RM_2	Research & monitoring; Forest 2020 site	2	Private plantation managed for environmental & land owner specific values, including research & monitoring	Potential for additional damage outside of ROW	 Limit all equipment to ROW only where possible Where debris disposal is by burning, pile well away from ROW edge Burn during winter months only Ensure fires are extinguished prior to spring breakup
ATK_1	ATK fuel wood area/trail	9	Traditional fuel wood collection area; access trail	 Potential to disrupt access to fuel wood area 	 Ensure access trails intersected by ROW are kept clear of debris Avoid access obstruction Where requested by local community, make fuel wood available from ROW clearing operations
WL_1	Woodlot	3	Private land woodlot managed for environmental & land owner specific values; varying levels of investment	 Removal in area of ROW intersect; 	 Clearing limited to winter only Develop mitigation plan with land owner Consider off-set mitigation options Compensate land owner based on woodlot specific management values and condition
				 Potential for additional damage outside of ROW 	 Limit all equipment to ROW only where possible Where debris disposal is by burning, pile well away from ROW edge Burn during winter months only Ensure fires are extinguished prior to spring breakup

Source ID	ESS Name	No. of Sites	ESS Description	Environmental Effects	Mitigation Measures
SB_1	Shelterbelts	125	Private land shelterbelts established for environmental values	Removal in area of ROW intersect	 Clearing limited to winter only Develop mitigation plan with land owner Consider off-set mitigation options Compensate land owner based on shelterbelt specific management values and condition

6.7 Follow Up

This forestry assessment technical report has identified Project effects to forestry values. It prescribes mitigation measures to minimize effects to the degree possible and quantifies residual effects. It is Manitoba Hydro's responsibility to fully implement all mitigation measures. This is best achieved through advance planning and ensuring that the required information is clearly conveyed to Manitoba Hydro construction supervisors, all crews and contractors. This can be achieved by developing a very detailed, easy to read, environmental protection plan for construction purposes. The EnvPP must show all environmental sensitivities and clearly state site specific mitigation measures. All spatial information must be geo-referenced.

The construction supervisor(s) and environmental inspectors must be on site regularly to direct construction crews/contractors, flag sensitive sites where required, and inspect work done to ensure mitigation measures are implemented as directed. In addition, they must assess the effectiveness of the mitigation measures implemented. Where they are not as effective as anticipated, adaptive management strategies will be required to address short-comings, inadequacies and unforeseen negative effects. It will be essential for Manitoba Hydro to have adequate numbers of well trained environmental inspectors on the job site at all times.

6.7.1 Monitoring

Aside from on-site supervision and inspections of the implementation of mitigation measures during and post construction, monitoring is required to document the proper implementation of mitigation measures, to assess their effectiveness and to verify effects predictions (i.e. residual effects) made in this environmental assessment (Section 6.2). It is Manitoba Hydro's responsibility to implement a monitoring program designed to capture, document and report on implementation and effectiveness of mitigation measures and to assess the accuracy of effects predictions in this report.

Sections 5.2.3.2 through to 5.2.3.5 and 6.6 identify VECs and corresponding ESS. Mitigation measures are provided in section 6.2 to protect these values. Aside from monitoring the implementation of mitigation measures, the following specific components shall be assessed/monitored to verify the outcomes of this assessment. Annual summary reports will be prepared which will contain the results of the monitoring program. A final report will be produced when the Bipole III Transmission Project has been fully constructed (post 2017).

6.7.1.1 Project Footprint

Monitoring will include quantifying the amount of timber salvaged and utilized from the Project footprint. This will be done by tracking the amount of timber delivered to processing facilities within the Project area (e.g., Tolko Industries Ltd., Louisiana Pacific Canada Ltd., Spruce Products Ltd., etc.). The receiving companies will be requested to annually track all timber received from the Bipole III footprint versus that received from other sources and provide that information to Manitoba Hydro.

When the Project has been fully constructed, total timber volume salvaged will be converted to carbon stock equivalent (using accepted conversion factors) to estimate the amount of **carbon** sequestration in goods versus what may have been released if all biomass was burnt.

Forest fire records will be obtained from Manitoba Conservation for those years in which the Project is constructed. Fires that occurred in the vicinity of the Project will be examined to determine if they are the result of Project activities. Where they are the result of the Project, quantification of such lateral effects to the forest environment will be calculated using the provincial forest inventory, including area burnt (ha) and timber volume affected (m³).

6.7.1.2 Domestic Forest Resource Utilization

Volume estimates (m³) will be generated where timber is made available to local and northern communities for domestic consumption (fuelwood). Manitoba Hydro will document where timber is made available to communities and generally how much is provided (preferrably in stock piles off the Project site). A concern is that timber made available is not fully utilized. Any stock piles that do remain after the Project has been completed will have to be disposed of by Manitoba Hydro. Monitoring will also document that all such timber is disposed of in accordance with Manitoba Conservation directives.

6.7.1.3 Forest Damage Appraisal and Valuation

The forest damage appraisal and valuation (FDA&V) conducted on the Bipole III Transmission Project was conducted using the best available information at the time of writing. Slight adjustments may still be made during the final design stage of the Project that may shift the footprint slightly. Clearing, in addition to the productive forestland evaluated in the

Transmission Project footprint, may be required for access development, borrow/deposition areas or bypass routes necessitated by terrain features encountered during ROW clearing. The exact locations of these areas are currently unknown but will be very localized, small in extent and minimally incremental. The most influential factors affecting the final results of the FDA&V are total volume affected, volume of timber salvaged, and the dues calculation factors applied. Timber dues are adjusted monthly to reflect input costs (e.g. haul distance to facility/market), final product produced (e.g. pulp, lumber) and market prices. These may vary significantly between now and 2017 when the Project is projected to be completed. Therefore, a final FDA&V will be conducted when the Project has been constructed. This will include an overlay of the actual Project footprint with the forest inventory and the application of current timber dues. This will ensure spatial accuracy based on post-construction photography and provide the basis for a final FDA&V calculation to support compensation payment to Manitoba Conservation.

6.7.1.4 Right-of-Way Maintenance

Forestry specific monitoring after Project construction will be limited to ensuring that forestry environmentally sensitive sites (Table 6-11) and high value forest sites are ensured long-term protection. It is recommended that Manitoba Hydro develop an Operations and Maintenance EnvPP that includes all forestry ESS along with all applicable mitigation measures (Section 6.2). It will be Manitoba Hydro's responsibility to ensure ESS are protected during the operations and maintenance phase of the Project.

6.7.1.5 Sustainable Harvest Levels and FMLA Withdrawals

Manitoba Conservation, Forestry Branch will retain responsibility with regard to AAC calculations and administration as well as matters relating to FMLA withdrawals. All follow up as a result of the Bipole III Transmission Project will reside with the Forestry Branch.

6.7.1.6 Managed Woodlots and Enhancement Projects on Private Lands

The specific mitigation and/or compensation measures agreed to between Manitoba Hydro and each individual landowner will be documented before any work begins on private lands. Monitoring will serve to ensure agreements with landowners are fully implemented, including where off-setting physical works are under taken to ensure that they meet end expectations and goals. The frequency of monitoring will vary depending on the mitigation measures employed. Final monitoring/documentation should occur when all agreed to mitigation measures have been fully and successfully implemented. The documentation should contain sign-off from the landowner indicating that Manitoba Hydro has fulfilled all of its' agreed to obligations.

6.8 Potential Cumulative Effects

The assessment of potential cumulative effects, for the Forestry Technical Report, Environmental Assessment, has been conducted under the guidance of the Canadian Environmental Assessment Agency, *Cumulative Effects Assessment Practitioners Guide* (1999).

The residual effects related to the forestry component include (Section 6.4):

- Loss of productive forestland resulting in a reduction in sustainable AAC levels, reduction in FML #2 and # 3 areas and loss of standing timber
- Potentially reduced harvest levels in the Mountain Forest Section
- Loss of area in high value forest sites
- Loss of area in three (3) managed woodlots, and
- Loss of portions or entire shelterbelts and other private land forest values.

6.8.1 Identification of Regional Issues of Concern

Regional issues of concern have been identified that may affect the values related to forested crown and private lands. Issues have been identified by soliciting comment from local individuals and regional stakeholders through the Manitoba Hydro, Bipole III Environmental Assessment consultation process (Manitoba Hydro, 2010B; 2011A), the Aboriginal Traditional Knowledge for the Bipole III Transmission Project (MMM Group et al, 2011) and through soliciting comments from Federal and Provincial regulators, the forest industry, agencies supporting reforestation/afforestation programs and team members conducting the environmental assessment of the Bipole III Transmission Project.

Residual forestry effects from the Project may contribute in a cumulative fashion to the following regional issues:

- Sustainable Harvest Levels (AAC);
- Forest Management License (FML) areas;
- ➤ Volume of standing timber;
- ➤ High value forest sites;
- Managed woodlots on private land;
- Enhancement projects in the agricultural zone;
- Domestic and aboriginal forest resource use;
- > Flooding from beaver activity, and
- Climate change.

6.8.1.1 Sustainable Harvest Levels

Sustainable harvest or annual allowable cut (AAC) levels are determined by Manitoba Conservation, at the FMU level, for the entire commercial forest zone within Manitoba (Map 4; Section 5.2.3.1). Provincially owned productive forestlands form the basis for determining AAC levels. The Bipole III Transmission Project will reduce the productive forestland available for forest management purposes resulting in reduced AAC levels. The effects of the Project are considered cumulative to all other projects or actions that remove productive forestlands from forest management.

6.8.1.2 Forest Management License Areas

Forest Management Licenses are awarded to forest companies to provide an adequate, long-term supply of fibre for their manufacturing facilities. Productive forestlands, within the FML areas, are used to determine sustainable fibre supply levels (AAC). The Forest Management License Agreements stipulate productive forestland withdrawal limits within specific time periods (Appendix A). Where the withdrawal limits are exceeded within the specified time period, the Province of Manitoba is obligated to compensate the FML holder. The effects of the Bipole III Transmission Project will remove productive forestlands from FML holders #2 and #3 and are considered cumulative to all other projects or actions that remove productive forestlands from the same FML areas.

6.8.1.3 Standing Timber

The Bipole III Transmission Project will result in the clearing of all trees from the Project footprint (Section 5.2.3.1). This will result in a permanent reduction in the volume of standing timber within the FMUs affected by the Project. The effects are considered cumulative to any other deforestation projects or actions that may occur within the FMUs overlain by the Project.

6.8.1.4 High Value Forest Sites

High value forest sites represent considerable investment in reforestation expenditures following commercial timber harvesting (Section 5.2.3.2). The Bipole III Transmission Project overlaps high value forest sites and will require their removal within the footprint area. Any other actions, within the FMUs overlain by the Project that result in the clearing of high value forest sites, are considered cumulative to those of the Bipole III Transmission Project.

6.8.1.5 Managed Woodlots on Private Land

Managed woodlots have been established by landowners throughout central and southern Manitoba. The establishment of woodlots is further described in Section 5.2.3.4. The Bipole III Transmission Project will reduce the area of private woodlots under management and is

considered cumulative to any other actions that may reduce or degrade established managed woodlots.

6.8.1.6 Enhancement Projects in the Agricultural Zone

Aside from woodlot management, the establishment of shelterbelts is the predominant forest enhancement activity in the agricultural zone (Section 5.2.3.5). The Bipole III Transmission Project will result in the loss of shelterbelts that fall within its footprint. This effect is considered cumulative to any other actions that result in the removal of shelterbelts.

6.8.1.7 Domestic and Aboriginal Forest Resource Use

The domestic and First Nation use of the forest resource is described in Sections 5.2.2.4 and 5.2.2.5 respectively. The Bipole III Transmission Project will involve clearing, construction and maintenance activities that may restrict access on the Project footprint to specific forest sites for safety reasons. These restrictions for the most part will be temporary. The Project may however, have a positive effect on local communities by making forest products available from clearing operations during construction. Other actions taking place on the land base that make timber products more readily available to local communities are considered a cumulative positive effect.

6.8.1.8 Beaver Flooding

The general drop in fur prices and waning interest by trappers to pursue beaver has caused their populations to soar over the last few decades. Southern and central portions of Manitoba and the Bipole III PSA have also seen increased levels of precipitation over the last number of years. The industrious beaver has been active throughout Manitoba, but particularly in central portions of the PSA where poplar species dominate. Their practice of building a series of dams along any stream system with limited depth has caused extensive flooding throughout the region. In many cases the streams are located within productive forestlands. Once the root systems of trees are submerged for any period of time, mortality ensues. The cumulative effect of thousands of beaver dams/ponds have caused and continue to cause extensive losses to forest resources. These losses are cumulative to those of the Bipole III Transmission Project where forest resources on productive forestlands are lost.

6.8.1.9 Climate Change

Climate change in Manitoba has been identified as potentially affecting forestlands through gradual increases in average annual temperature, increased precipitation in winter and spring, and droughts along the southern forest margin. These climatic changes are predicted to result in increased insect and disease incidence and increased incidence and severity of forest fires (Johnson et al, 2001; Field et al, 2007; Sauchyn et al, 2008). These conditions could lead to

lower forest productivity resulting in reduced sustainable harvest levels. The effects of climate change could therefore be cumulative to other actions, including Bipole III, that affect the AAC.

6.8.2 Identification of Valued Environmental Components

Valued Environmental Components (VECs) for the forestry study have been identified in Section 3.2 and are further described in the *Alternative Routes Evaluation, Forestry Technical Report* (Plus4 Consulting, 2009B). Those forestry VECs determined to have residual effects as a result of the Bipole III Transmission Project are listed below and are summarized in Table 6-12.

- Productive forestlands
- ➤ High value forest sites
- Private lands with forestry values (e.g., woodlots, shelterbelts etc.)

Table 6-12 Bipole III Transmission Project - Valued Environmental Component Summary

Valued Environmental Component	Environmental Indicators	Measurable Parameters/ Variables	Residual Environmental Effects	Comments
Productive forestland	Productive forest area contributing to the sustainable AAC	Forested area (ha)	-reduction in productive forestland area -reduction in AAC levels -potential reduction in industry annual harvest level	The AAC may be recalculated if cumulative reductions in productive forestland is determined to be significant
	Forest Management License Areas	Area withdrawn from license areas (ha)	-reduction in size of license areas -potential reduction in FML holders annual harvest levels	Cumulative withdrawals may trigger land withdrawal clauses in FMLAs
	Standing timber	Wood fibre volume (m3)	-reduction in standing timber	Activities resulting in deforestation will cumulatively reduce the volume of standing timber
High value forest sites	Forest management investments	Area under development (plantations, assisted regeneration) (ha)	-loss of high value forestlands	Cumulative losses of high value forestlands may reduce the productive capacity of managed forestlands
Private land enhancements	Woodlots	Area under management (ha)	-potential loss of woodlot area	Cumulative losses to woodlots may affect the ability of the land-owner to effectively implement the management plan established for the area
	Shelterbelts	Area/length affected (ha/m)	-loss of shelterbelts or portions thereof	Cumulative losses to shelterbelts may affect sustainable farming practices, wildlife habitat and aesthetic values.

6.8.3 Identification of Cumulative Effects Assessment Area

To assess the cumulative effects of the Project on the forestry VECs, spatial and temporal boundaries are required. These boundaries need to be realistic in time and space in considering other actions/projects on the landscape as well as environmental influences. Such other actions may have been influential in the past and may continue to be so into the future.

6.8.3.1 Spatial Boundaries

Manitoba Conservation has established Forest Management Units as the spatial administrative units, within the Commercial Forest Zone, to determine annual allowable harvest levels and to define FML areas. Therefore, FMUs are the logical spatial unit against which to assess the effects of the Bipole III Transmission Project along with those considered to be cumulative in nature. As no Project related residual effects have been identified, related to the forestry component within the Non-Commercial Forest Zone (Map 4; Section 2.2.2), no spatial boundaries are required for cumulative effects assessment in this portion of the Project area. Cumulative effects related to private land enhancements are limited to affected landowner holdings. All ecological effects for this area are considered in the vegetation, aquatics and wildlife studies being conducted for the Bipole III Transmission Project.

6.8.3.2 Temporal Boundaries

A number of Provincial guidelines and agreements influence the selection of temporal boundaries for the assessment of cumulative effects on forestlands. *Manitoba's Forest Plan - Towards Ecosystems Based Management* (KPMG, 1995) was developed with a 20-year window in mind. Manitoba Conservation (2007) has established the forest management planning period at 20 years for the development of long-term plans by FMLA holders. The Provincial standard for the development of new forest inventories to recalculate AACs has historically been 15 to 20 years (Manitoba Conservation, 2007) and the effective period for the Tolko and LP FMLAs is 20 years (Manitoba, Government of (F) website, 2011).

Given that the main effect of the Bipole III Transmission Project is on productive forestland, it is reasonable to assume a temporal boundary of +/- 20 years that is consistent with Manitoba Conservation forest management time horizons. High value forest sites are part of the productive forestland base and are therefore included in the aforementioned time line. Temporal boundaries on private land enhancements are difficult to apply as these values are very site specific and subject to independent/private management objectives.

6.8.4 Identification of Other Actions

Other past, present and future actions or activities have been identified for assessment if they are deemed to have cumulative effects on the same forestry VECs as the Bipole III Transmission

Project. The identified actions have been categorized according to their effect on the state of the forest. Table 6-13 lists the actions, by action category, identified for the assessment of forestry related cumulative effects.

Table 6-13 Cumulative Effects Action List by Category

Deforestation	Temporal Forest Status	Afforestation	Land Use Reclassification
Mine site, borrow pits, quarries and access road development	Mineral exploration trails and drill sites	Forest ingress	Provincial and Federal park establishment
Forest industry permanent road development	Forest industry access roads	Manitoba Hydro Forest Enhancement Program	Protected Area establishment
Provincial and Municipal road development	Commercial timber harvesting	Woodlot Management Program	Treaty Land Entitlement selection areas
Manitoba Hydro generating station and transmission project development	Forest fires	Prairie Shelterbelt Program (AESB)	
Urban expansion	Insect and disease infestations	Plantation programs; e.g., Trees for Tomorrow, Forest 20/20, woodlot management, riparian zone stabilization	
Agricultural expansion	Windstorms (windthrow)		
Other infrastructure & industrial development (i.e., rail lines & pipelines)			
Beaver activity			
Climate change			

The following action categories have been defined for assessing cumulative effects:

<u>Deforestation</u> – Actions that have resulted or will result in the permanent clearing of productive forestland or well beyond the future temporal boundary (20+ years) established in Section 6.8.3.2.

<u>Temporal Forest Status</u> - Actions that have resulted or will result in the removal of trees, from productive forestlands, for a temporary period (e.g., timber harvesting) but will result in natural or artificial reforestation of the site immediately following the disturbance (within 1 to 5 years). The regeneration lag period may extend up to 10 years for actions such as forest industry roads established to access multi-year commercial harvest areas.

<u>Afforestation</u> – Actions that have resulted or will result in the establishment of trees or forested area on lands not previously forested or areas where forests were cleared long ago and other land-use activities have dominated the landscape.

<u>Land Use Reclassification</u> - Actions that have resulted or will result in the reclassification of productive forestlands under forest management to land use categories restricting or excluding forest management.

6.8.4.1 Deforestation Action Descriptions

Mine sites, borrow pits, quarries and associated access roads – Mineral exploration is a dominant land use activity within the northern portion of the assessment area. The actual establishment of mine sites, above ground mining activities and their related access roads are considered deforestation activities. Table 6-14 lists all mine sites located within the FMUs affected by the Bipole III Transmission Project. Mine sites included are those that are currently active and those which were in operation during the last 20 years (closed in 1990 or later). Associated access roads are included in their productive forestland footprints. Future mine developments are difficult to predict, particularly their spatial footprints as these differ widely depending on minerals being extracted, mining methods used and tailing volumes disposed of.

Borrow pits and quarries are associated with developments such as road and rail line construction, mining operations, hydro-electric, industrial and urban development. A variety of soil types, aggregates, rock and stone are extracted for construction purposes. In forested areas, the extraction of these resources is preceded by clearing. Borrow/quarry areas and associated access roads are very often located on productive forestlands, requiring the removal of these lands from forest management. Manitoba Innovation, Energy and Mines, Mineral Resources Division records and tracks Quarry Leases but no detailed information is available as to the extent of deforestation associated with such leases (Manitoba, Government of (R) website, 2011). The areas under quarry leases far exceeds the areas in active borrow/quarry areas. When

borrow areas are depleted or no longer needed, they are rehabilitated and often reforested, either through planting or natural seeding.

Table 6-14 Mine Developments within the Cumulative Effects Area

	Status Prod. Yrs			Location			
Mine			Productive Forestland		Coord.	UTM (14)	
			Footprint (ha)	FMU	Easting	Northing	
Vale T3	Ор	1972 – P		87	574313	6176824	
Vale 1-D	Ор	1958 – P	1,988	87	573555	6175602	
Vale T1	Ор	1972 – P		87	571932	6175173	
Vale – Birchtree	Ор	1968 – P	122	87	566664	6172318	
Vale – Pipe	Ор	n/a – P	430	87	553135	6149720	
Falconbridge – Bucko L.	Non-Op	n/a	49	83	522055	6081438	
HBM&S – Stall L.	Non-Op	1964 – 1994	41	61	439585	6079326	
HBM&S – Snow Lake	Non-Op	1946 – 2000	188	61	433884	6079698	

Source: Innovation, Energy & Mines, 2011

Google Earth, 2011 DigitalGlobe, 2011 Cnes/Spot Image, 2011 GeoEye

Op = operational; Non-Op = non-operational; P = present; n/a = not available.

<u>Forest Industry Permanent Road Development</u> – The forest industry constructs a permanent network of roads to provide general access throughout FML areas. Temporary forest access roads are discussed in Section 6.8.4.2.

Although forest harvesting activities continue on an annual basis within some of the FMUs intersected by the Bipole III Transmission Project, these activities are limited in extent. A case in point, Tembec Industries Inc., in collaboration with the Manitoba Model Forest, conducted a road density analysis for FML #1 in 2008 in eastern Manitoba (Manitoba Model Forest website, 2011). Being the oldest FML within Manitoba (harvesting has been ongoing since the 1940s), the total area of permanent all-weather and winter forestry roads accounts for 0.22% of the gross land area of FML #1 (Appendix K). This is representative of the potential level of disturbance

associated with forestry activities over a period of 70 years and may be applicable to FML # 2 and 3. FML # 3, unlike FML # 2, has an existing extensive network of provincial and municipal roads and therefore requires minimal additional development of permanent roads by forest industries.

Provincial and Municipal Transportation Infrastructure – The province of Manitoba has a well developed network of provincial and municipal roads servicing communities, farming and resource extraction areas. Aside from regular maintenance and some upgrades of existing infrastructure (e.g. PTH 6 south of Ponton and near Thompson), no major new developments are slated within the FMUs intersected by the Bipole III Transmission Project within the next 10 to 20 years. New projects that are proposed (e.g., CentrePort) do not affect the commercial forest base. Private lands with forest resources on them may be affected but are limited.

Upgrades are planned for the Pikwitonei and Thicket Portage airport runways. They will be extended from 2200 feet to 3000 feet (Manitoba, Government of (P) website, 2011). Minimal additional clearing of unrestricted crown productive forestland will be required.

<u>Manitoba Hydro Developments</u> – Manitoba Hydro infrastructure spans the province. Electricity generated at hydro-electric generating stations in northern Manitoba is sent south via numerous high-voltage transmission lines. Most of this infrastructure, located within the FMUs intersected by the Bipole III Transmission Project, pre-dates the temporal boundary of this Project. The exceptions are the Wuskwatim Generating Station and transmission line in northern Manitoba that affected 477 ha of productive forestland in the Nelson River Forest Section, 321 ha in the Saskatchewan River Forest Section and 96 ha in the Highrock Forest Section (Table 6-15). The development of several smaller transmission lines, and the Riel Station sectionalization project, in the southern agricultural zone of Manitoba (e.g. Glenborough – Harvey line) did not affect crown owned productive forestlands. Minor amounts of privately owned forestlands may have been affected.

Proposed future developments in northern Manitoba (e.g. Keeyask and Conawapa generating stations, transmission lines and related infrastructure) are located almost entirely within the Non-Commercial Forest Zone and therefore only minimally affect the VECs identified for the Bipole III Transmission Project and the associated residual effects. Additional high voltage transmission lines that are proposed for southern Manitoba, fall primarily within the agricultural zone. Very little, if any, crown owned productive forestlands are expected to be affected. Minor amounts of privately owned forestlands may be affected (Table 6-15).

Table 6-15 details the productive forestlands affected by existing and proposed Manitoba Hydro developments.

Table 6-15 Manitoba Hydro Developments - Effects on Crown Productive Forestland

	Year		Existing	Future	Comments
Project	Est.	FMU	(ha)	(ha)*	
Past/Existing Projects					
Wuskwatim generating					
station	2011	87	57	n/a	
	2008	87	420	n/a	
Wuskwatim Transmission	2010	61	96	n/a	
Traskwatiii Transinission		55	278	n/a	
	2011	54	34	n/a	
		52	9	n/a	
Riel Station	2010	1	0	n/a	
Glenborough – Harvey	2002	4	0	n/a	Ag. Zone; private land
Future Projects					
		86,			Mostly in FMU 76
Keeyask	2018	76	n/a	574	Wiostly III TWIO 70
Conawapa	2022	76	n/a	0	All in FMU 76
US tie line	2015	1	n/a	0	Ag. Zone; private land
Dorsey - Portage	2015	1, 2	n/a	0	Ag. Zone; private land
Dorsey - Riel	2017	1	n/a	0	Ag. Zone; private land
Letellier - St Vital	2017	1	n/a	0	Ag. Zone; private land
Total			894	574	

*Estimated.

Source: Manitoba Hydro, 2010A

<u>Urban Expansion</u> – There are no readily available sources of information to determine the extent of past urban expansion on crown owned productive forestlands. However, some can be attributed to population growth in existing communities and the establishment and expansion of cottage subdivisions. Urban expansion in the past 20 years will have accounted for a very minor reduction in productive forestland within the assessment area, most of which would have occurred in west-central and southern Manitoba. Cottage subdivisions are mostly located on lands closed to forest operations, including riparian areas which are excluded from sustainable harvest calculations. Expansion around most existing communities would also have occurred on privately owned lands.

Future urban expansion is anticipated to have a minor effect within the assessment area. The most pronounced expansion is expected in and around the town of Snow Lake, in FMU 61. The Snow Lake Sustainable Community Plan (MMM Group, 2009) was developed to plan for community expansion as a result of increased mineral exploration, the potential re-opening of the Garson Gold mine and the planned Lalor Lake mine development by HudBay Minerals. The planned town expansion is proposed to occur over the next 20 years within the Town of Snow Lake boundary. The recommended development plan proposes 84 new single-family dwellings

and an industrial/commercial reserve site in locations that are currently forested. The development plan also identifies potential townhouse and apartment construction in locations that are predominately non-forested. The proposed development potentially affects approximately 15 hectares of productive forestland, based on scale drawings. Additional spin-off development may also occur, on forested areas, within the surrounding Rural Municipality but the area affected is anticipated to be very small.

Agricultural Expansion – The potential for agricultural expansion has been and is limited to southern, west-central portions of the PSA and to a lesser extent, the Carrot River Valley, west of The Pas. Agricultural expansion is estimated to have had a negligible and possibly no negative effect on the net forestlands in the assessment area over the past 20 years. This can be attributed to expansive forestland clearing projects on marginal agricultural land, during the 1970's and early 1980's, promoted by provincial government sponsored financial incentive programs (pers. comm. Nielson, 2011). Marginal lands that they are, many have since been abandoned and have become subject to forest ingress (Agriculture and Agri-Food Canada, 2010). An analysis of satellite data has been used in the description of Forest Ingress in Section 6.8.4.3 and is provided in Appendix M.

Future agricultural expansion, in the assessment area, is anticipated to have a negligible effect on forestlands. This is because the better quality agricultural lands have already been cleared. Economic realities and present day thinking sees marginal potential agricultural lands for values other than agriculture, including environmental, forestry (including non-traditional values), habitat and long-term protection from all development (pers. comm. Beaubien, 2010). General environmental awareness and stewardship promotional programs offered by various organizations (MHHC, MAFRI, MFA, DUC, MWF, NCC, etc.) are further changing land management trends on the landscape.

<u>Other Infrastructure</u> – There are no other major infrastructure projects identified, either past or proposed, within the assessment area that have affected or will affect productive forestlands to any degree. The recently opened (2010) Global Aerospace Centre for Icing and Environmental Research (GLACIER) just outside of Thompson (MDS website, 2011) resulted in some minor clearing of forest, however the extent is minimal.

Beaver Activity – The Manitoba Conservation, 2010 – 2011 Trapping Guide (2010A) documents a decline in beaver trapping along with a resultant increase in beaver populations across Manitoba. Flooding, as a result of beaver activity, has resulted in major damage to private property and transportation infrastructure in many rural municipalities, most notably those surrounding Duck Mountain Provincial Park and Riding Mountain National Park. The situation has been exacerbated by the increased amounts of precipitation that have occurred in southern and central regions of Manitoba in recent years.

In addition to damage and flooding to private property and transportation infrastructure, beavers can, and are, flooding substantial areas of productive forestland. Beaver-caused flooding was widely reported (including the communities of Barrows, Camperville, Duck Bay and Pine Creek) in the collection of Aboriginal Traditional Knowledge (MMM Group et al, 2011) and during the public consultation process for the Bipole III Transmission Project. Louisiana Pacific Canada indicated substantial losses in FML #3, where in some instances up to 50% of planned harvest areas have been flooded, resulting in the loss of half of the timber volume in those areas (pers. comm. LeBlanc, 2011). In the eastern portion of Manitoba, an analysis for the 2008 Local Level Indicators of Sustainable Forest Management for FML #1 (Manitoba Model Forest website, 2011) identified an increase of almost 7,000 ha in beaver flooded area from 1986 to 1997. This represented an increase of 18% in beaver flooded area over the eleven-year period.

Although flooding from beaver activity does not result in permanent deforestation of forestlands, beaver dams can have a lifespan of up to 25 years in the Boreal Plain Ecoregion and up to 5 years in the Boreal Shield Ecoregion (pers. comm. Jansson, 2011). When the flooded period is combined with the forest ingress period, beaver flooding of productive forestlands, throughout the assessment area, may have a significant cumulative effect within past and future temporal boundary periods.

<u>Climate Change</u> – Canada has seen an average temperature increase of 0.16° C per decade, over the last 100 years along with an increase in precipitation. These changes have been most notable in winter and spring (Canada, Government of (G) website, 2011). This is supported by the findings of the Intergovernmental Panel on Climate Change (IPCC) that has identified earlier onset of spring greening of up to 10 to 14 days since 1981 (Field et al, 2007). As a result, northern forest growth appears to be accelerating at a rate of less than 1% per decade (Field et al, 2007).

The IPCC has forecast a 0.2° C warming, per decade, for the next 2 decades (Intergovernmental Panel on Climate Change, 2007) and the U.S. Environmental Protection Agency (EPA) predicts that temperature increases may double that of increases seen in the 20th century (United States, Government of (B) website, 2011). The IPCC warns of major changes in ecosystem structure and function if temperatures increase 1.5° to 2.5° C, which could occur within 5 to 8 decades based on warming forecasts. Sauchyn (2008) forecasts an increase in precipitation in Canada's forested area and more severe droughts in the prairie environment.

Climate change is expected to affect boreal forests to a greater degree than other forest types because of its northern location and because boreal forests are more sensitive to temperature (Johnson et al 2001). Johnson et al (2001) goes on to indicate that climatically-induced changes to the boreal forest in western Canada would likely occur through three principal mechanisms and their synergies: moisture availability, forest fires and insect outbreaks. Disturbances such as wildfire and insect outbreaks are increasing and are likely to intensify in a warmer future with

drier soils and longer growing seasons (Field et al, 2007). Models show a northward shift in the forest-grassland boundary with aspen groves shrinking and forest ingress decreasing in the Aspen Parkland Ecoregion. Similarly, the northern forest zone is predicted to expand northward, however, over numerous decades (Sauchyn et al, 2008). Forest growth is anticipated to decrease in drought areas and increase in areas not subjected to moisture limitations (Johnson et al, 2001; Field et al, 2007; Sauchyn et al, 2008).

Forest range retraction in the south and expansion in the north, within the temporal assessment period, is expected to be negligible. However, a changing climate may precipitate an increase in insect and disease infestation, which combined with drought periods, may result in an increase in forest fire frequency and area burned. Continued increases in precipitation in the winter and spring may result in increased flooding of productive forestland, especially when combined with increased beaver populations and related beaver flood areas.

6.8.4.2 Temporal Forest Status Action Descriptions

Mineral Exploration – Mineral exploration is a prominent activity in the northern portions of the Bipole III Transmission PSA (north of The Pas). Activities that require forest clearing include access and drill site development. Most sites are one-time occurrences requiring only unimproved access development from existing road systems to drill sites. Recent years have seen a change in that exploration companies are air lifting their crews and equipment into work sites rather than developing ground based access. This is as a result of demands to improve efficiencies and more restrictive environmental conditions surrounding these operations (pers. comm. Whaley, 2011). Most of the exploration activities still occur during the winter months and favour the use of non-productive forestlands that require less effort for clearing and access development. These activities have a limited, short-term effect on productive forestlands, which regenerate naturally as soon as the drilling activities cease.

<u>Forest Industry Temporary Access Development</u> – The forest industry constructs temporary roads to access forest areas to extract timber. The life expectancy of temporary forest access roads ranges from one to 10 years.

Annual Reports for FML #3, for the period 1999 to 2008, showed a total of 8.0 km of all-weather and 59.6 km of seasonal roads constructed. The annual reports did not classify the all-weather road construction into the Louisiana Pacific Canada (LP) short-term and long-term road categories. The total estimated gross area for all road construction, for FMUs 10, 11 and 12 combined, is 105 hectares for the 10-year period (Louisiana Pacific Canada website (A), 2011; Appendix L). LPs policy is to decommission new logging roads, after both harvesting and renewal activities have been completed in the associated harvest blocks. During road and trail decommissioning, rehabilitation activities include reforestation through natural regeneration or tree planting.

Annual Reports for FML #2 only report road construction activities by Forest Section; therefore, it is difficult to assess the effects specific to the assessment area. As part of their Canadian Standards Association Z809-08 forest certification, Tolko has established road-decommissioning targets that incorporate natural regeneration through forest ingress. Since 2006, Tolko has decommissioned 280 km of roads in FML #2, which approximates 14 years of Tolko's average annual all-weather road construction program of 20 km per year (pers. comm. Chapman, 2011). Similar to LP, Tolko regularly decommissions and rehabilitates temporary harvest roads as soon as renewal activities have been completed.

As policies exist to decommission and regenerate temporary roads through natural ingress or tree planting, forest access roads have been deemed as a temporary removal of forest area for the cumulative effects assessment.

<u>Commercial Timber Harvesting</u> – Manitoba Conservation regulates commercial timber harvesting through the establishment of Annual Allowable Cut levels and the requirement to achieve forest renewal standards on all harvest areas within seven years of harvest (Manitoba Conservation, 2001). Timber harvesting affects the age class distribution of forest areas and may also result in a change of species composition, but the productive capacity of harvested sites are maintained through forest renewal. Timber harvest is therefore considered a temporary condition with respect to cumulative effects assessment.

<u>Forest Fires</u> – Forest fires are a natural component of forest ecology. Forest fires affect the age class distribution of forested areas and may also result in a change of species composition but the productive capacity of forest sites is usually not affected. Natural regeneration on productive forestland occurs very quickly after fire and follows successional pathways associated with the ecosites affected. Regeneration on specific forest fire sites may also be assisted through renewal efforts such as seeding or tree planting. As with timber harvesting, the effects of forest fires are considered a temporary condition with respect to this cumulative effects assessment.

<u>Insect and Disease Infestations</u> – Severe insect and disease infestations may result in mortality to forested areas but the productive capacity of forest sites is not affected. Insect and disease mortality may create conditions favourable for the development of forest fires, in which case, productive forestlands would regenerate as described above. Insect and disease are usually species specific (host species) and therefore do not kill off the entire stand(s). Infestation affected areas may recover slower than burnt areas and follow different successional pathways; however, their productive capacity is not diminished and the condition is temporary.

<u>Windstorms</u> – Severe windstorms may result in windthrow and tree mortality but the effects on productive forestlands are similar to those of insect and disease infestations. Windthrow areas create favourable conditions for the development of forest fires and the resultant regeneration pathways that follow burned areas. Sites affected by windthrow and left to regenerate naturally

will recover slower than burnt areas and follow different successional pathways; however, their productive capacity is not diminished and the condition is temporary.

6.8.4.3 Afforestation Action Descriptions

Forest Ingress – Forest ingress is defined as the natural establishment of regeneration in an opening (Dunster et al, 1996). There is no data available to assess forest ingress affects by FMU; however, Manitoba Conservation has conducted a comparative analysis, for the periods 1994 and 2002, for land use/land cover features using Landsat Thematic Mapper^(TM) (LTM) spatial data (Manitoba, Government of (I) website, 2011). The analysis covers four (4) large geographic areas (Swan River, Dauphin, Minnedosa and Winnipeg) in south-western and southern Manitoba, ranging in size from 1.3 to 1.6 million hectares (Appendix M). These four (4) areas generally overlap the southern half of the Bipole III Transmission Project. These areas include agro-Manitoba and lands that are a mix of forested and agricultural lands where land cover changes can be pronounced due to economics and government land use policies.

The comparative analysis using forest cover and forest cutblock classifications in the LTM data, showed changes in forested area of 0.3%, 4.3%, 2.3%, and -1.3% for the four respective assessment areas. Over a total area of approximately 1.3 million ha of forested land, approximately 23,000 ha of additional area were added to the forest land cover classifications, an increase of 1.8% (Appendix M).

The LTM data do not cover the northern portion of the Project area but land cover change is expected to be negligible as there are few developmental pressures to clear forested lands (with the exception around The Pas). Most lands are not suitable for agriculture thereby further reducing the likelihood of extensive clearing in the future. Forest ingress does occur on a small scale, localized basis where past developments such as temporary access trails/roads, borrow pits, mine sites and mineral exploration sites have been abandoned.

Manitoba Hydro Forest Enhancement Program

The Manitoba Hydro Forest Enhancement Program provides funding support to enhance and sustain the forest environment of communities in Manitoba. Tree planting objectives of the program are to establish healthy, long-term forests or community tree stands utilizing native Manitoba species, with demonstrated hardiness for the local area (Manitoba Hydro website, 2011).

Although quantitative geo-referenced data is not available, the afforestation effect of the Forest Enhancement Program is estimated to be small in relation to the forested area contained within the Project LSA, but it is anticipated to have an incrementally positive effect when combined with all the actions in the afforestation category.

Woodlot Management Program

As described in Section 3.3.10, there are two separate Woodlot Management Programs administered by the Manitoba Forestry Association (MFA) and Manitoba Agriculture Food and Rural Initiatives (MAFRI). The woodlot programs were initiated in 1992 and 1993 respectively and are active in Project FMUs 1, 2, 4, 5, 10, 11 and 12. Both administrations have planted approximately 1500 hectares with trees across southern and west-central Manitoba (pers. comm. Thornblom, 2011). Although the quantitative data is not geo-referenced it is estimated from the Woodlot Program map (Appendix N) that approximately 2/3 of the total area planted (2000 ha), over the last 18 years, has been within Project affected FMUs. Plantings under the woodlot program may in part be reflected in the land cover change analysis discussed under forest ingress.

Future afforestation projects, under the Woodlot Programs, are anticipated to be smaller than in the past 20 years. The movement towards zero till practices has reduced the use of shelterbelts for soil conservation. They are also increasingly seen as obstacles for today's larger farming equipment and federally funded tree planting programs ended in 1995 (pers comm Thornblom, 2011).

Prairie Shelterbelt Program

As described in Section 3.3.10, the Agri-Environment Services Branch (AESB) administers the Prairie Shelterbelt Program. Although quantitative geo-referenced data is not available, the afforestation effect of the Prairie Shelterbelt Program is estimated to be small in relation to the forested area contained within the Project LSA. The establishment of new shelterbelts is expected to be very limited as federally funded shelterbelt programs ended in 1995, zero tillage programs have reduced the perceived need for shelterbelts and existing shelterbelts are being removed as the farm equipment footprint continues to grow in size (pers comm Thornblom, 2011). Shelterbelts are anticipated to have an incrementally positive effect when combined with all the actions in the afforestation category. Plantings under the shelterbelt program may in part be reflected in the land cover change analysis discussed under forest ingress above.

Tree Planting Programs

Two principal tree planting programs that have been administered by Manitoba Conservation and the Manitoba Forestry Association are the Trees for Tomorrow and Forest 2020 programs. Together they have accounted for approximately 1.36 million trees being planted which equates to approximately 852 ha at a standard 1600 trees/ha density. Most of these trees have been planted in agro-Manitoba as can be seen in Table 6-16 in the distribution by FMU. These initiatives are the result of environmental policies implemented by federal and provincial governments and therefore have limited lifespans. The Forest 2020 Program was completed in 2006 and the Trees for Tomorrow Program, scheduled to run to 2012, is currently at the midway

point of the program. It is uncertain if any new programs will be initiated in the 2011 - 2030 period.

Table 6-16 Afforestation under Tree Planting Programs

FMU	Trees for Tomorrow Planted	Trees for Tomorrow Estimated Area ¹ (ha)	Forest 2020 Trees Planted ¹	Forest 2020 Area (ha)	Total Area (ha)
1	795,633	497	73,600	46	543
2	227,296	142	51,200	32	174
4	63,495	40	64,000	40	80
5	40,200	25			25
10			32,000	20	20
83	50,000 ²	31			31
Total	1,176,624	714	220,800	138	852

Source: Manitoba Conservation, 2010C & 2011A

Manitoba, Government of (I) website, 2011

6.8.4.4 Land Use Reclassification Descriptions

Any actions that reclassify existing crown owned productive forestlands managed for fibre production, to a restricted classification that excludes forest management, reduces the amount of land in production. In doing so, it negatively affects the AAC, the amount of area under management within the FMLs and the volumes of standing timber on the managed land base.

There are numerous activities and initiatives that have in the past and will continue to erode away at the productive forestland base, including mining, quarries and borrow areas, road and other infrastructure development, industrial development, urban expansion and agricultural expansion. Although all these activities result in the re-designation and removal of the affected lands from forest management (where so previously designated), the cumulative effect is very small when considering the total amount of productive forestland under forest management. The much larger effect of land use reclassification stems from past, present and future initiatives that set aside lands for protection from development (e.g., Areas of Special Interest, parks, park reserves, ecological reserves), elevate the protective status of lands that are already under some level of protection (e.g. provincial parks, forest reserves, wildlife management areas) and land ownership changes that result in land use restrictions (e.g., treaty land entitlements). These are discussed in greater detail below.

¹ - Based on an average of 1,600 trees/ha; ² 35,000 trees not geo-referenced (pers. comm. Philis, 2011)

Provincial and Federal Park Establishment

There are seventeen (17) Provincial Parks in the cumulative effects assessment area. The establishment of thirteen (13) of the Provincial Parks took place from 1961 to 1974 and therefore predates the temporal boundaries determined for this assessment in Section 6.8.3.2. Four (4) additional Provincial Parks were established between 1997 and 2003, and have all been designated as protected areas.

The cumulative effects resulting from the establishment of these four Provincial Parks are included in the protected areas establishment analysis below.

Protected Areas Establishment

Manitoba's Protected Areas Initiative (PAI) is a government program dedicated to building a network of protected areas that contains representation of the tremendous biological diversity found in Manitoba's varied landscapes (Manitoba, Government of (J) website, 2011). Since the early1990s, 18,471 ha of productive forestlands have been awarded protected status within the FMUs affected by the Bipole III Transmission Project. The majority of this area (15,913 ha) is in the Aspen Parkland Forest Section. Relative to the FMLs, 315 ha were within FML #2 and 2,214 ha of productive forestland were within FML #3.

Table 6-17 provides the distribution of area of productive forestland awarded protected area status within the past 20 years by FMU and FML.

Table 6-17 Productive Forestland Awarded Protected Status within the Assessment Area

	Productive Forestland (ha)						
FMU	Total	FML #2	FML #3				
1	3,344						
2	1,931						
4	7,924						
5	2,714						
10	2,046		2,046				
11	168		168				
12	75	46					
52	269	269					
Total	18,471	315	2,214				

Source: Manitoba, Government of (I) website, 2011.

In addition to those areas already awarded protected status, Manitoba's PAI has identified Areas of Special Interest (ASIs) to capture additional features that are not yet adequately represented within existing protected areas. In most cases, ASI boundaries are flexible and can be changed

to respond to new information; however, single or restricted occurrence enduring features have limited flexibility for boundary changes (Manitoba, Government of (J) website, 2011). There are a total of 249,251 hectares of productive forestland contained within the current suite of ASIs in the Bipole III cumulative effects assessment area. The Nelson River, Mountain and Saskatchewan River Forest Sections account for the majority of this area with 109,264, 62,809 and 47,740 productive forestland hectares respectively. These potential protected areas overlay 177,142 productive forestland hectares in FML #2 and 29,289 hectares in FML #3 (Table 6-18).

Table 6-18 provides the distribution of productive forestland hectares that may potentially be awarded protected area status within the next 20 years by FMU and FML.

Table 6-18 Areas of Special Interest within the Assessment Area (pending protection)

	1	Productive Forestland (ha)						
FMU	Total	FML #2	FML #3					
1	5,454							
2	1,131							
4	4							
5	3,599							
10	4,855		4,855					
11	24,432		24,432					
12	33,522	22,093	2					
52	28,645	28,645						
55	19,095	19,095						
61	463	463						
74	18,755							
83	14,329	14,329						
84	67,507	67,507						
87	25,010	25,010						
88	2,451							
Total	249,251	177,142	29,289					

Source: Manitoba, Government of (I) website, 2011.

Treaty Land Entitlement

Treaty Land Entitlement (TLE) settlements were reached between 27 Manitoba First Nations, Canada and Manitoba between 1994 and 1997 (Canada, Government of (D) website, 2011). In 2008, Peguis First Nation, Canada and Manitoba reached a settlement resolving outstanding land claims (Canada, Government of (C) website, 2011). The total TLE settlement for crown land

obligations in Manitoba is 463,104 hectares (Appendix O). To date, 403,273 ha have been identified by eligible First Nations for consideration by Canada and Manitoba (Manitoba Conservation, 2010B).

The TLE process in Manitoba commenced near the beginning of the temporal assessment period (1990) and should be completed by the end of the period (2030). It is administered by the Treaty Land Entitlement Committee of Manitoba Inc. under the auspices of the TLE Framework Agreement (Manitoba, Government of (S) website, 2011). There are eight (8) First Nations that have currently selected 51,150 hectares of productive crown forestland within the forestry cumulative effect assessment area. The majority of this area (36,288 ha) has been selected in FMU 12 and the remaining area (14,862 ha) is distributed among the other 8 FMUs. These selections partially fall within FML #2 and #3 and account for 8,894 and 5,594 productive forestland hectares respectively (Table 6-19). Although the TLE Framework Agreement stipulates procedural measures for selecting lands within forest management plan areas, there are no exclusionary limitations on selecting lands within them (Manitoba, Government of (S) website, 2011).

Provincially, there is an outstanding balance of 81,848 hectares of TLE entitlement, which will encompass productive and non-productive crown forestland. This outstanding balance can be broken down to 57,788 hectares – First Nations residing outside of the assessment area, and 24,060 hectares – First Nations currently selecting or residing inside the assessment area. There are also a total of 22,017 hectares of over selected area of which 6,576 hectares are located within the assessment area (Appendix O).

It is currently unknown where the outstanding selections will occur or which of the over selections will be returned. Resolution of the outstanding balance is expected to add to the 51,150 productive hectares currently affected within the assessment area. As an estimate, based on the percentage factor of those lands awarded versus those lands within the assessment area that are productive forestlands, another 7,600 ha may be awarded through the TLE process.

Table 6-19 shows the distribution of area for TLE selections to date within the cumulative effects assessment area by FMU and FML.

Table 6-19 Treaty Land Entitlement Selections within the Assessment Area

Table 6-19 Treaty Land Entitlement Selections within the Assessment Area Total Area Productive Forestle								
First Nation	FMU	FML	(ha)	Productive Forestland Area (ha)				
			(na)	Area (na)				
Peguis First Nation	1		7,101	547				
Rolling River First Nation	5		924	725				
Wuskwi Sipihk First Nation	11	3	7,352	5,594				
Sapotaweyak Cree Nation ¹	12	2		1,133				
Sapotaweyak Cree Nation ¹	12		45,177	31,821				
Wuskwi Sipihk First Nation	12		5,285	3,333				
Total FMU 12			50,462	36,288				
Opaskwayak Cree Nation	52	2	2,297	149				
Sapotaweyak Cree Nation	52	2	64	57				
Total FMU 52			2,361	206				
Opaskwayak Cree Nation	55	2	1,135	1,001				
Norway House Cree Nation	83	2	4,543	3,111				
Nisichawayasihk Cree Nation	87	2	4,730	3,443				
York Factory First Nation	88		413	237				
Total FML#2				8,894				
Total FML#3				5,594				
Total Awarded			79,020	51,150				
Future Eligible			59,831	7,600 ²				
Total (past and future)			138,851	58,750				

Source: Manitoba Conservation, 2010B

The effects of other actions within the cumulative assessment area, as applicable to the Project area VECs, are summarized in Table 6-20. They are indicated in context of their resultant environmental effects and measureable parameters.

¹Total hectares by FML designation was not determined and has all been attributed to the largest area of productive land.

² Estimate based on percent of area awarded to date that is productive forestland and located within the assessment area.

Table 6-20 Cumulative Effects Assessment Other Actions Summary

Other Actions by Category	Other Action Description	VEC	Measurable Parameter/Variable	Environmental Effects	Comments
				Reduced area under forest management/AAC	Extent limited
	Mine site and access road development;	Productive forestland	Area withdrawn from FML (ha)	Reduced area in FMLs	Extent limited
	Forest Industry permanent road development;		Volume of standing timber (m ³)	Reduced volume of standing timber	Extent limited
Deforestation	Provincial and Municipal road development; Manitoba hydro generating station and access road development;	High Value Forest Sites	Area of high value forest sites (ha)	Reduced area of high value forest sites; loss of investments	Extent very limited
	Urban expansion; Agricultural expansion; Other infrastructure development	Private Lands with Forestry Values	Area under woodlot management (ha); Area/length of shelterbelt affected (ha/m)	Reduced area under management; Loss of shelterbelts or portions thereof	Extent very limited
			Forested area contributing to AAC (ha)	Temporary halt in productivity	Extent and effect very limited
	Mineral exploration trails, drill	Productive forestland	Area withdrawn from FML (ha)	No effect on FML area	Extent and effect very limited
	sites and seismic lines; Forest industry road		Volume of standing timber (m)	Reduced volume of standing timber	Extent and effect very limited
Temporal Forest Status	development accessing harvest areas; Commercial timber harvesting; Forest fires; Insect and disease infestations; Windstorms	High Value Forest Sites	Area of high value forest sites (ha)	Reduced area of high value forest sites; loss of investments	Extent and effect very limited
		·		Temporary halt in productivity; Loss of shelterbelts or portions thereof	Extent and effect very limited

Other Actions by Category	Other Action Description	VEC	Measurable Parameter/Variable	Environmental Effects	Comments
			Forested area contributing to AAC (ha)	Increased area under forest management	Positive effect
	Forest ingress;	Productive forestland	Area withdrawn from FML (ha)	No effect on FML area	
	Manitoba Hydro Forest Enhancement Program;		Volume of standing timber (m)	Increased volume of standing timber	Positive effect
Afforestation	Woodlot Management Program; Prairie Shelterbelt Program (AESB); Conservation District Initiatives;	High Value Forest Sites	Area of high value forest sites (ha)	No effect on high value forestlands	Positive effect
	Trees for Tomorrow Program; 20/20 Program	Private Lands with Forestry Values	Area under woodlot management (ha); Area/length of shelterbelt affected (ha/m)	Increased area under management; Increase in area of shelterbelts	Positive effect
			Forested area contributing to AAC (ha)	Reduced area under forest management	Significant effect
		Productive forestland	Area withdrawn from FML (ha)	Reduced area in FMLs	Significant effect
	Provincial and Federal Park establishment; Protected Area establishment;	Troductive forestiand	Volume of standing timber (m)	No effect on standing timber but reduced volume available for utilization	Significant effect
Land Use Reclassification	Treaty Land Entitlement selection areas	High Value Forest Sites	Area of high value forest sites (ha)	No effect on high value forestlands	Extent limited
		Private Lands with Forestry Values	Area under woodlot management (ha); Area/length of shelterbelt affected (ha/m)	Effects are tied to management objectives which may change at any time	Extent very limited

6.8.5 Magnitude Scoping of Potential Cumulative Effects

Having identified the other actions within the Bipole III Transmission Project area that contribute to cumulative effects on Bipole III VECs, the next step is to scope the potential magnitude of their effects. This is accomplished in Table 6-21 where the effects of other actions are ranked in magnitude based on the information in Section 6.8.4 and against the known effects of the Bipole III Transmission Project. Most of the actions magnitudes of effects are negligible on the forestry VECs except for those that result in the reclassification of crown-owned productive forestlands, which preclude forest management activities or change ownership status.

Table 6-21 Magnitude Scoping of Potential Cumulative Effects

		VEC/Residual Environmental Effects						
	Action Description		oduct orestla		High Value Forest Sites	Private Lands with Forestry Values		
Action Category			Reduced area in FMLs	Reduced volume of standing timber	Reduced area of high value forest sites; loss of investments	Reduced area under management; Loss of shelterbelts or portions thereof		
	Mine sites, quarries/borrow areas & access development		1	1	1	0		
	Forest industry permanent road development	1	0	1	0	0		
	Provincial and Municipal road development	1	1	1	1	0		
	Manitoba Hydro generating station and transmission project developments (excluding Bipole)	1	1	1	1	1		
Deforestation	Urban expansion	1	0	1	0	1		
	Agricultural expansion	0	0	0	0	1		
	Other infrastructure & industrial development	1	1	1	1	1		
	Beaver activity	1	0	1	1	1		
	Climate change	0	0	+	0	0		
	Bipole III Transmission Project	1 ¹	1 ¹	1 1	1 ²	1 ³		

		VE	C/Res	idual En	vironmenta	I Effects
			oduct restla		High Value Forest Sites	Private Lands with Forestry Values
Action Category	Action Description		Reduced area in FMLs	Reduced volume of standing timber	Reduced area of high value forest sites; loss of investments	Reduced area under management; Loss of shelterbelts or portions thereof
	Mineral exploration trails and drill sites	0	0	1	1	0
	Forest industry temporary access development	0	0	1	0	0
Tomporal Forest	Commercial timber harvesting	0	0	1	0	0
Temporal Forest Status	Forest fires	0	0	1	1	0
	Insect and disease infestations	0	0	1	1	1
	Windstorms	0	0	1	1	1
	Bipole III Transmission Project	1	0	1	0	1
	Forest ingress	0	0	+	+	+
	Manitoba Hydro Forest Enhancement Program	0	0	0	0	+
Afforestation	Woodlot Management Program	0	0	0	0	+
	Prairie Shelterbelt Program (AESB)	0	0	0	0	+
	Tree plantating programs	0	0	0	+	+
	Bipole III Transmission Project	0	0	0	0	0
Land Use D-	Protected Area establishment, including parks	4	4	3	1	0
Land Use Re- classification	Treaty Land Entitlement selections	4	4	3	1	0
	Bipole III Transmission Project	1	1	1	1	0

Magnitude ranking: + = positive; 0 = no effect; 1 = negligible; 2 = low; 3 = low to moderate; 4 = moderate; 5 = moderate to high; 6 = high.

The above scoping of other action effects and their potential magnitude of effects focuses the analysis of effects in Section 6.8.6.

¹ < 1% of FMUs area/vol affected; ² < 2% of HVFS in 3 mile wide LSA; ³ values not clearly quantifiable but mitigable.

6.8.6 Analysis of Effects

The analysis of cumulative effects focuses on those actions that are realistically quantifiable and recognizable within the Project assessment area. The magnitude scoping assessment (Section 6.8.5; Table 6-21) determined that cumulative effects from all actions are primarily focused on the principle VEC, which is productive forestland. Where possible, all effects are shown relative to productive forestland.

The details of the cumulative effects analysis are contained in Appendix P and summarized in Table 6-22.

Table 6-22 Cumulative Effects Summary

FMU / FS	;	Bipole III Footprint (prod ha)	Deforestation Actions (prod ha)	Reclassification Actions (prod ha)	Afforestation Actions (prod ha)	Balance / Cumulative Effect (prod ha)	Productive Forestland in FMU (ha)	Effect (%) of productive forestland
	1	159	0	3,891	543	3,506	171,460	2.0
	2	76	0	1,931	174	1,833	119,605	1.5
	4	29	0	7,924	80	7,873	148,910	5.3
	5	126	0	3,439	25	3,540	105,146	3.4
Aspen Parkla	nd	389	0	17,185	7,398	10,175	545,121	1.9
	10	424	32	2,046	20	2,482	349,498	0.7
	11	285	32	5,762	0	6,078	249,219	2.4
	12	194	44	36,363	0	36,601	192,957	19.0
Mountain		903	108	44,170	18,847	26,334	791,674	3.3
	52	37	72	475	0	583	65,146	0.9
	54	170	118	0	0	288	90,976	0.3
	55	225	333	1,001	0	1,559	51,745	3.0
Saskatchewa	n R	431	523	1,476	0	2,430	207,867	1.2
Highrock	61	51	227	0	0	278	87,896	0.3
Churchill R	74	120	0	0	0	120	244,092	0.0
	83	141	365	3,111	31	3,585	290,148	1.2
	84	210	237	0	0	446	215,424	0.2
	85	214	192	0	0	405	184,712	0.2
	87	89	1,957	3,443	0	5,489	215,017	2.6
	88	227	0	237	0	463	74,652	0.6
Nelson River		880	2,750	6,791	31	10,389	905,301	1.1
Total (1990 - 2010)		n/a	3,608	69,621	26,276	46,953	2,781,951	1.7
Estimate (2011 - 2030)		2,774	2,764	256,852	1,735	260,655	2,781,951	9.4
Total Effects Period (1990 - 2030)		2,774	6,372	326,473	28,011	307,608	2,781,951	11.1

The Bipole III Transmission Project deforestation footprint, on productive forestland, equates to a one time effect of 2,774 ha. Similarly, cumulative effects from mining, forest permanent road development and hydro-electric projects are estimated to be 6,372 ha over the period 1990 to 2030.

Effects of afforestation more than counter those of deforestation when viewed from a total area perspective only, with 28,000 ha potentially added to the forest landbase. It is however, important to note that most of the deforestation activities are occurring in the northern portions of the Commercial Forest Zone (Nelson River, Highrock and Saskatchewan Forest Sections) affecting crown-owned lands, while most of the afforestation activities occur in agro-Manitoba (Aspen Parkland and Mountain Forest Sections), affecting a combination of private and crown lands. Afforestation in the more southern portion of the PSA is attributed to forest ingress and tree planting programs. Although the data show significant gains in forestlands within recent years in agro-Manitoba, this trend is uncertain. Government policies and economics are both highly influential and may vary significantly over relatively short periods of time. The areas gained in more southern regions may not off-set the effects to crown-owned productive forestlands in more northern regions when considering forest management objectives.

The greatest effect to productive forestlands stems from actions that result in the reclassification of lands from open to forest management to a restricted status that excludes forest management. The principal causal actions are government sponsored activities such as setting lands aside for protection (under designations such as parks, ecological reserves, wildlife management areas, etc.) and settling outstanding treaty land entitlements (TLEs). Between 1990 and 2030, total projected reclassifications of productive forestlands include 267,723 ha to protected status and 58,750 ha to First Nations lands through the TLE process, for a total of 326,473 ha (Table 6-22 and Appendix P).

All actions/projects combined result in a cumulative negative effect on productive forestlands of approximately 307,600 ha for the period 1990 to 2030. This constitutes 11.1% of the productive forestland within the affected FMUs (Table 6-22). The estimated cumulative effects on FML #2 and #3 are 135,081 ha (11.3%) and 38,520 ha (11.1%) respectively (Table 6-23 and Appendix P). As with the total area assessment, the largest effect on productive forestlands stems from the reclassification of forest lands. When reclassified, these lands will be withdrawn from the FML holders, affecting the sustainable harvest levels and the total volume of standing timber.

The total productive forestland affected when considering all cumulative effects far exceeds the total maximum allowable of 0.5% over 5 years under the FML agreements (Appendix A). When extrapolated over 40 years (1990 to 2030), the maximum allowable is 4%. Cumulative effects exceed this by 7.3% and 7.1% for FML #2 and #3 respectively.

20,624

12.4

	FML	Bipole III Footprint (prod ha)	Reclassification	Reclassification	•	Productive	Effect (%) of productive forestland in FML
	2	1,165	12,753	121,163	135,081	1,194,296	11.3
ĺ	3	465	7,871	30,184	38,520	345,813	11.1

191,274

1,540,109

169,020

Table 6-23 Cumulative Effects on Productive Forestlands in FML Areas

6.8.7 Identification of Mitigation

1,630

Total

The Bipole III Transmission Project specific mitigation measures are provided in Section 6.2. However, their effectiveness will be limited relative to cumulative effects of other actions. To limit similar effects in the future, Manitoba Hydro should attempt to locate its projects on non-productive forestlands, outside of the Commercial Forest Zone or outside of FML areas. However, these alternatives may not be practical or cost effective.

The larger responsibility for mitigation falls on government who is responsible for reclassification of lands to protected status and settlements of outstanding TLEs. In this respect the government of Manitoba may consider the following mitigation measures:

- Where possible, direct the establishment of protected areas outside of the Commercial Forest Zone and FML areas;
- Where possible, direct the selection of lands for protection to non-productive lands;
- Where possible, direct the selection of lands for protection to purchase of privately owned lands;
- Where lands in excess of agreed to limits are withdrawn from FML areas, Manitoba must abide by the terms of the respective agreements (Appendix A);
- Where possible, practical, socially and culturally acceptable, direct the selection of TLE lands to areas outside of the Commercial Forest Zone and FML areas;
- ➤ Where possible, practical, socially and culturally acceptable, direct the selection of TLE lands to non-forested and/or non-productive lands;
- Where possible, practical, socially and culturally acceptable, direct the selection of TLE lands to purchase of privately owned lands;
- Scale down the forest industry in FMUs where sustainable harvest levels are fully committed (e.g., Mountain Forest Section) and financially compensate the affected forest industries/companies for related harvest level reductions; and
- Where possible re-negotiate the license agreements with the FML holders.

6.8.8 Evaluation of Significance

The evaluation of significance of cumulative effects of all actions on productive forestlands will be addressed in the *Bipole III Transmission Project: A Major Reliability Improvement Initiative, Environmental Impact Statement* (Manitoba Hydro, 2011B) in context with all other study discipline results.

6.8.9 Follow-Up

It is Manitoba Hydro's responsibility to ensure that the mitigation measures prescribed in this forestry technical report are implemented and verified through follow-up inspections, monitoring and reporting. It is also Manitoba Hydro's responsibility to remain cognizant of its future projects potential effects on productive forestlands and minimize these, where possible.

Manitoba Hydro has no authority to address the largest of the cumulative effects, specifically the reclassification of productive forestlands to protected status and the settlement of TLEs. Manitoba Hydro's role is therefore limited to monitoring and reporting on its contribution to the cumulative effects on productive forestlands.

7.0 Conclusions

Forestry VECs, related environmental indicators and measurable parameters for the Bipole III Transmission Project effects assessment were identified as indicated in Table 7-1.

Table 7.1 Forestry VECs, Environmental Indicators and Measurable Parameters

Valued Environmental Component	Environmental Indicator	Measurable Parameter/ Variable
Productive forestland	Productive forestland contributing to the sustainable AAC	Forested area (ha)
	Forest Management License Areas	Area withdrawn from license areas (ha)
	Standing timber	Wood fibre volume (m3)
High value forestlands	Forest management investments	Area under development (plantations, assisted regeneration) (ha)
Research/monitoring sites	Site(s) integrity	Number of sites affected
Private land	Woodlots	Area under management (ha)
enhancements	Shelterbelts	Area/number affected (ha/m)

The results of the Bipole III Transmission Project effects assessment are summarized in Table 7-2.

Table 7.2 Bipole III Transmission Project - Forestry Assessment Results Summary

Effect on	Total	Project	% of Total
Crown productive forestland	2,090,854 ha	2187 ha	0.11
Private forest land	690,120 ha	586 ha	0.09
Softwood AAC	1,062,280 m3/yr	1,441 m3/yr	0.14
Hardwood AAC	786,120 m3/yr	692 m3/yr	0.09
FML #2 productive forestland	1,194,296 ha	1165 ha	0.1
FML #3 productive forestland	345,813 ha	465 ha	0.14
Softwood Standing Timber	69,659,961 m3	94,443 m3	0.14
Hardwood Standing Timber	30,878,072 m3	39,116 m3	0.13
High Value Forest Sites	8,072 ha	126 ha	1.56*
Research/monitoring sites	3 adjacent	0	0
Woodlots	453 ha	21 ha	4.6**
Shelterbelts	n/a	19 ha	n/a

^{* %} of total high value forest site within the LSA.

Mitigation measures have been prescribed to minimize Project related effects on the environment and specifically the identified VECs. Some potential negative effects were mitigated through careful routing of the Project. In addition to applicable regulations (e.g., *The*

^{** %} of affected woodlot areas.

Forest Act, The Crown Lands Act, and The Wildfires Act), the following mitigation measures shall apply:

- Where possible, limit clearing to the above ground organic matter;
- Where practical, salvage and utilize all merchantable timber;
- Where the demand exist, provide opportunity for local communities to access nonmerchantable timber;
- Dispose of vegetative debris by piling and burning under frozen conditions, chipping, mulching, mounding or burying, or as authorized by work permit;
- ➤ Where elm trees need to be removed, all wood shall be burnt or chipped immediately or disposed of at approved disposal sites;
- Where burning is employed as a method of debris disposal, burning shall occur on mineral soil, where possible;
- ➤ Debris piles must be located well away from ROW edges to minimize scorching adjacent vegetation during burning;
- Within the forested zone all burning is to be conducted during the winter months;
- All burn sites must be thoroughly examined prior to spring breakup to ensure all fires are fully extinguished;
- Manitoba Hydro must compensate Manitoba for Project effects to forest resources as determined by application of the Forest Damage Appraisal and Valuation policy, or as directed by the government;
- Manitoba Hydro shall prepare Environmental Protection Plans (EnvPP) for the construction, operations and maintenance, and decommissioning phases of the Project. The EnvPPs shall include all forestry specific environmentally sensitive sites and applicable mitigation measures to protect those sites from damage;
- Construction, operations and maintenance activities shall be limited to the Project footprint as much as possible to minimize damage to adjacent forest resources;
- Manitoba Hydro will meet with landowners whose woodlots, shelterbelts and other forest values are affected by the Project to discuss mitigation measures. These may include off-site replacement/enhancement initiatives and/or compensation reflective of the landowners management objectives; and
- Manitoba Hydro will endeavour to minimize the effects of the Project on private land forest values.

Even though the effects of the Bipole III Transmission Project on commercial forestry and the related VECs will be evident for the life of the Project, residual effects on productive forestland are limited relative to their current state and extent. The Bipole III Transmission Project will not negatively affect current harvest levels in the Nelson River, Highrock and Aspen Parkland Forest Sections. It may marginally reduce harvest levels in FMU 10 where the AAC is fully allocated to Louisiana Pacific Canada Ltd. (FML #3) and Timber Sale Agreement holders; however, this is not certain as numerous variables affect the calculation of sustainable harvest

levels including operational variables, forestland ownership, forest age class distribution and overlapping land use interests. Effects on private forest values are minimal and mitigable through direct negotiations with affected landowners. The opportunity exists to make fuelwood available to communities in proximity to the Project footprint, where demand exists.

Cumulative effects as a result of the Project are primarily related to the Commercial Forest Zone as a result of the reclassification of productive forestlands to exclude forest management activities. These reclassifications stem from such government initiatives as the Protected Areas Initiative and settlements of Treaty Land Entitlements and have the potential to substantially affect Forest Management License holders within the Project area. The responsibility to mitigate these effects rests with the provincial government.

8.0 References

8.1 Citations

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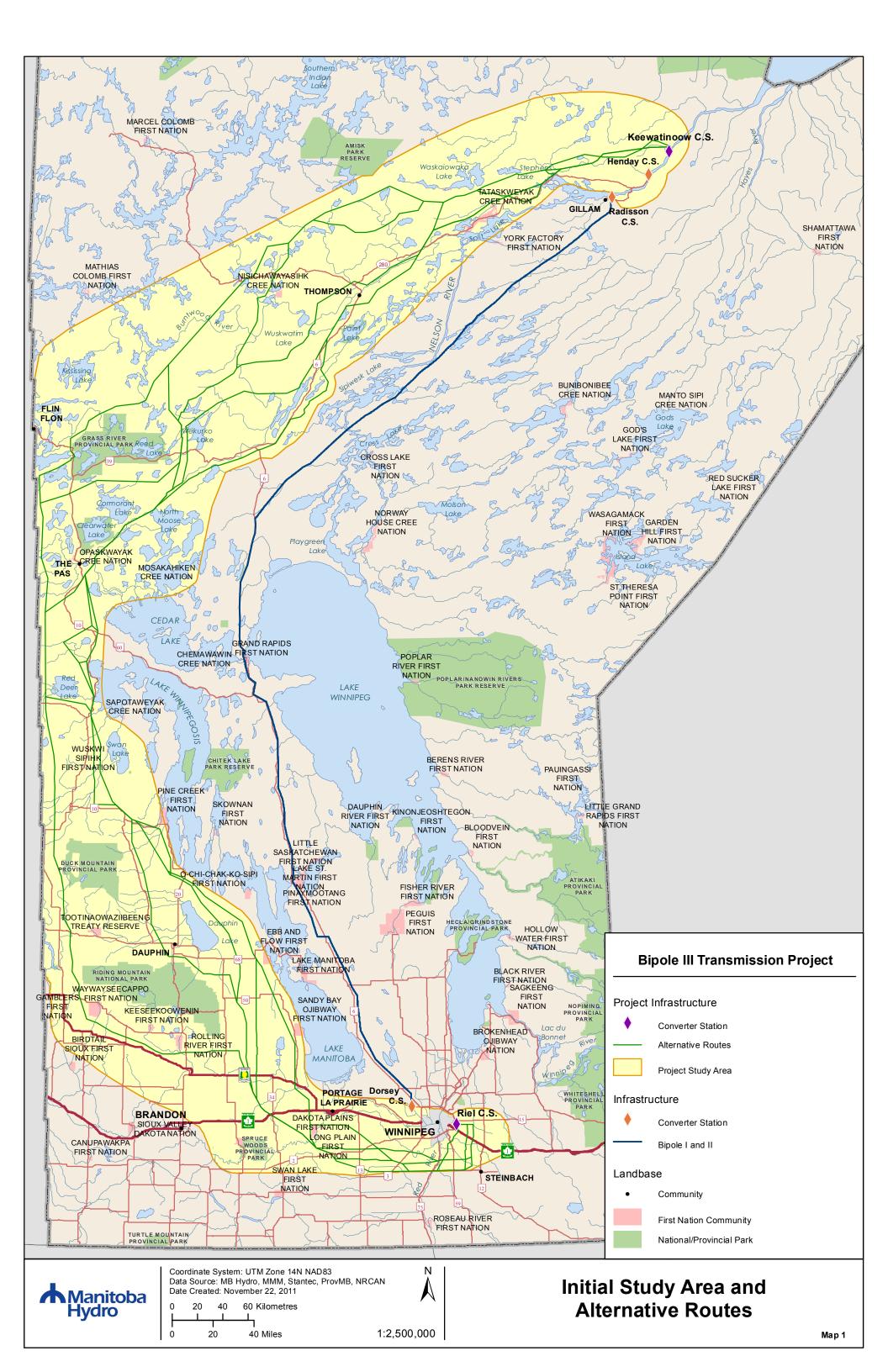
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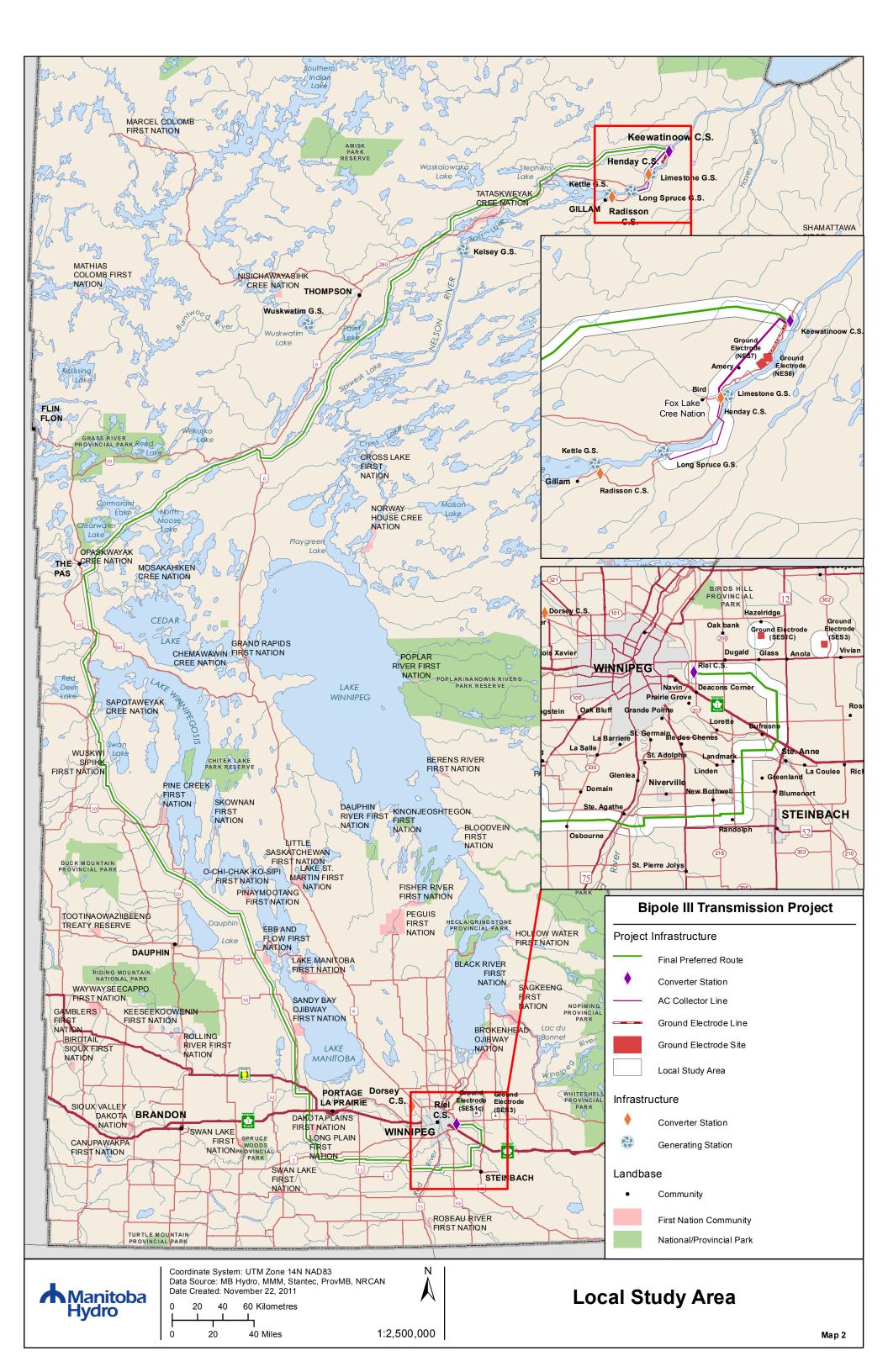
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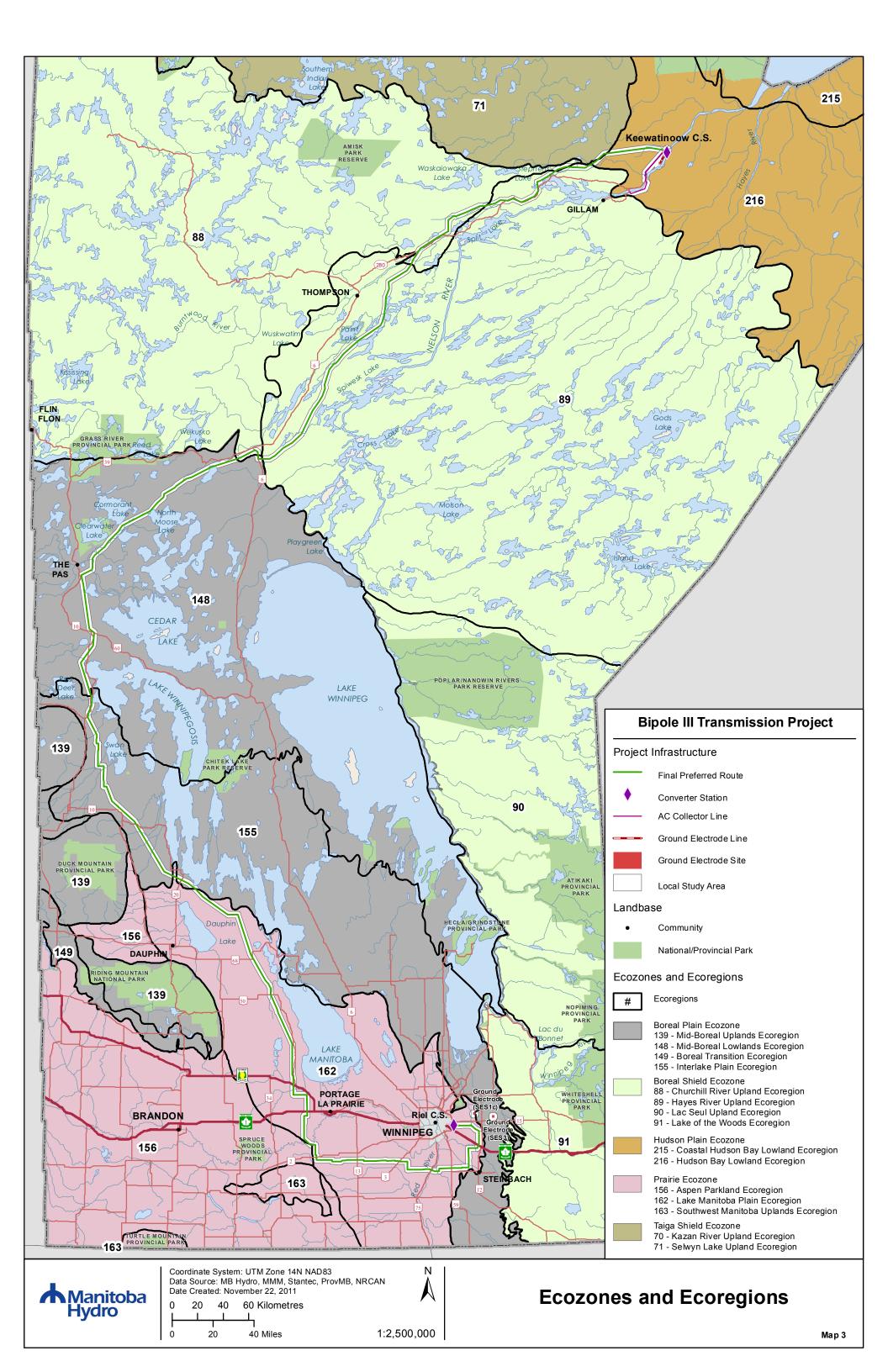
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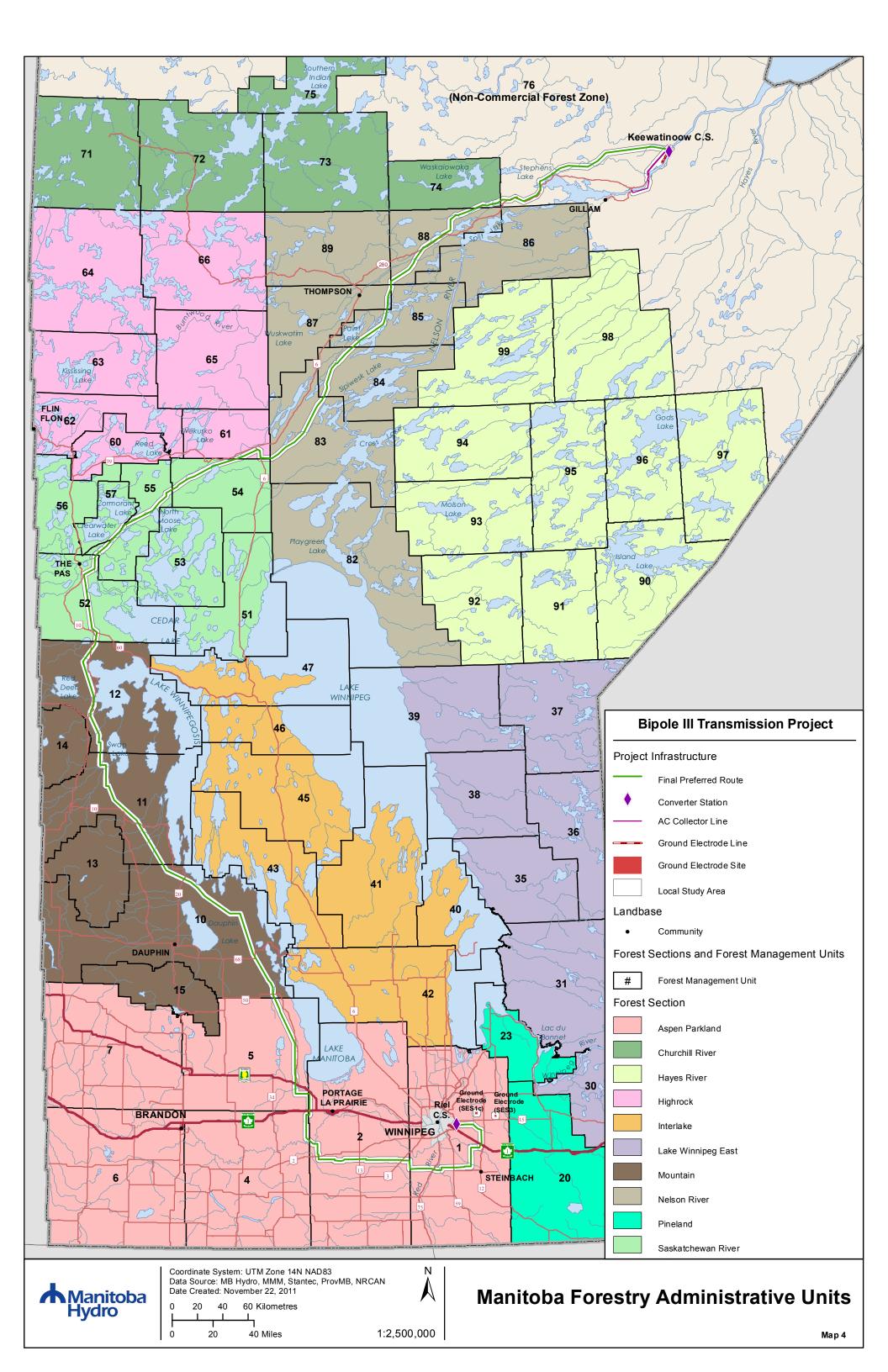
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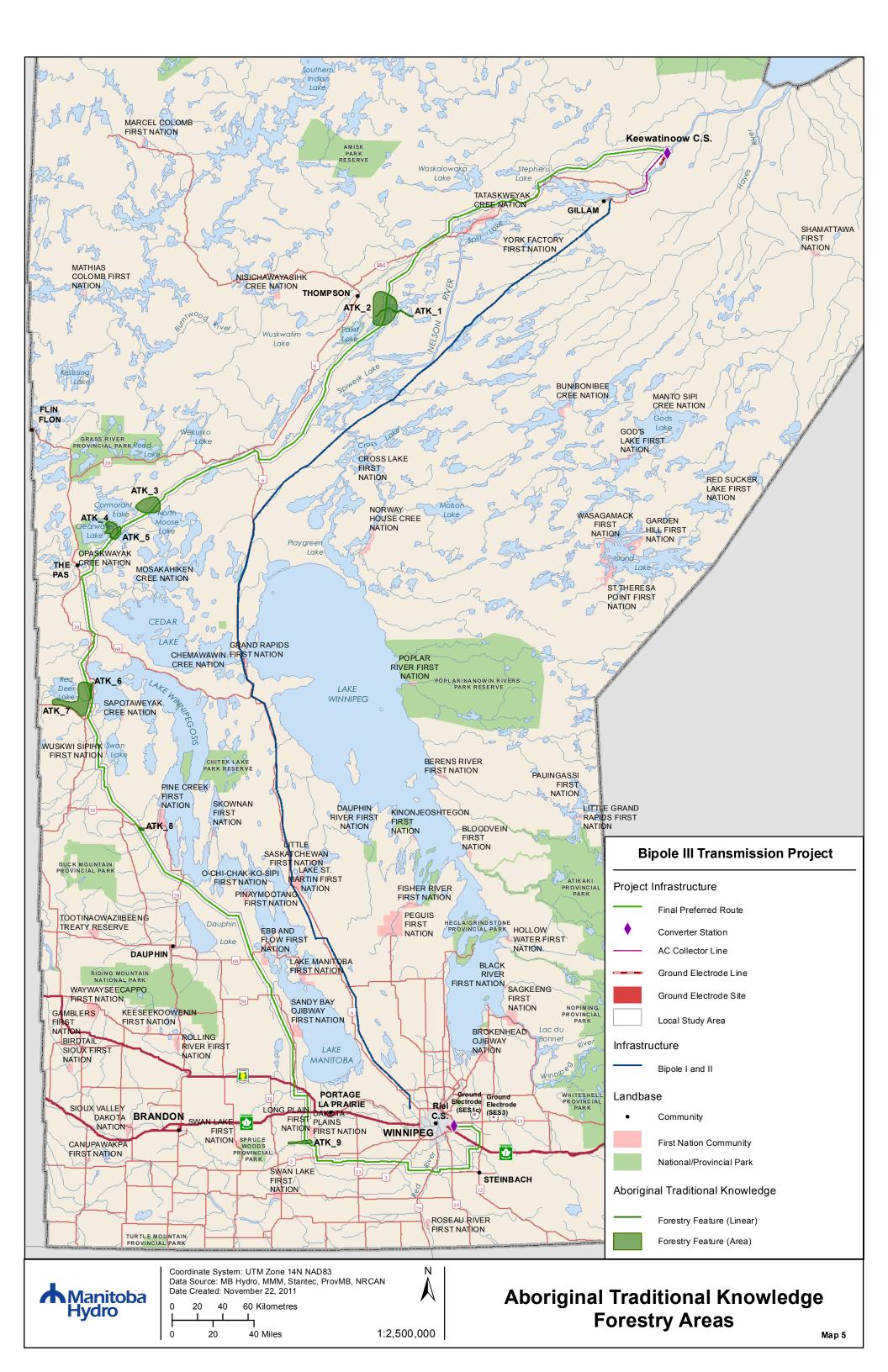
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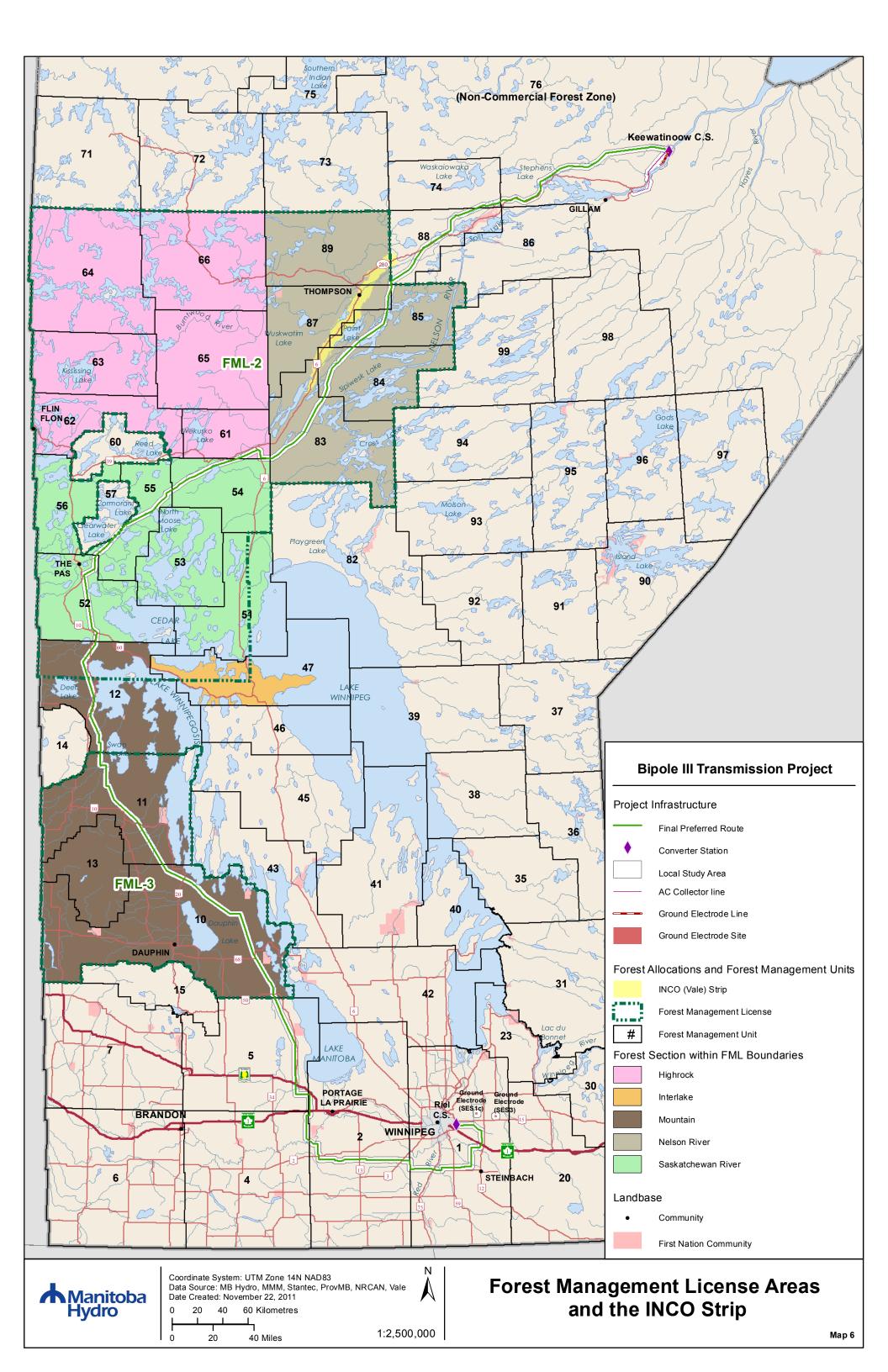


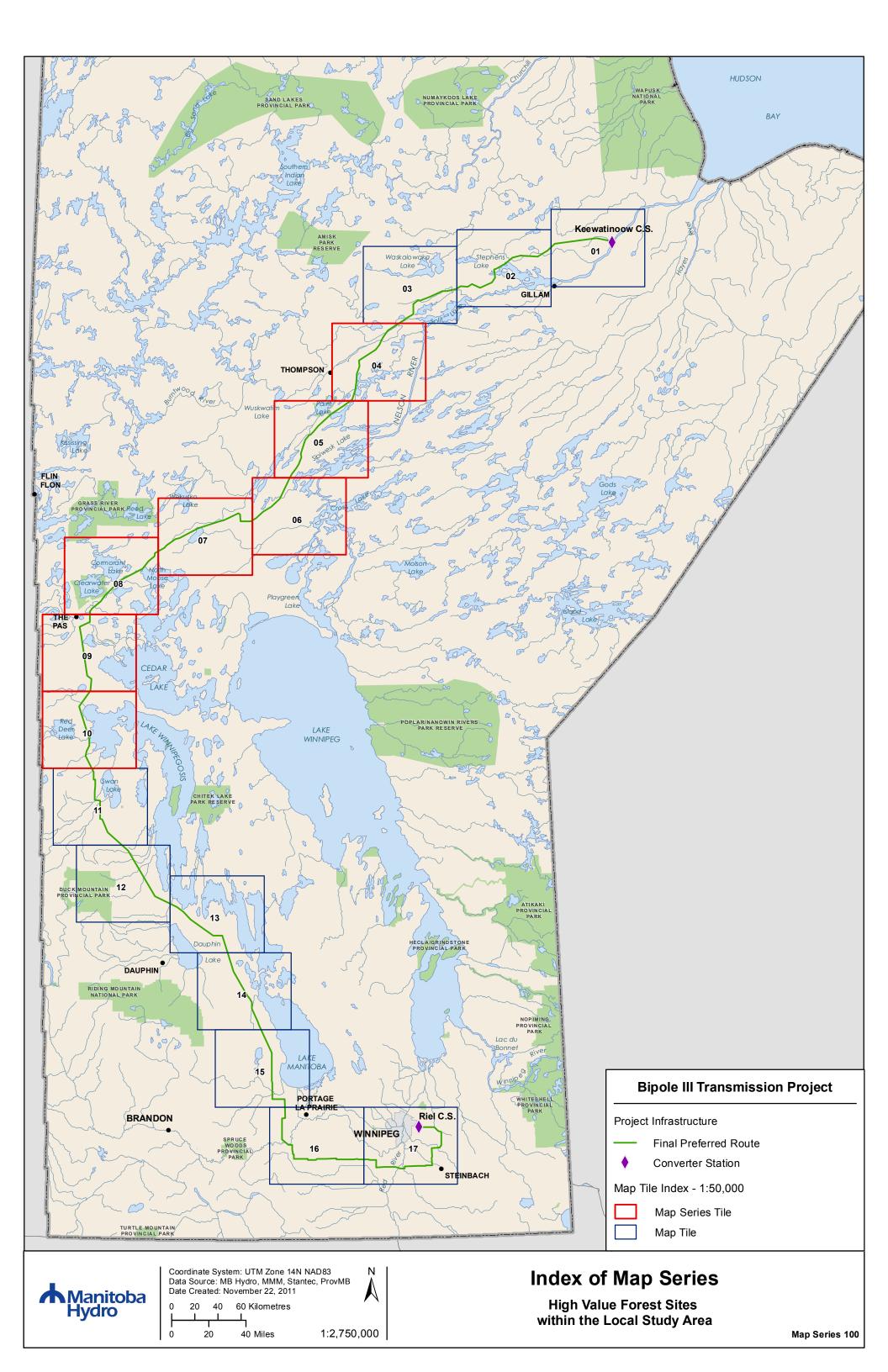


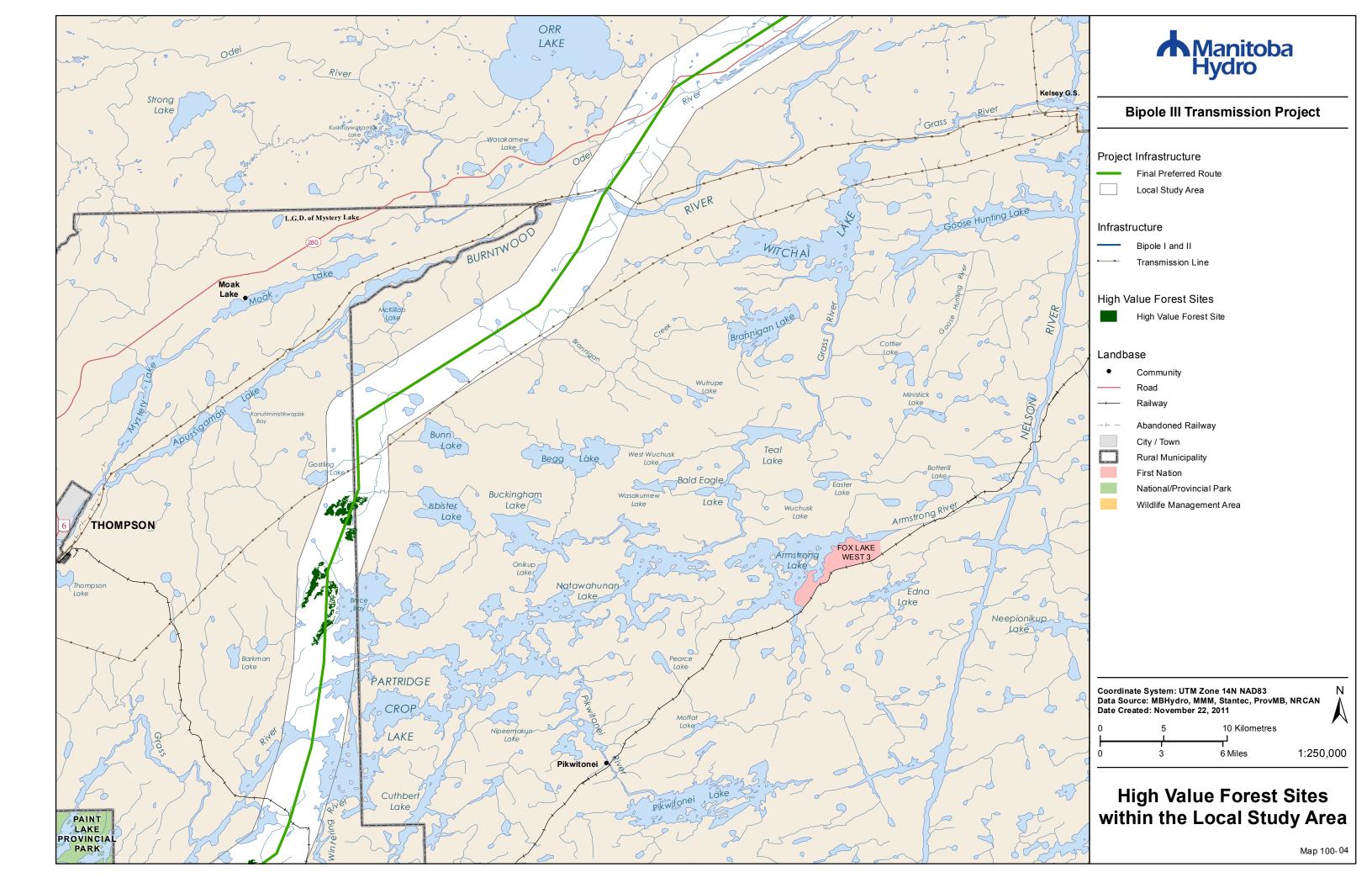


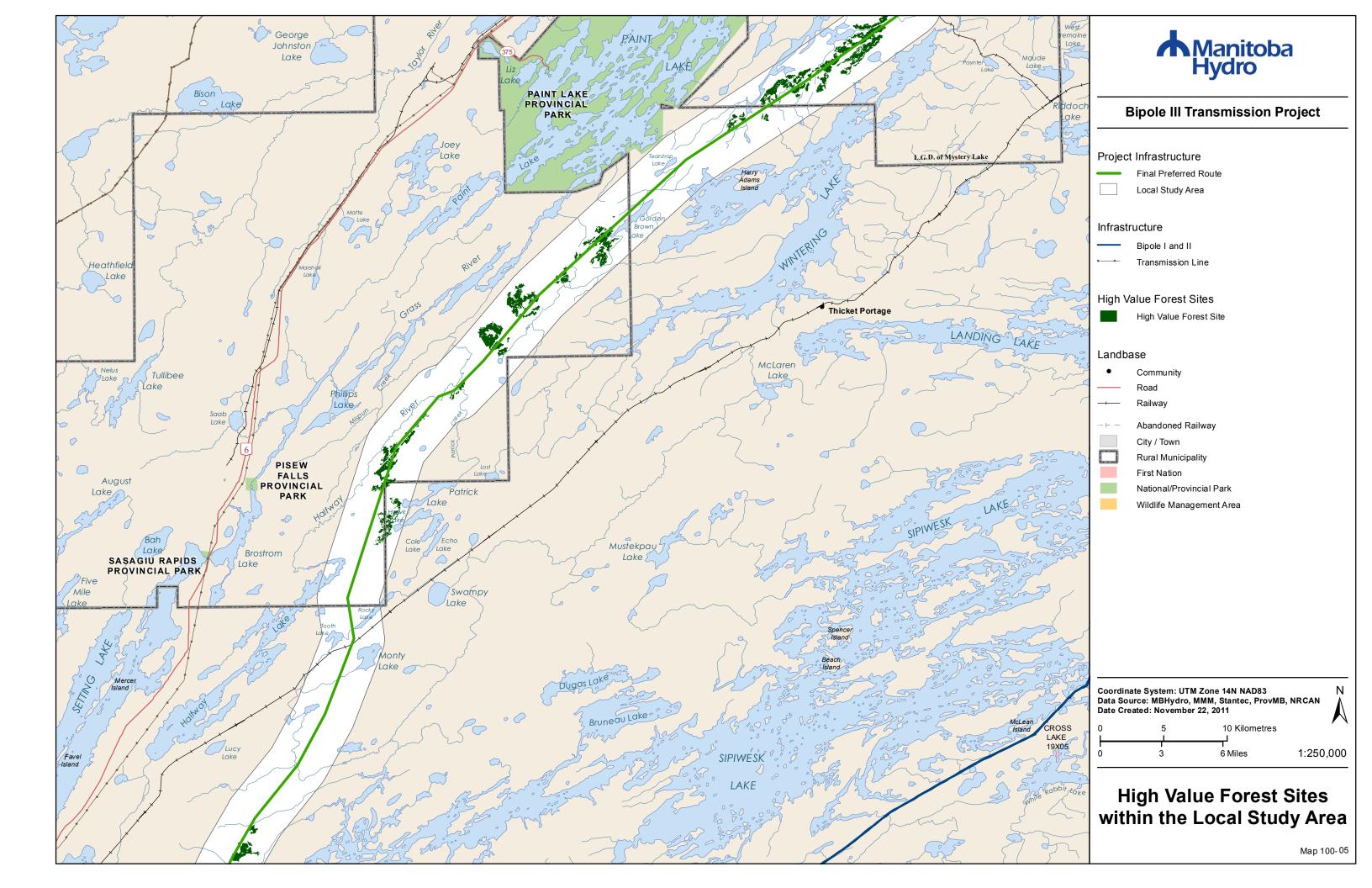


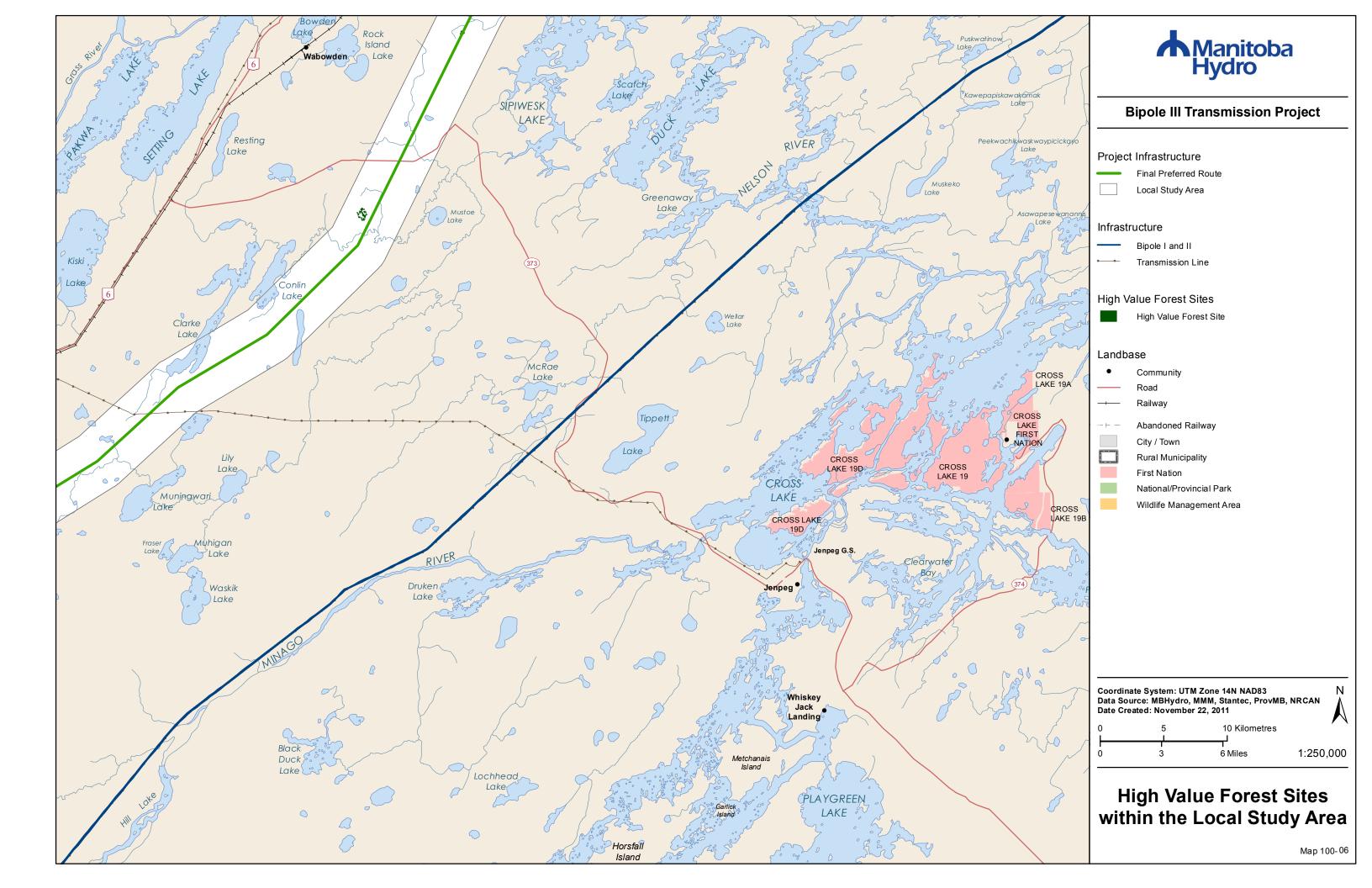


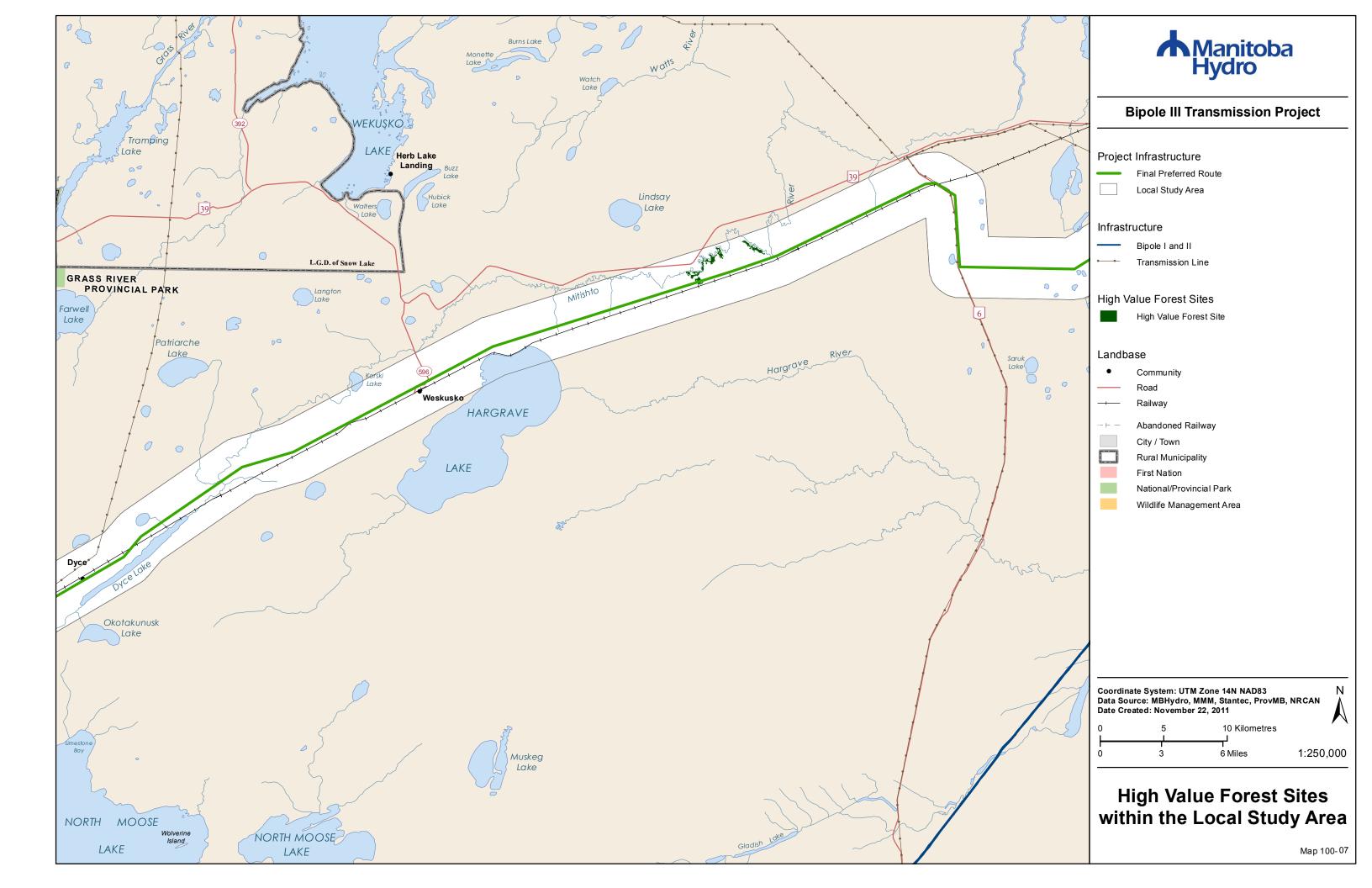


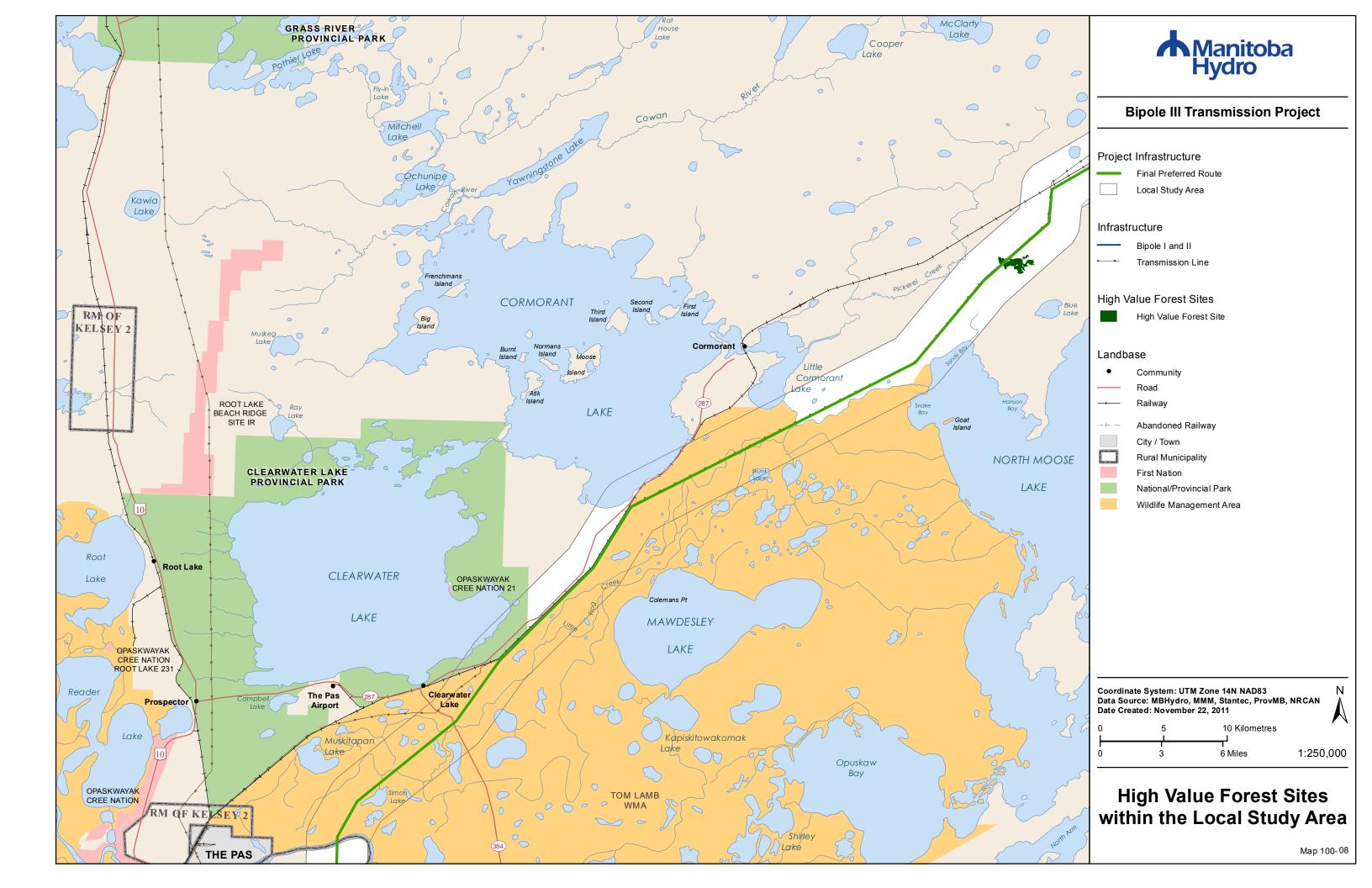


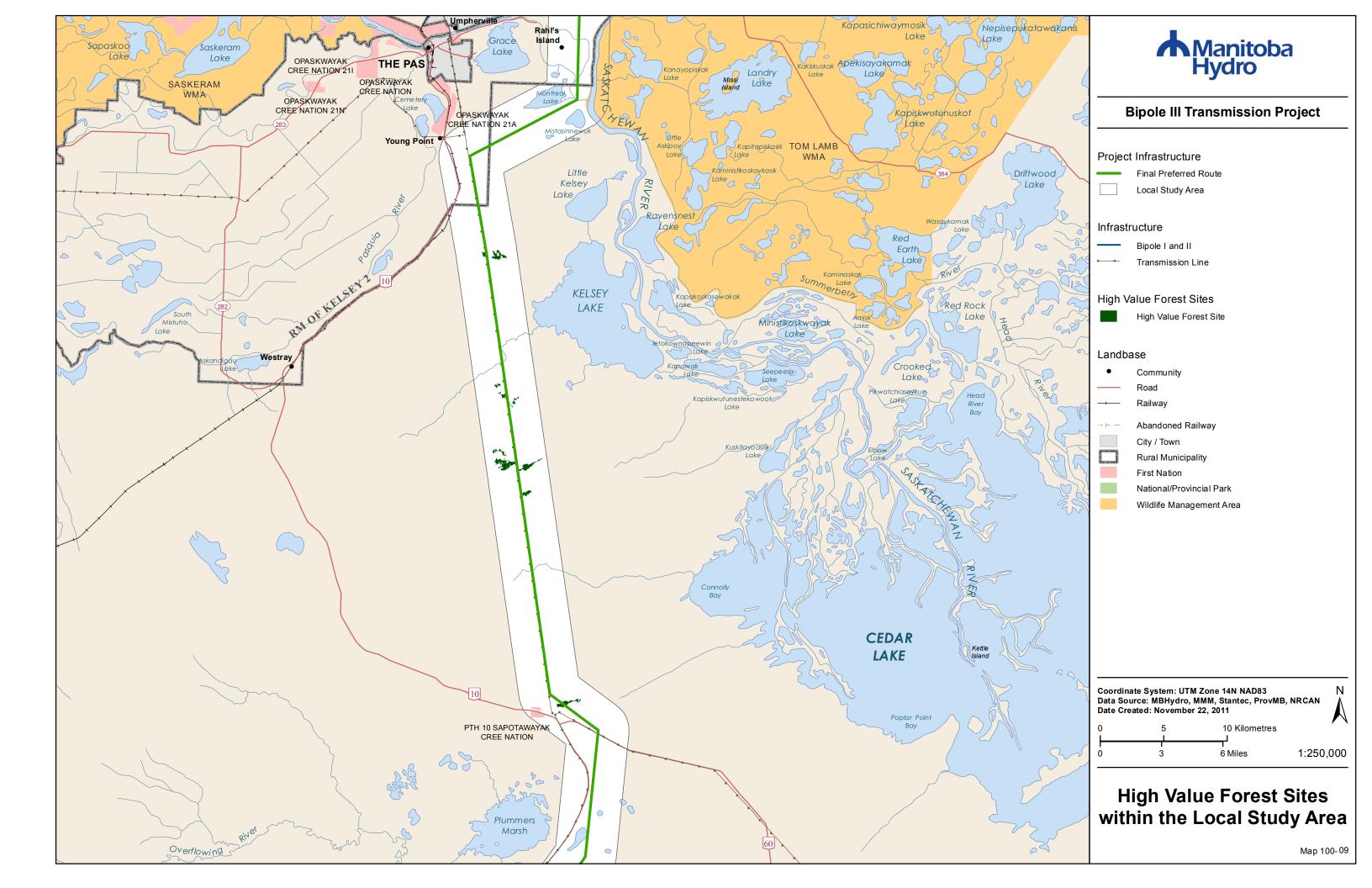


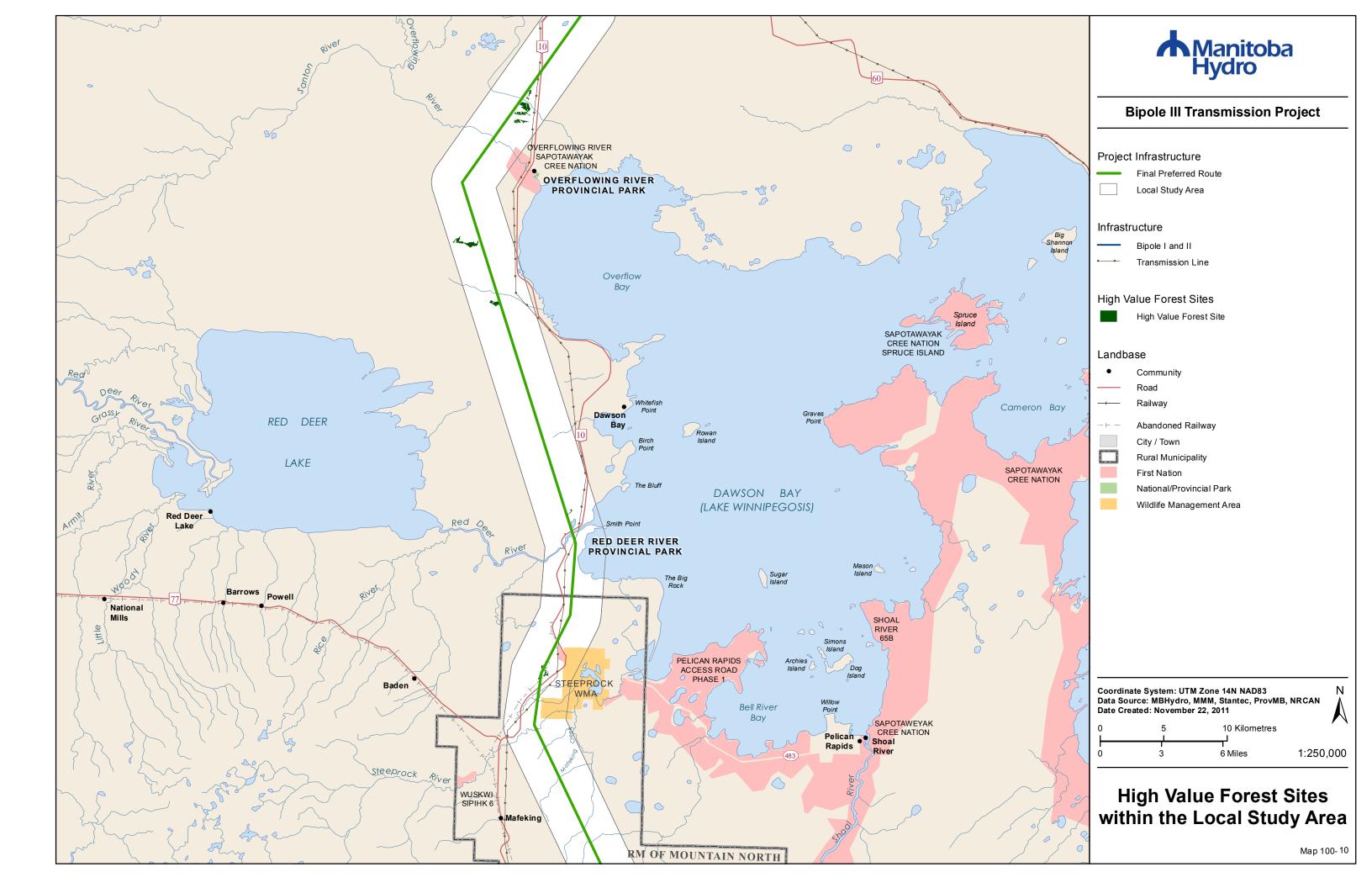


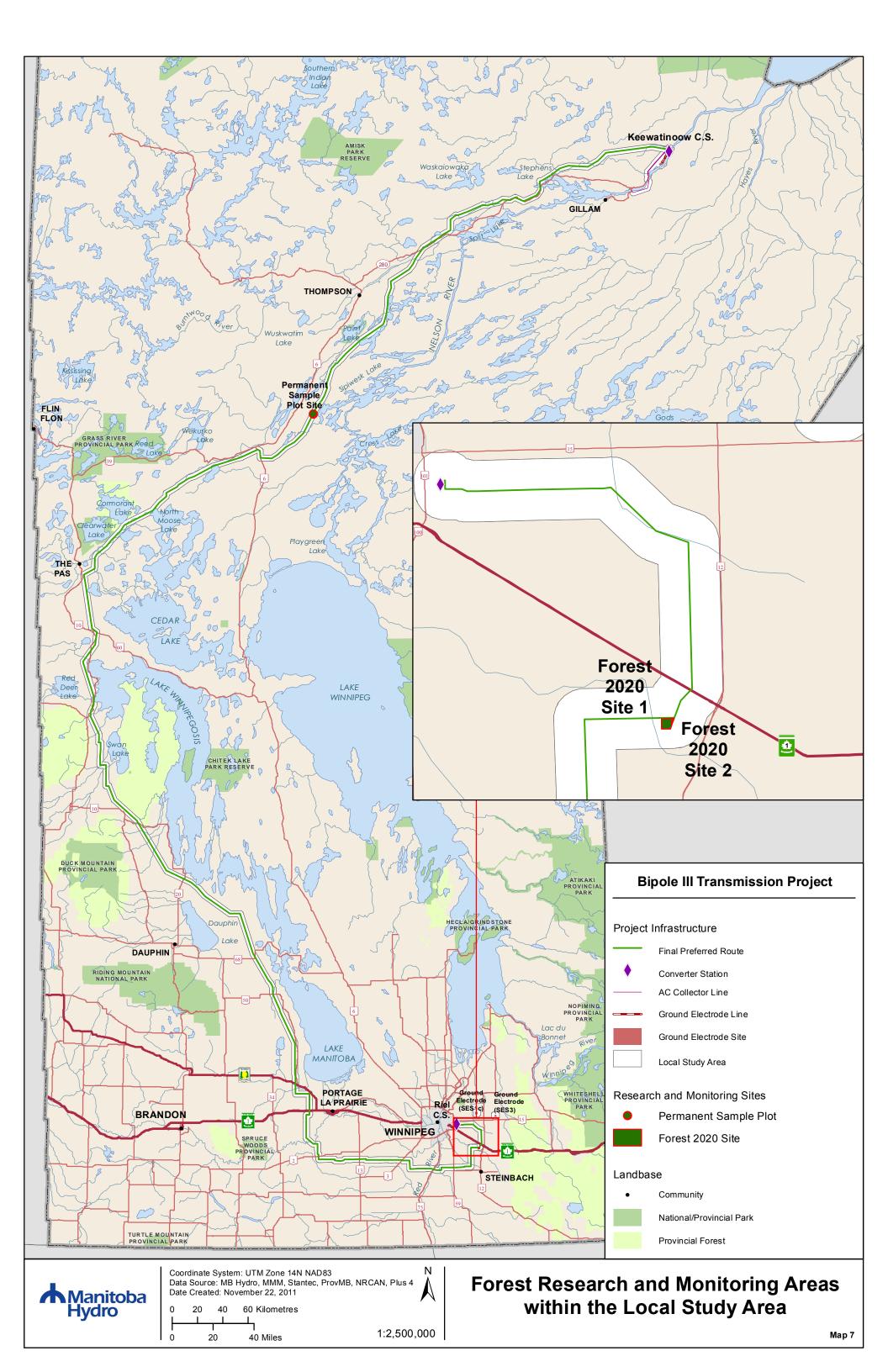


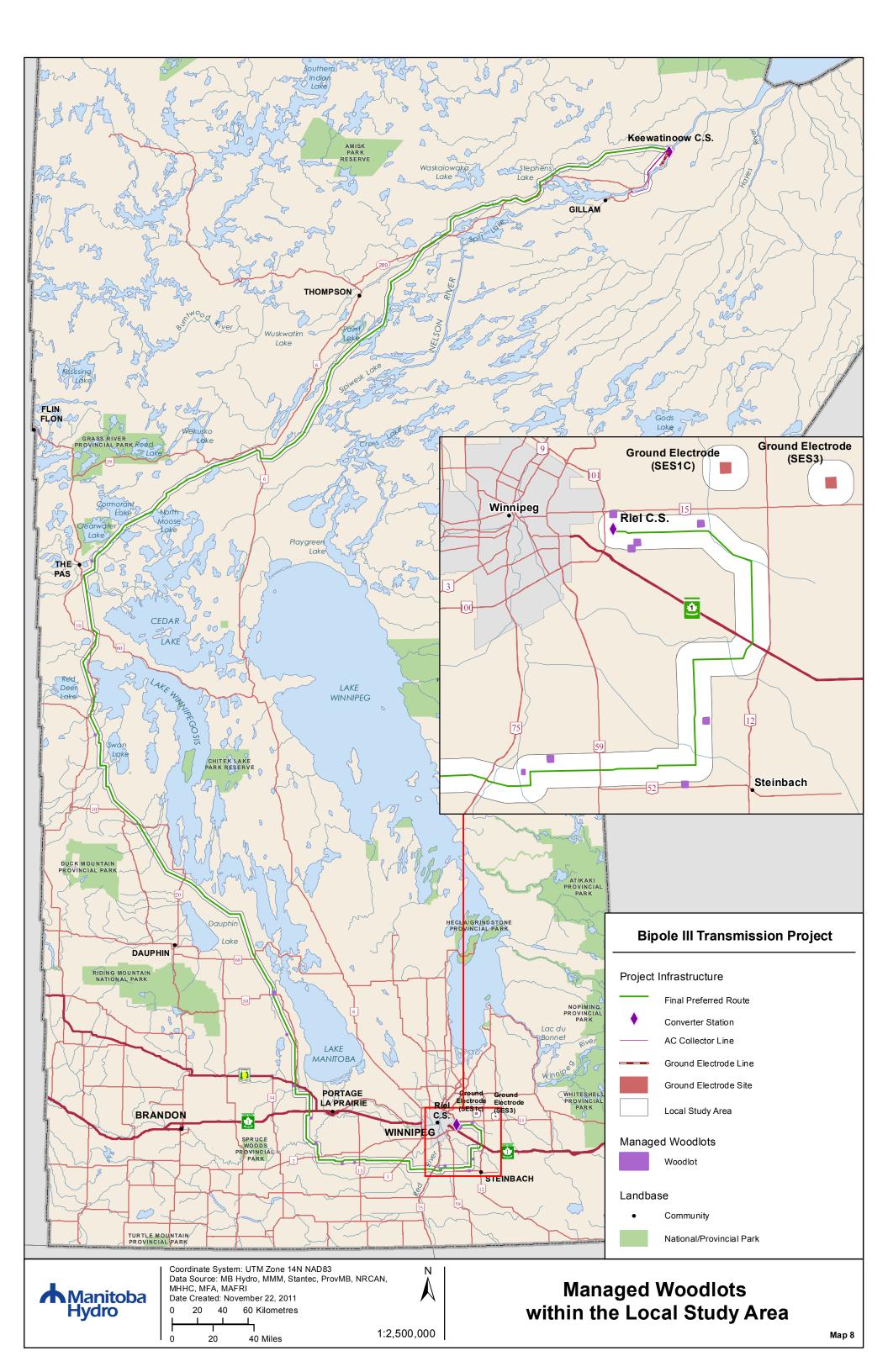


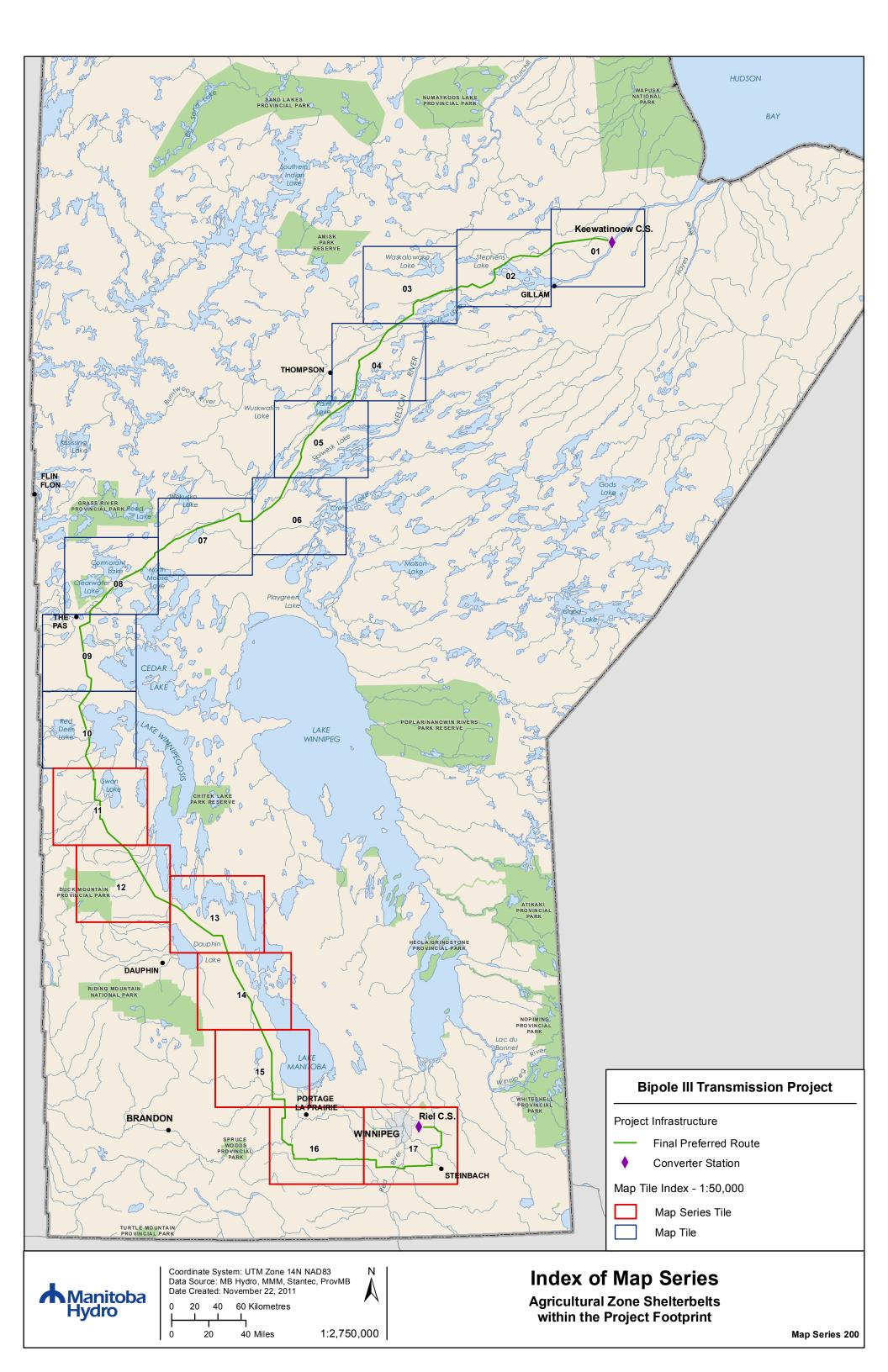


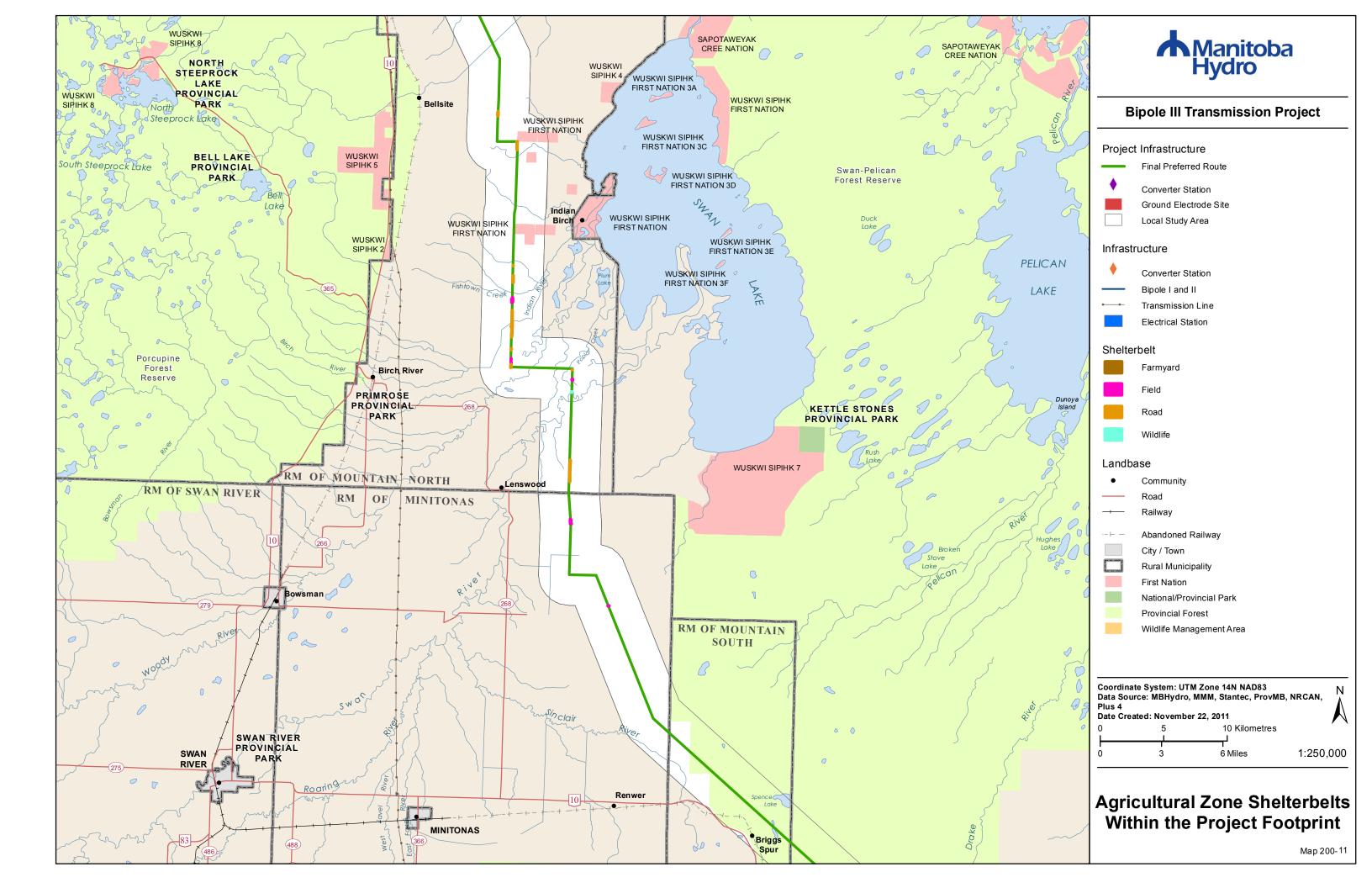


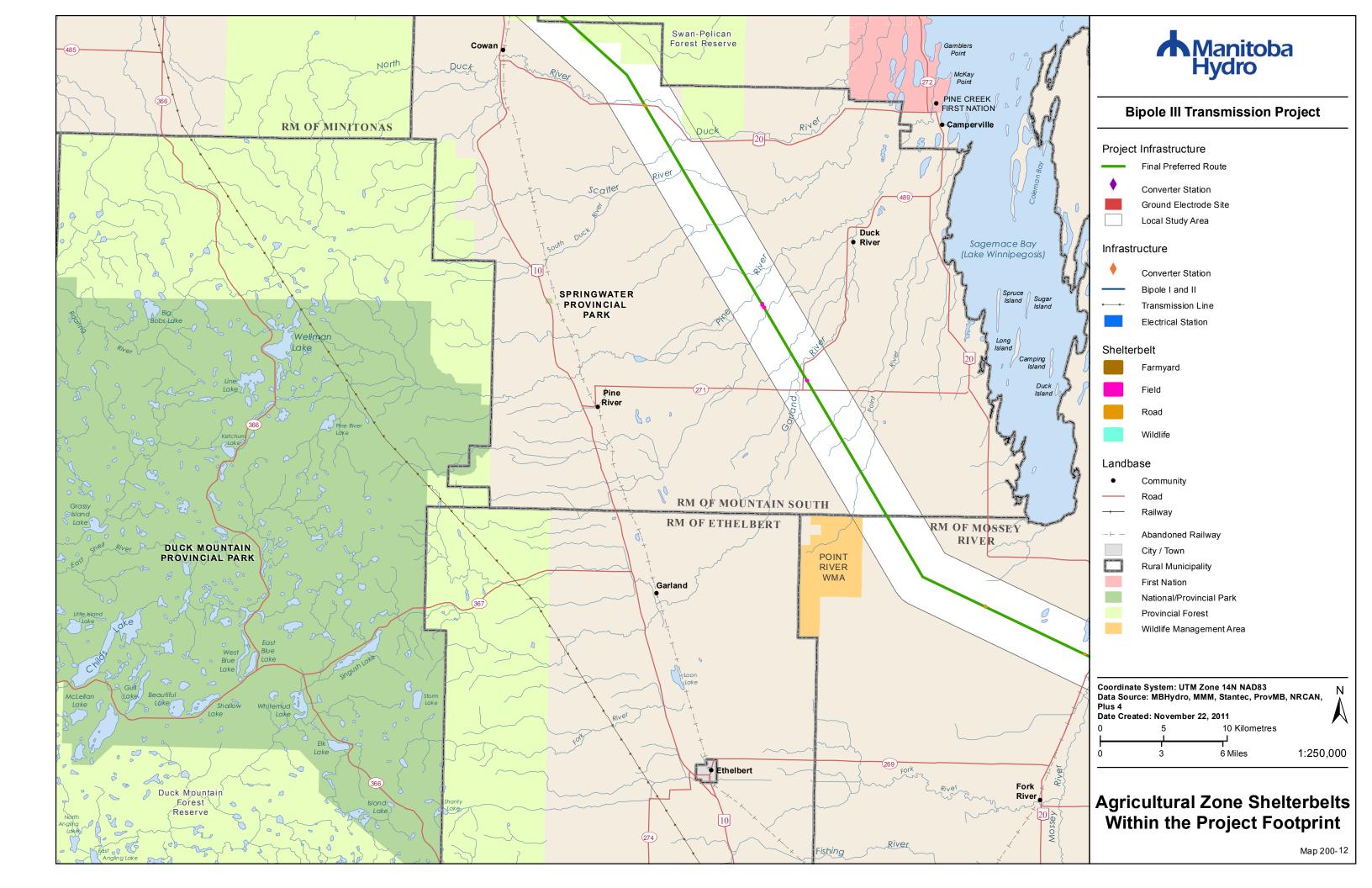


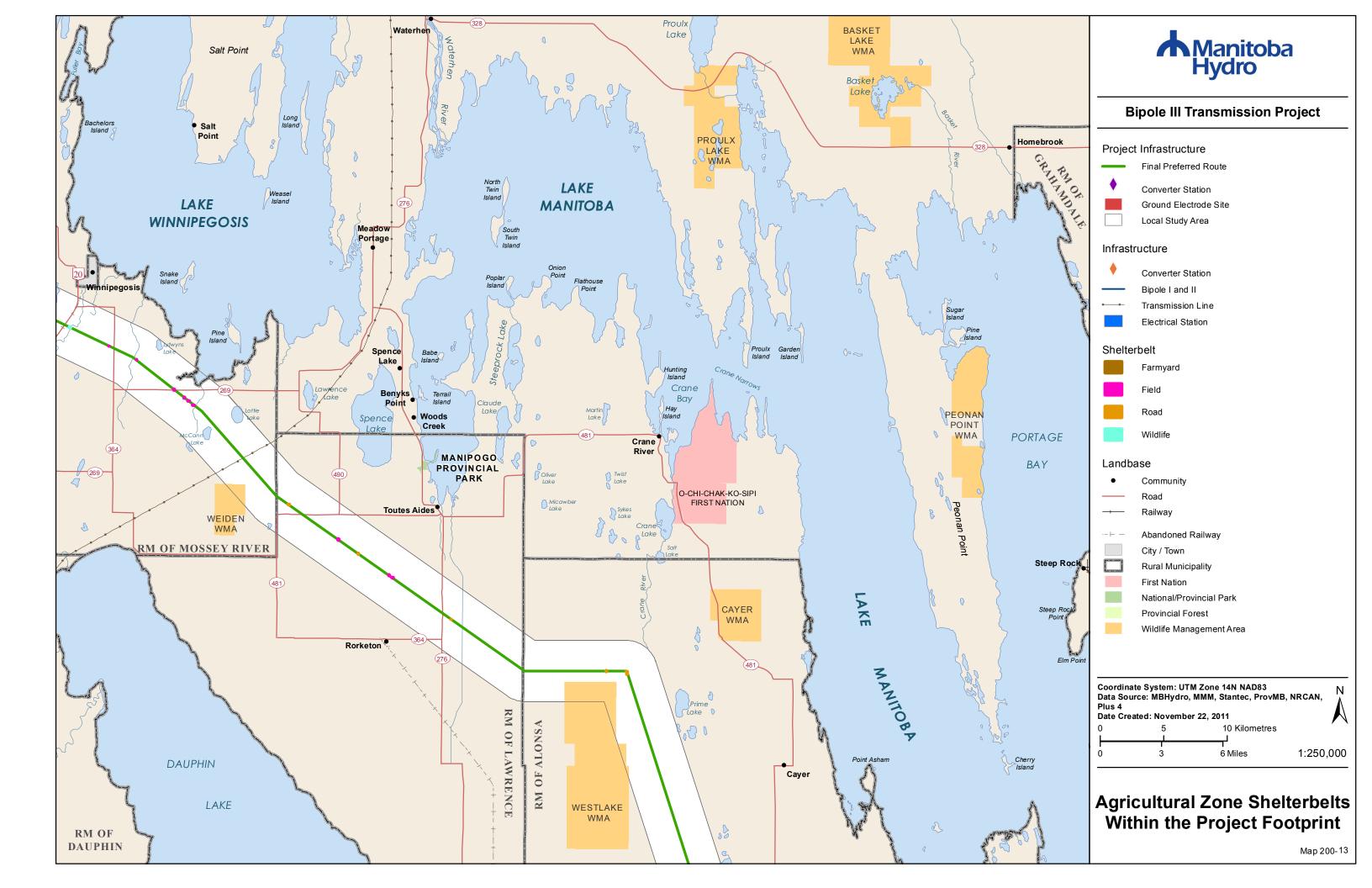


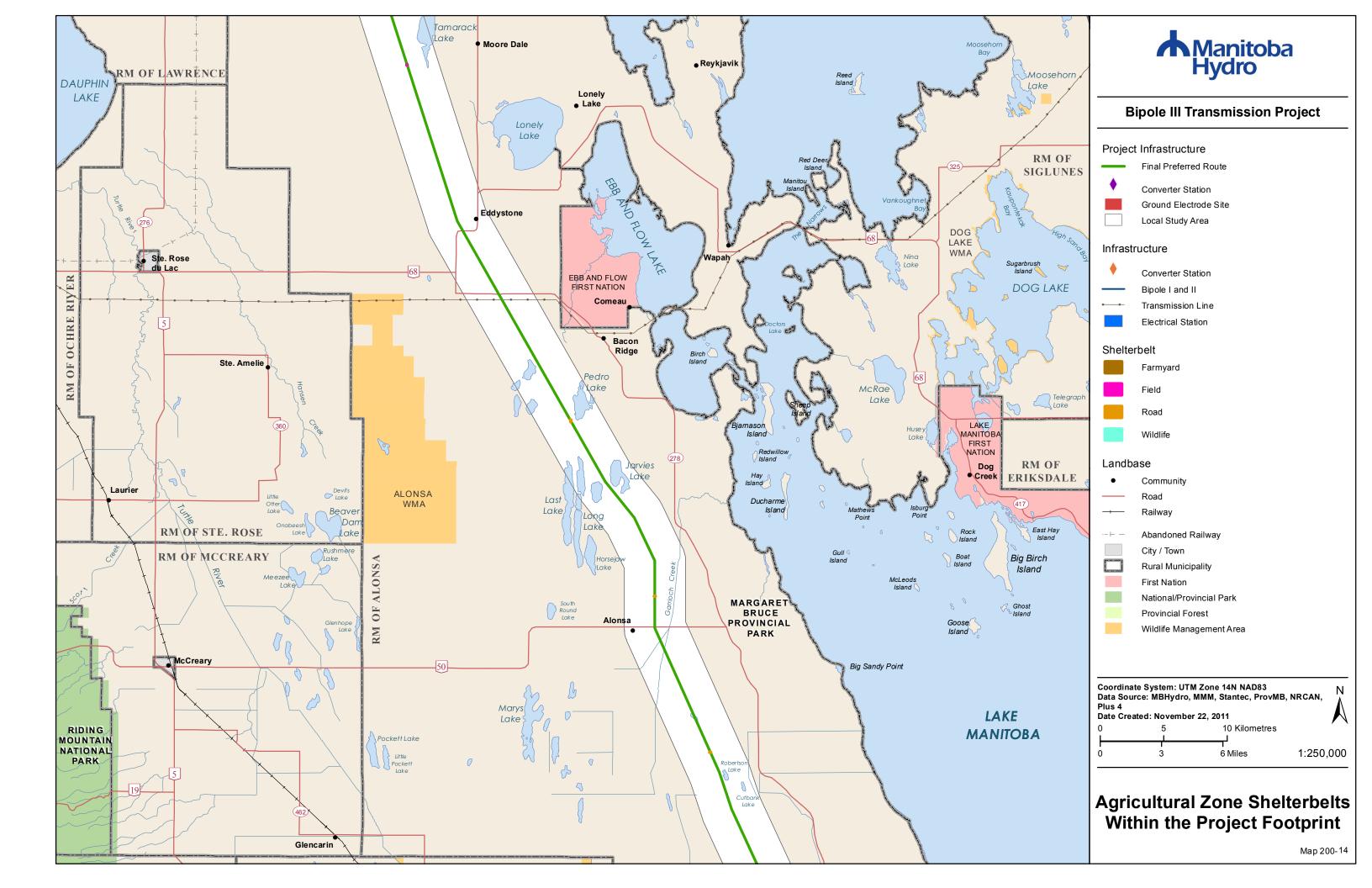


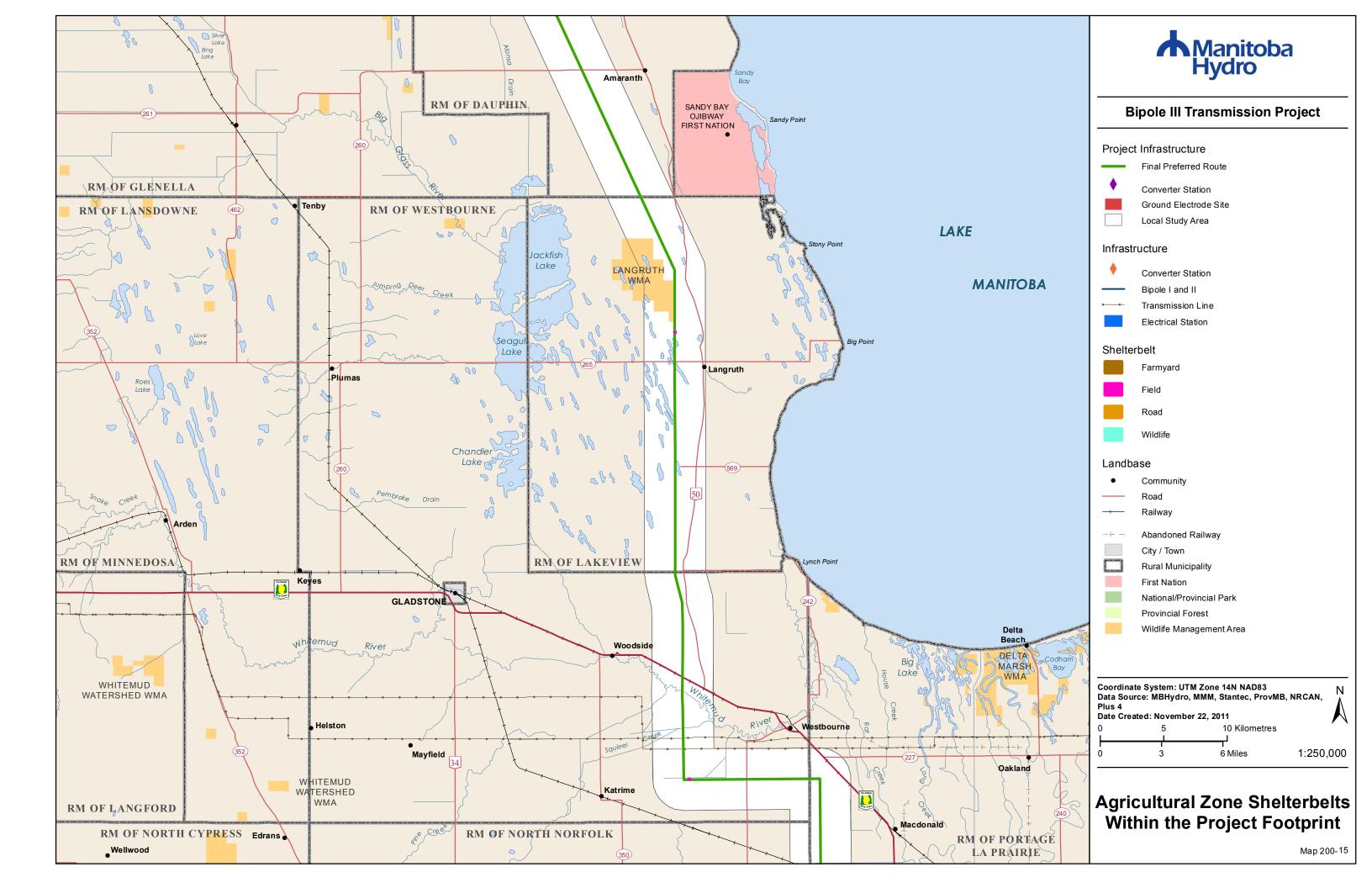


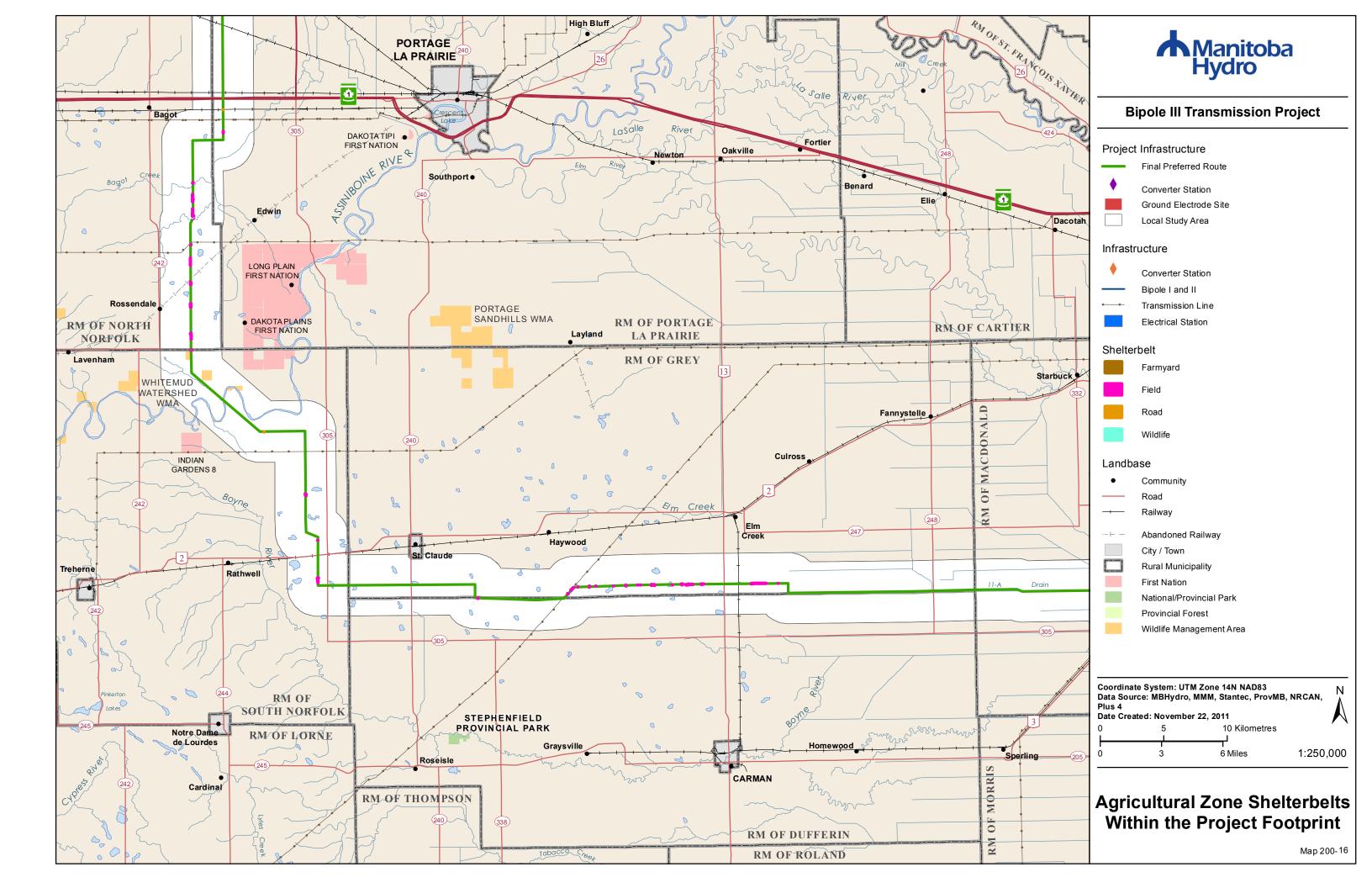


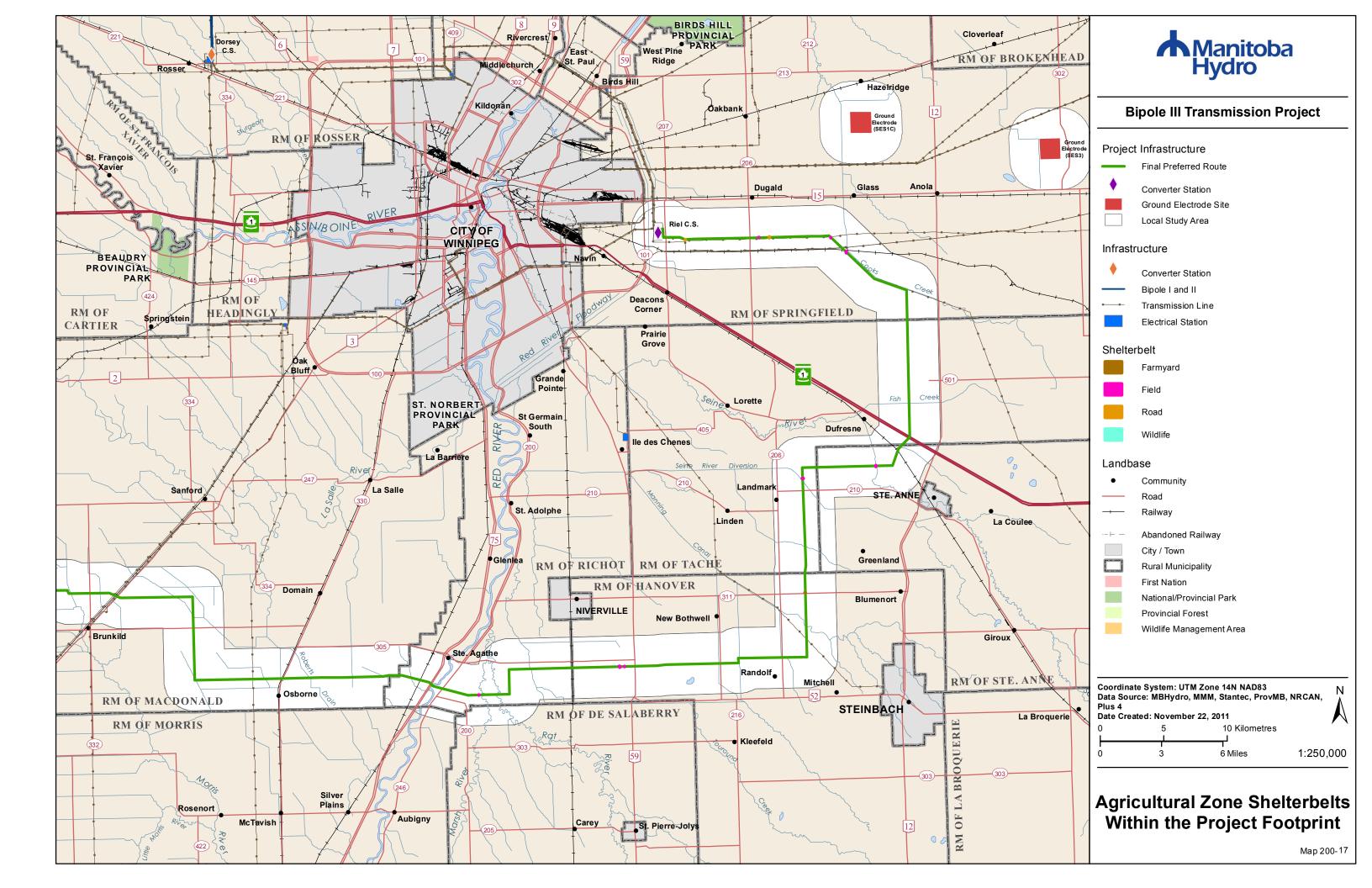


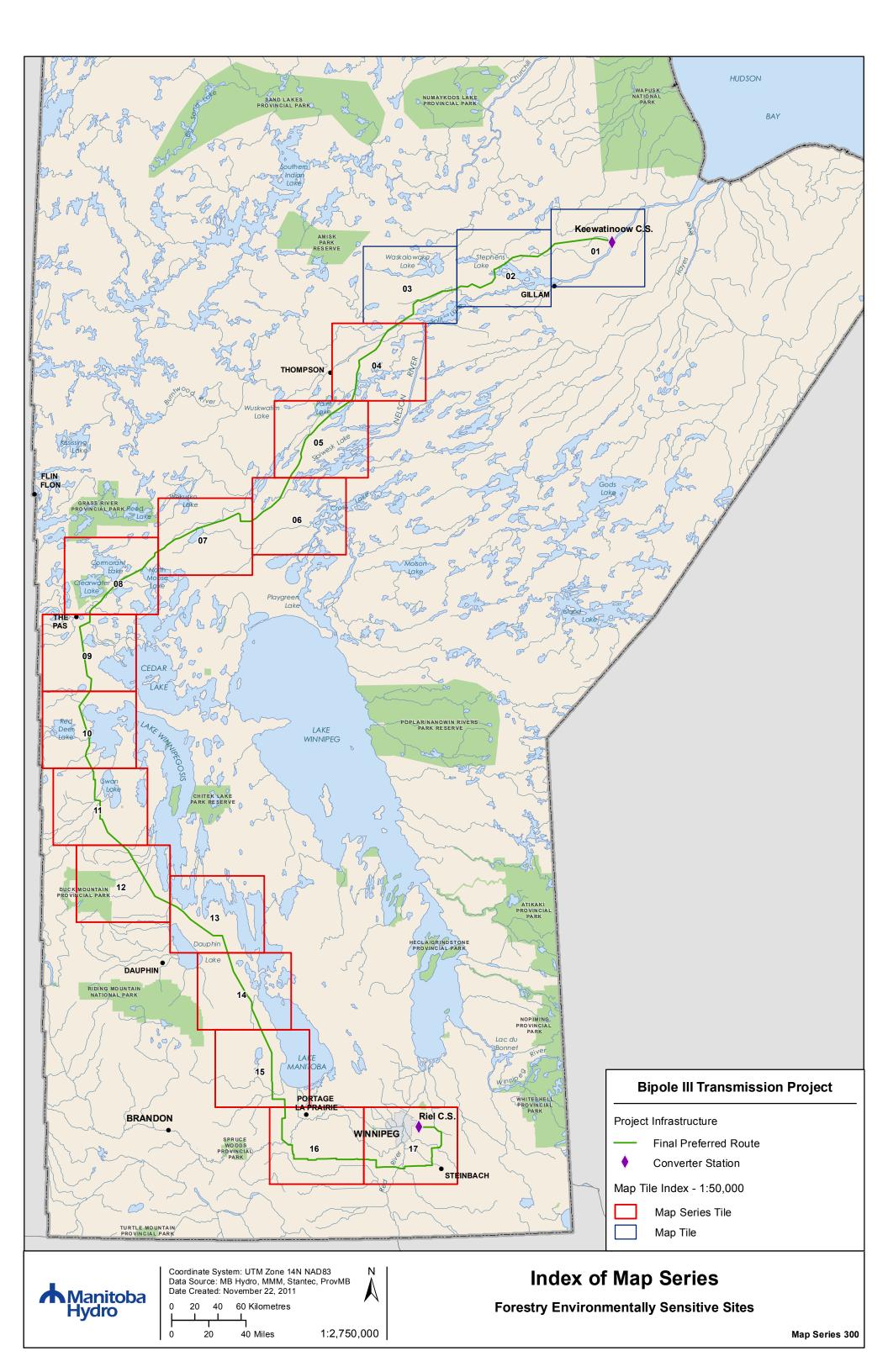


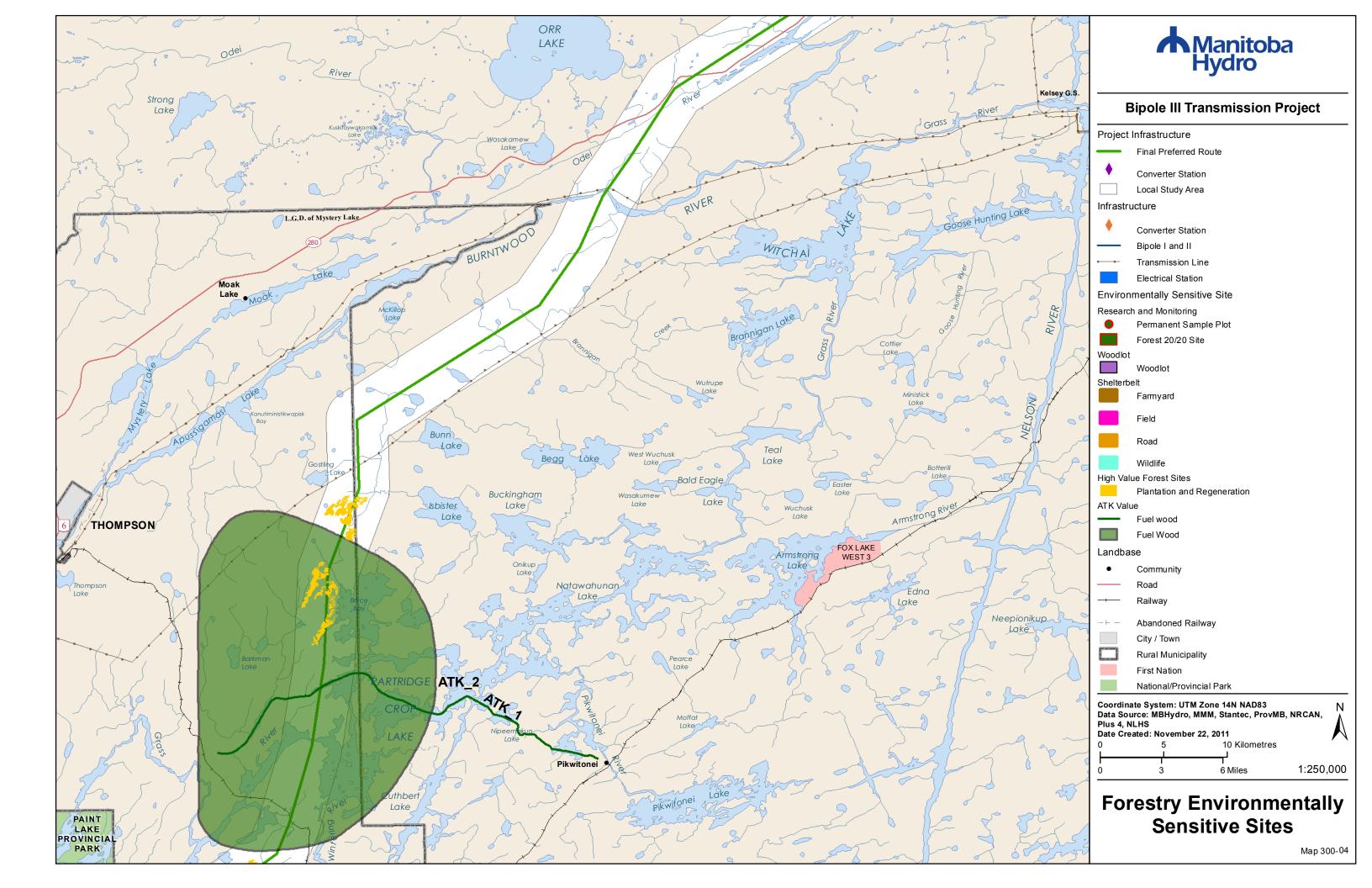


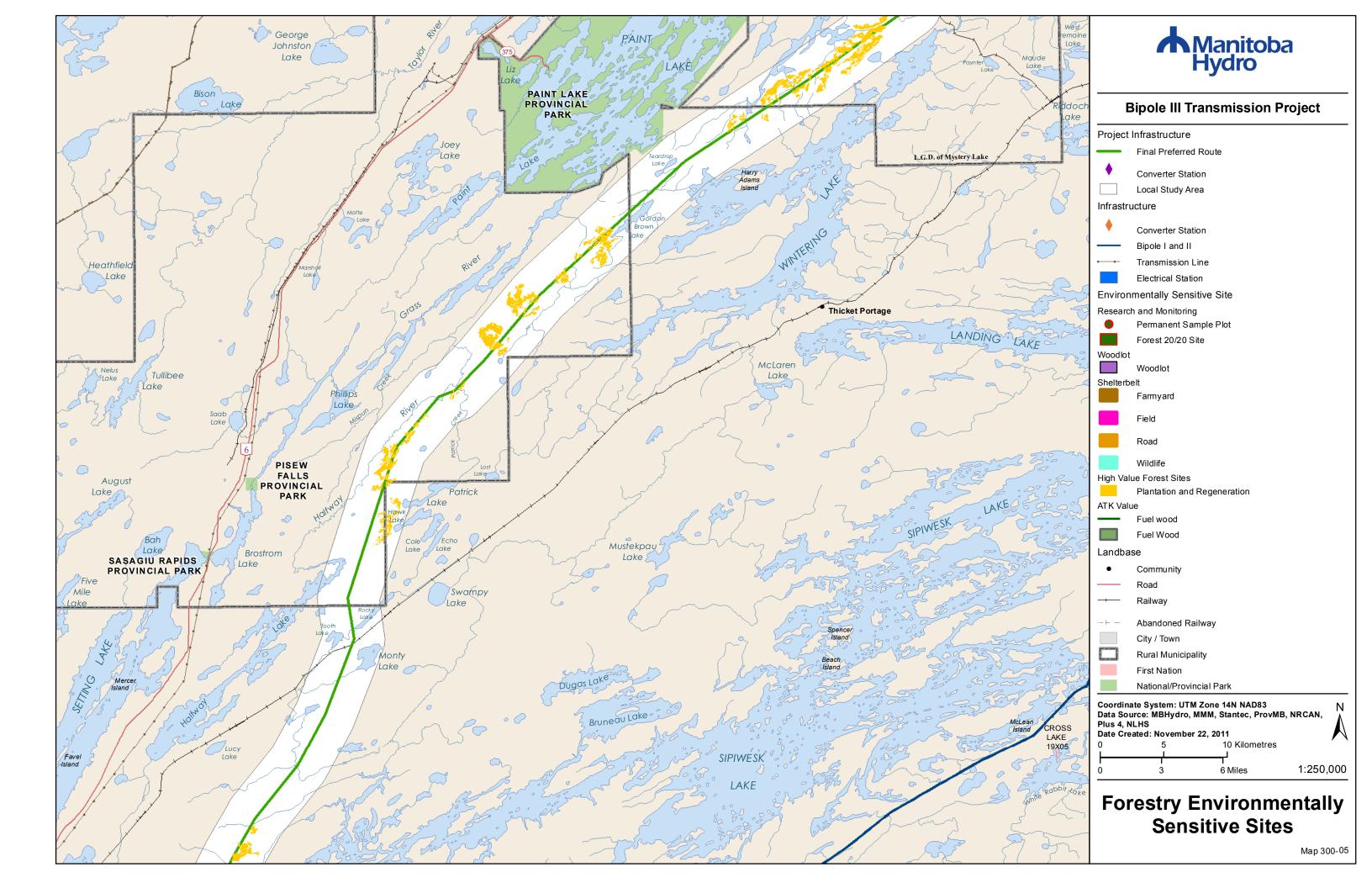


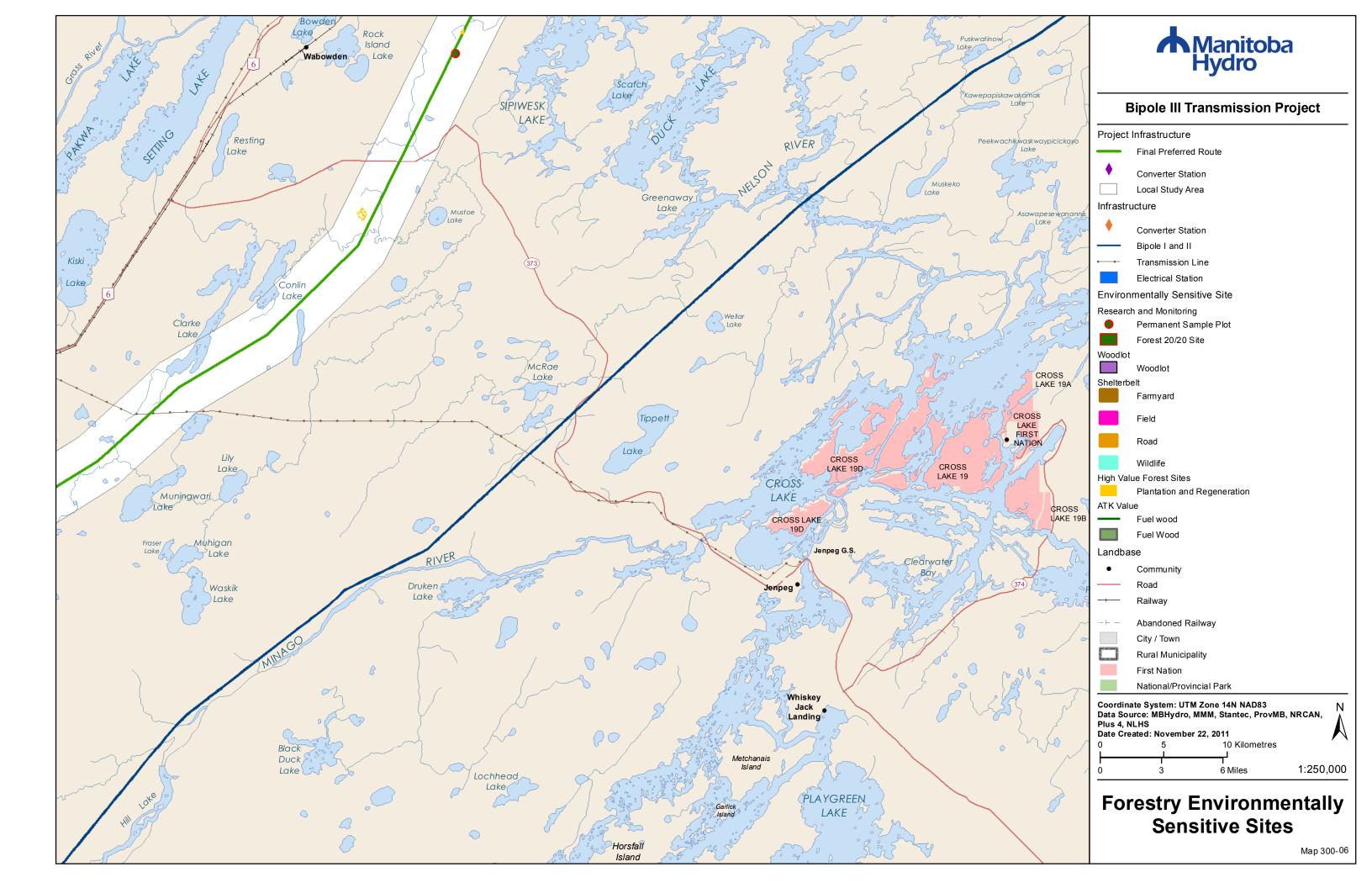


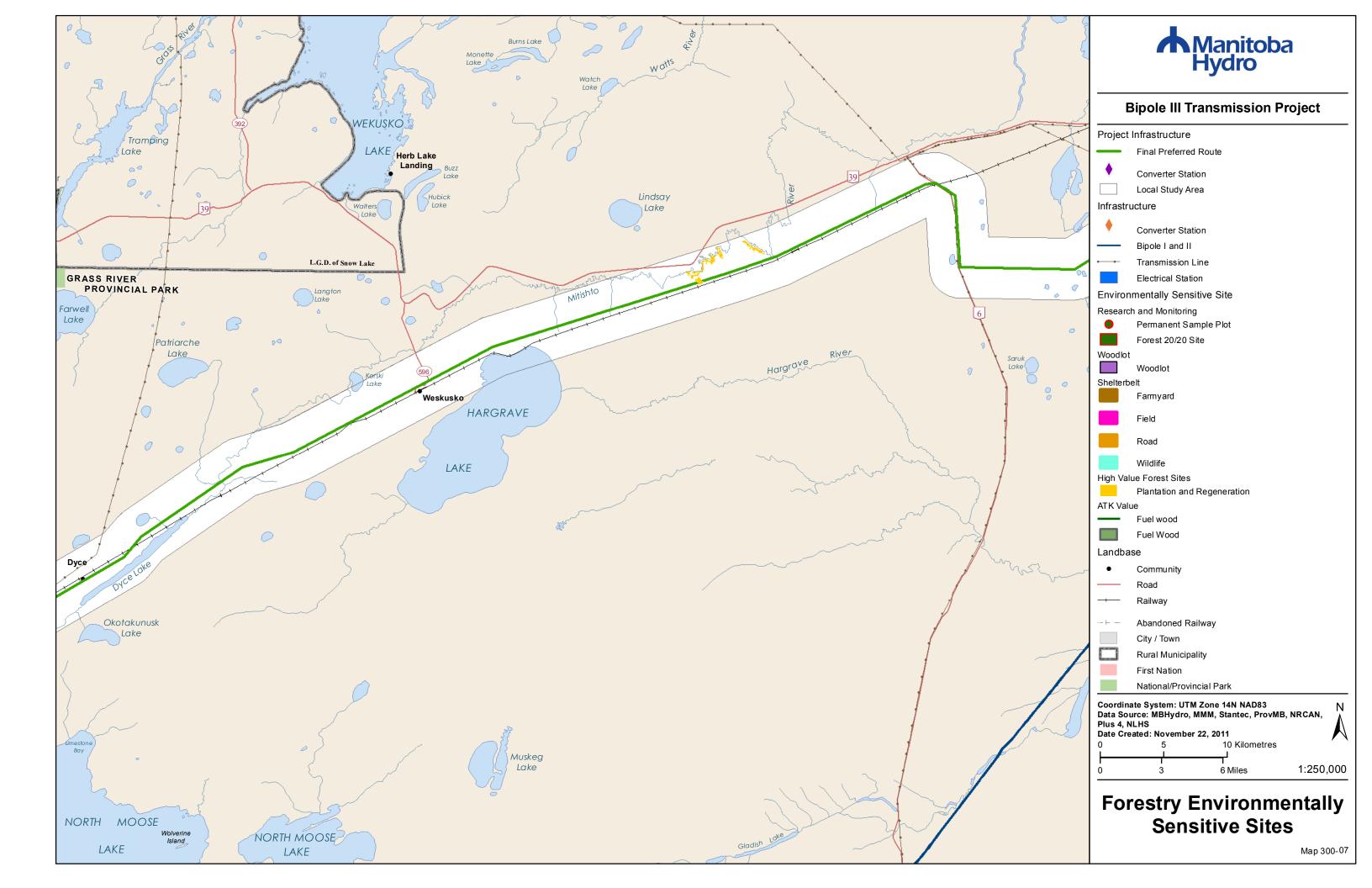


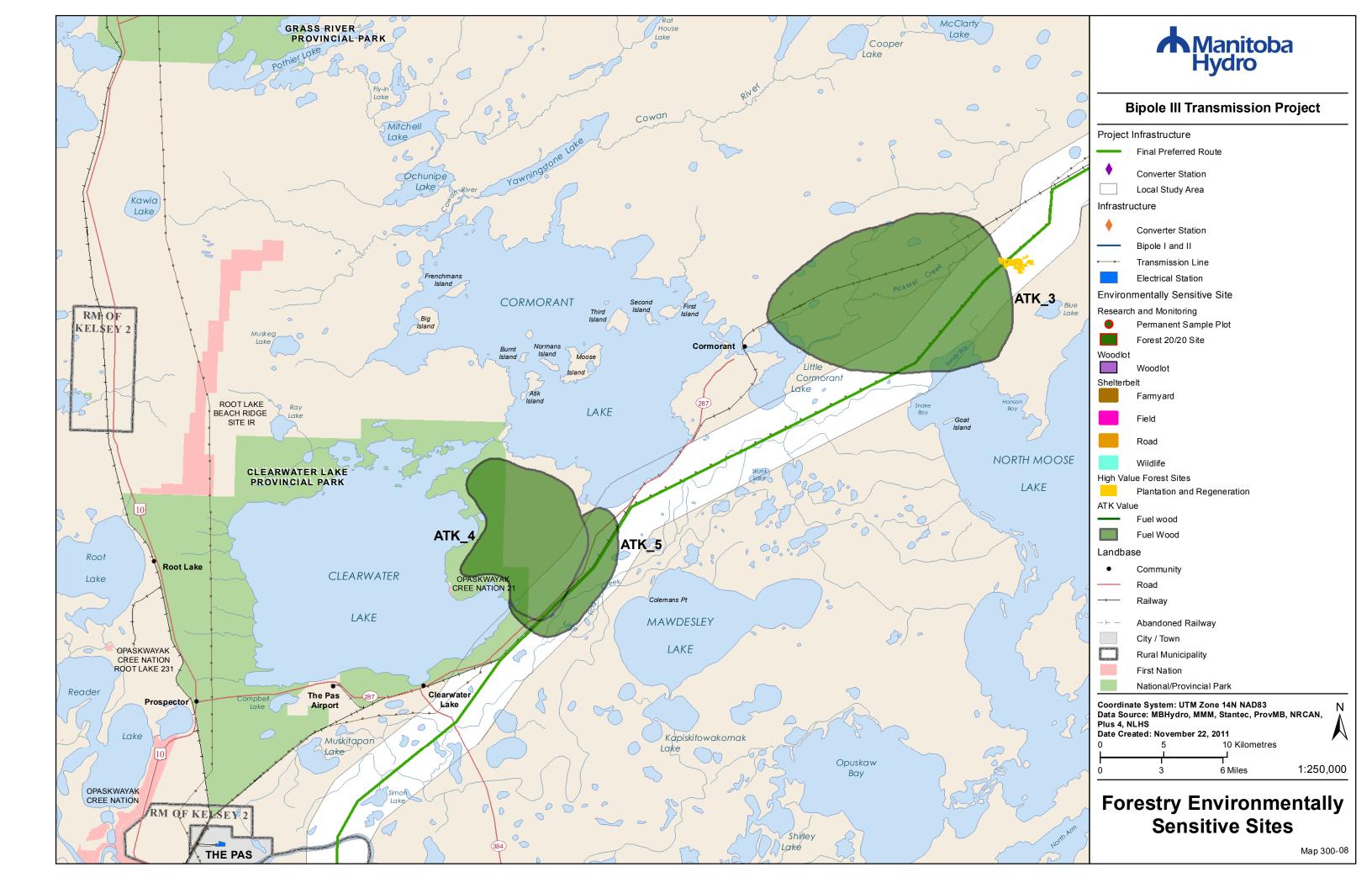


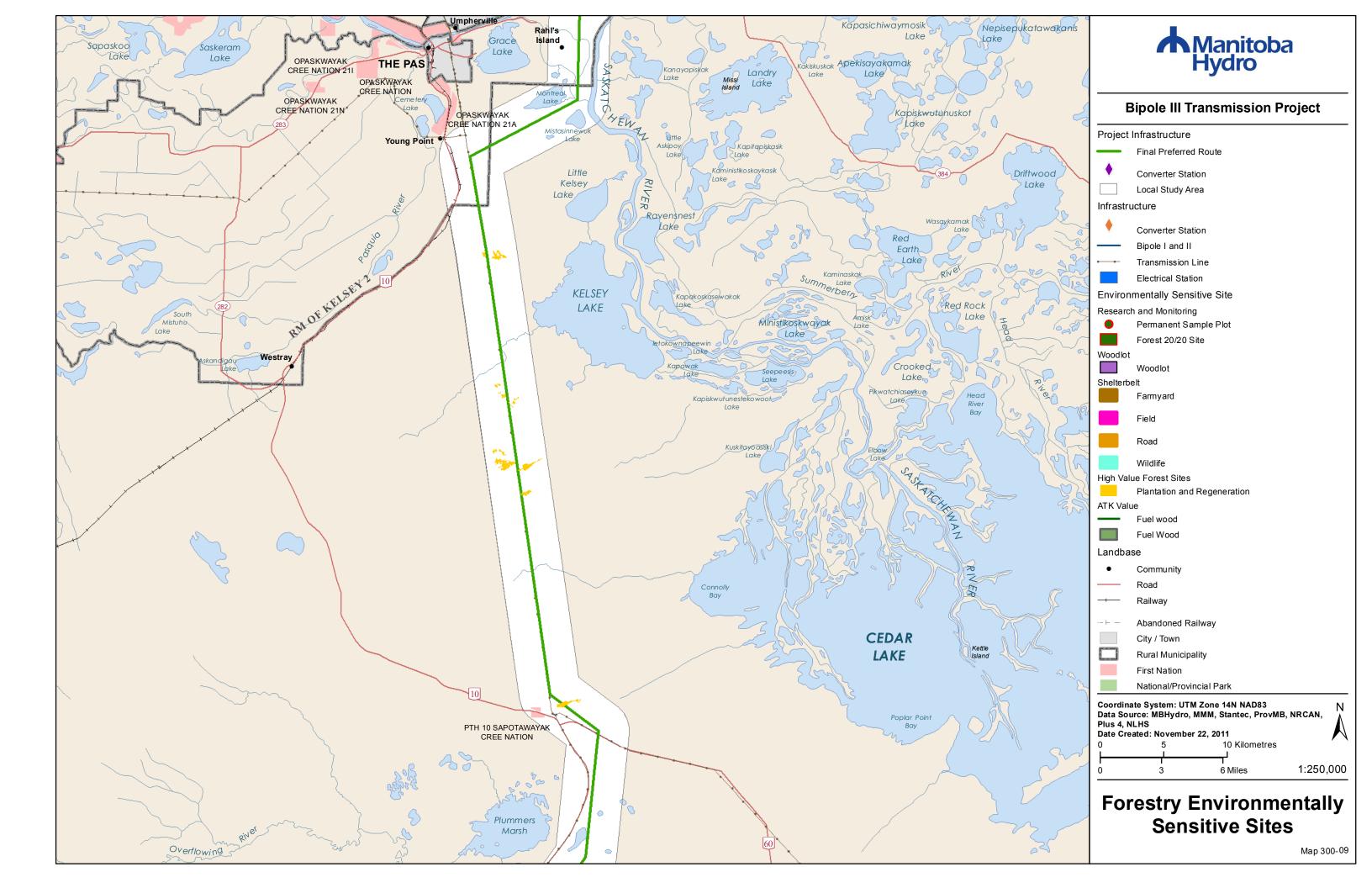


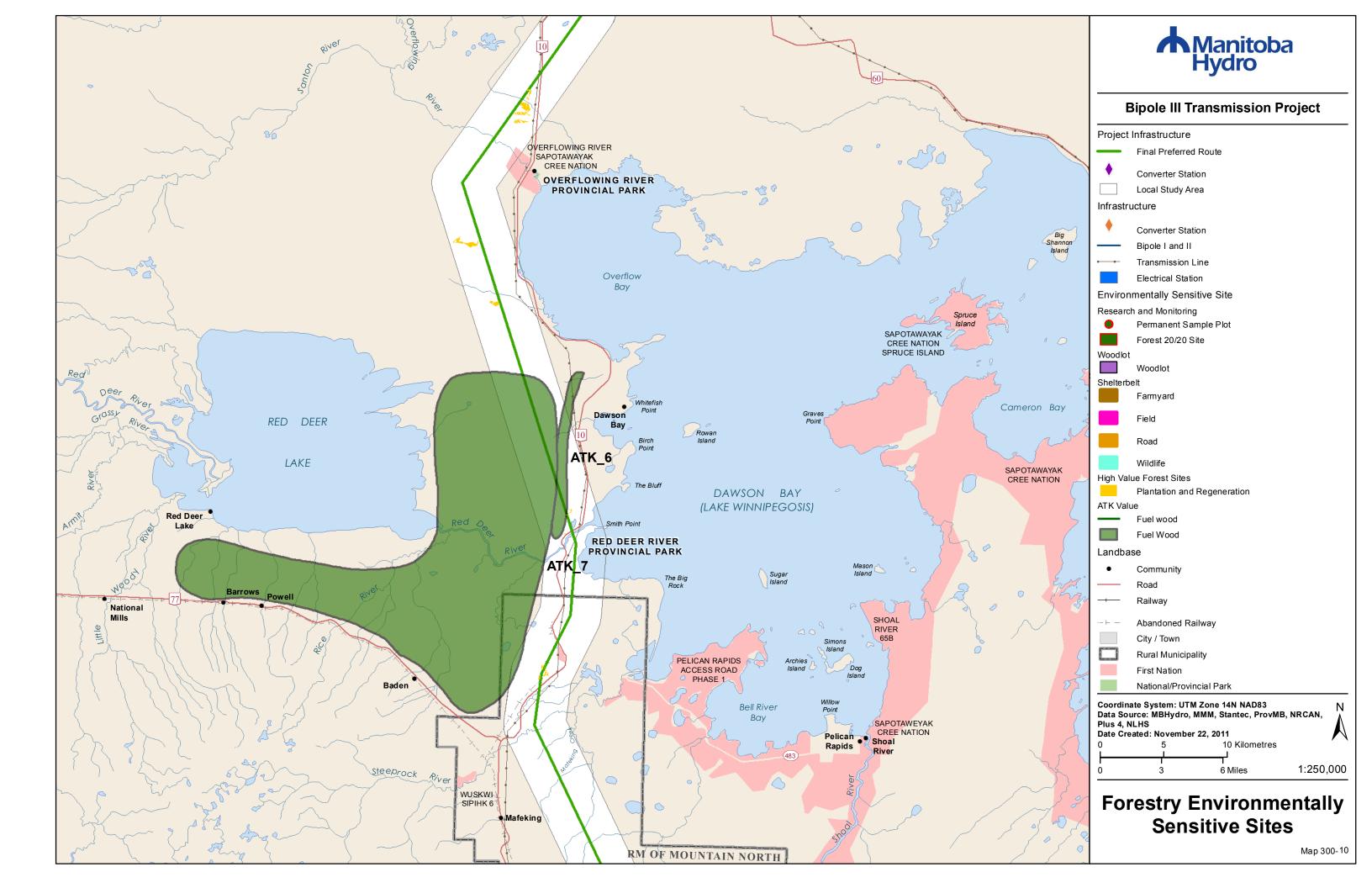


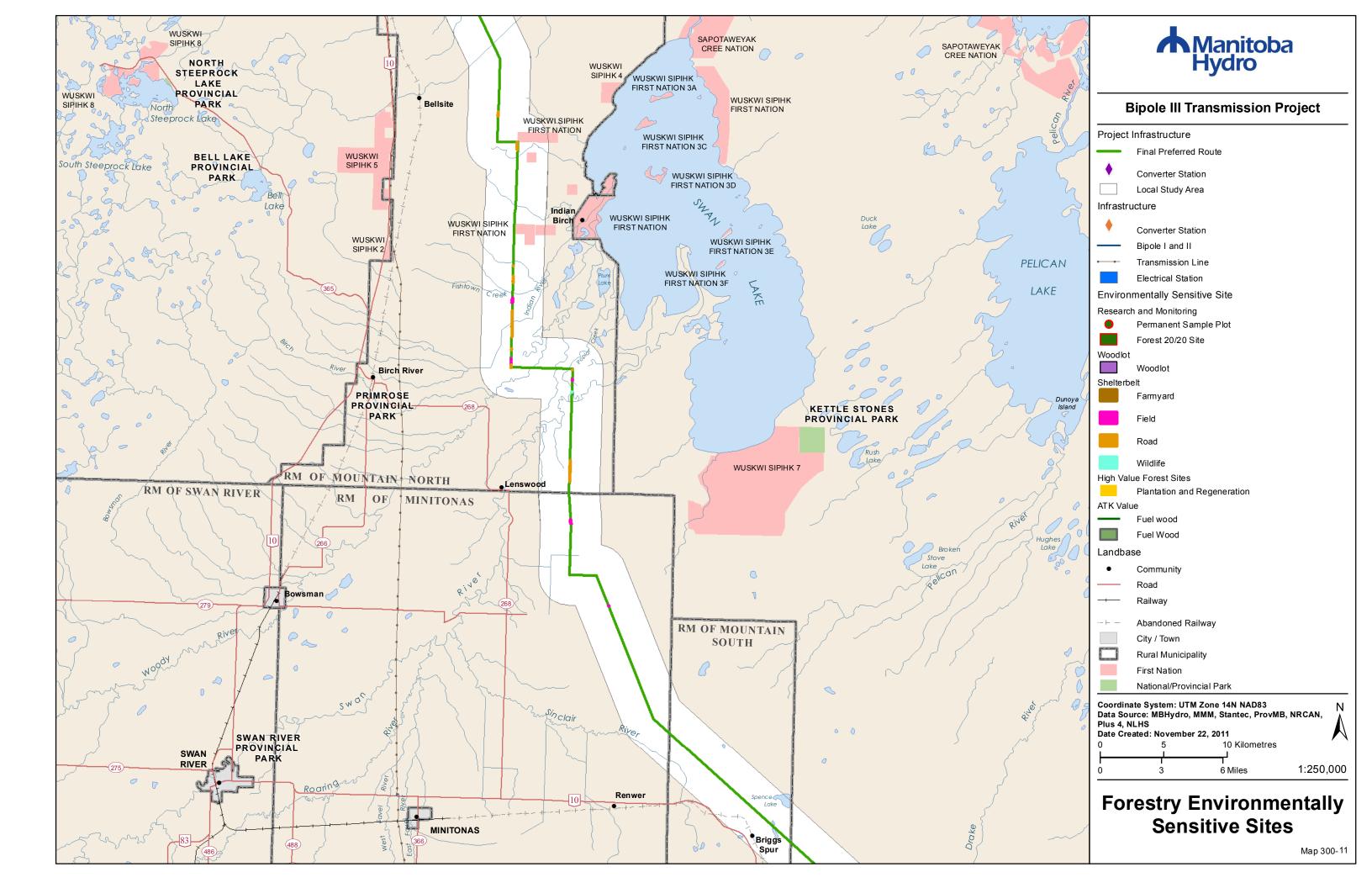


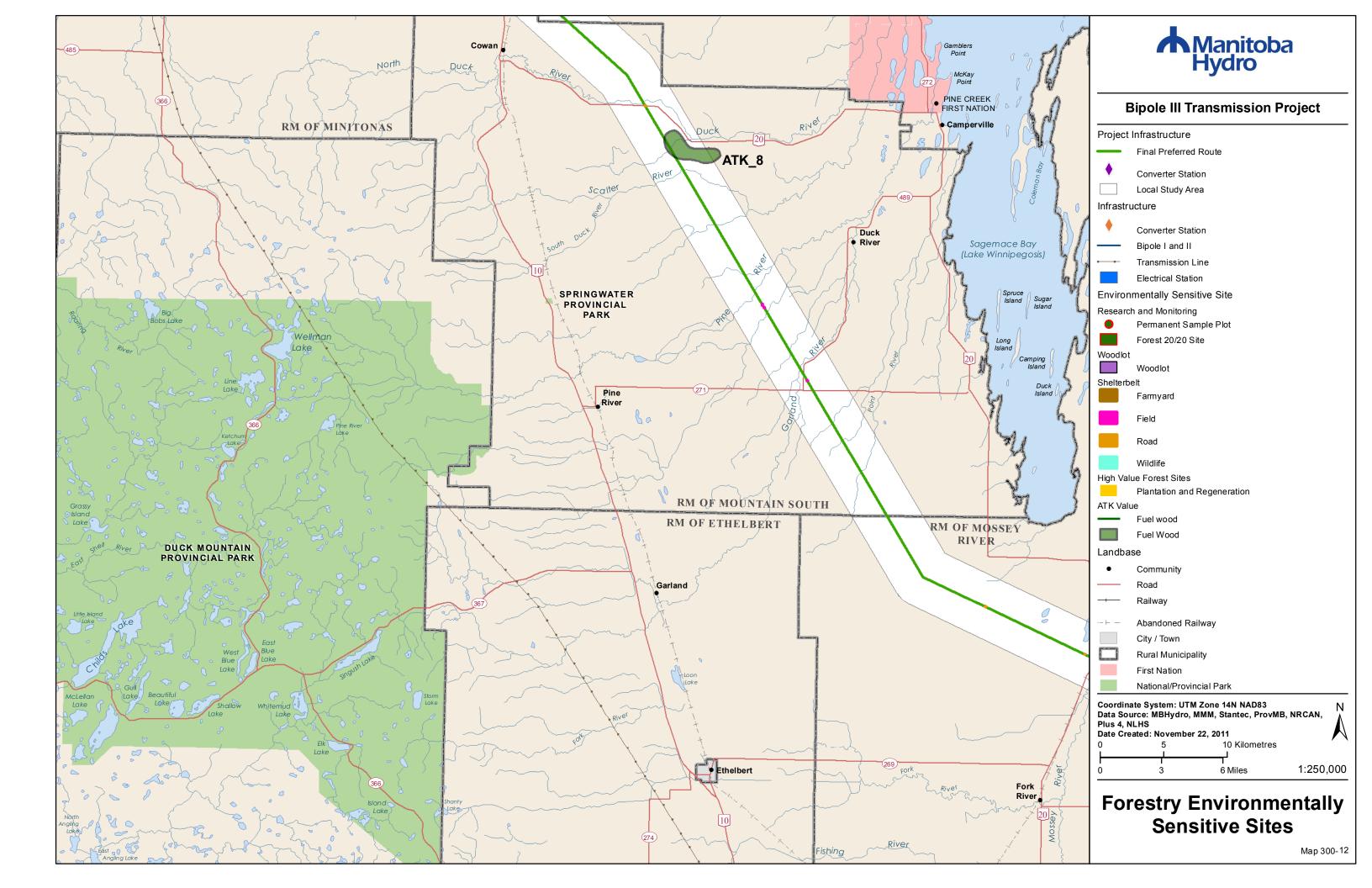


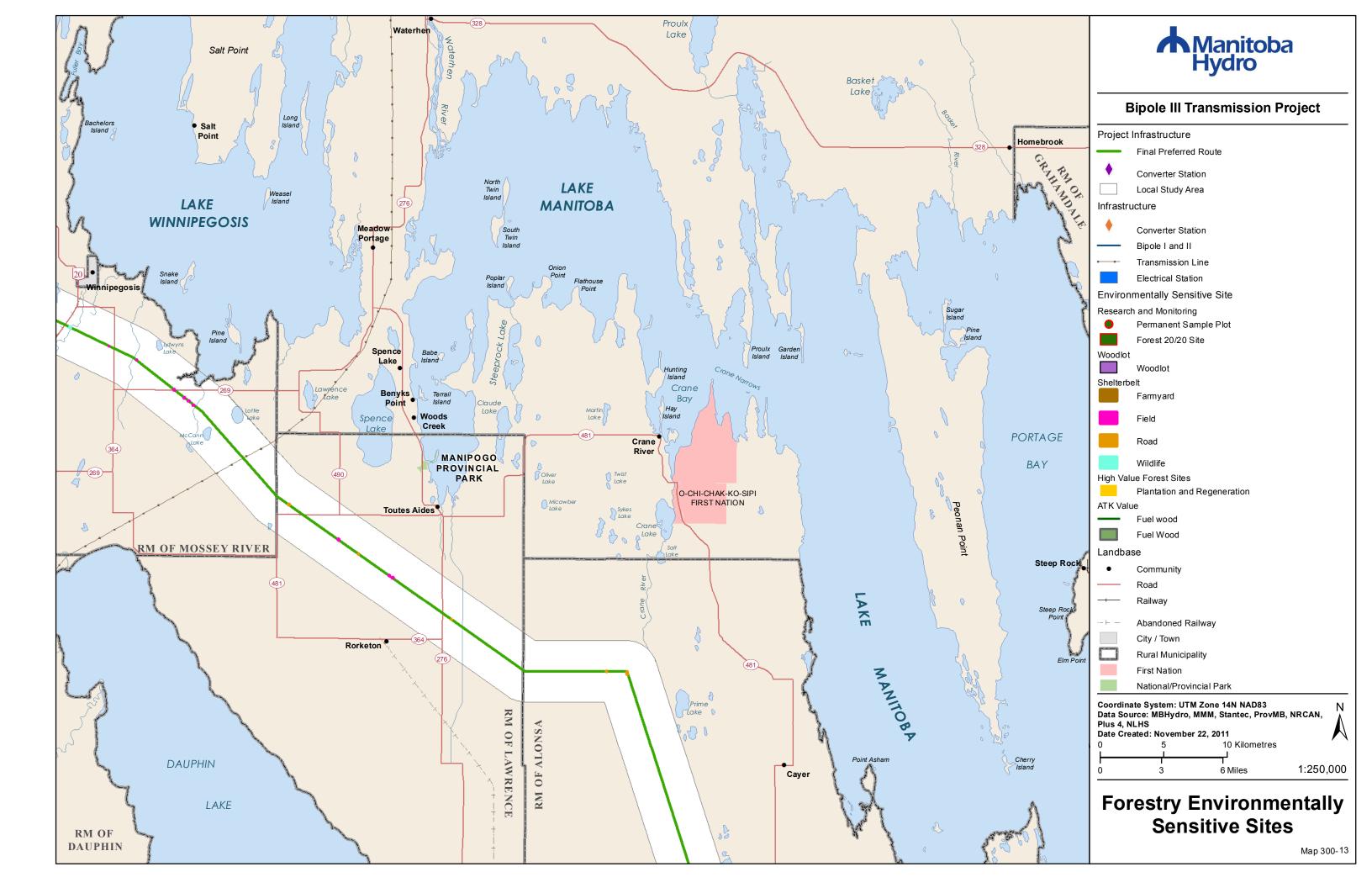


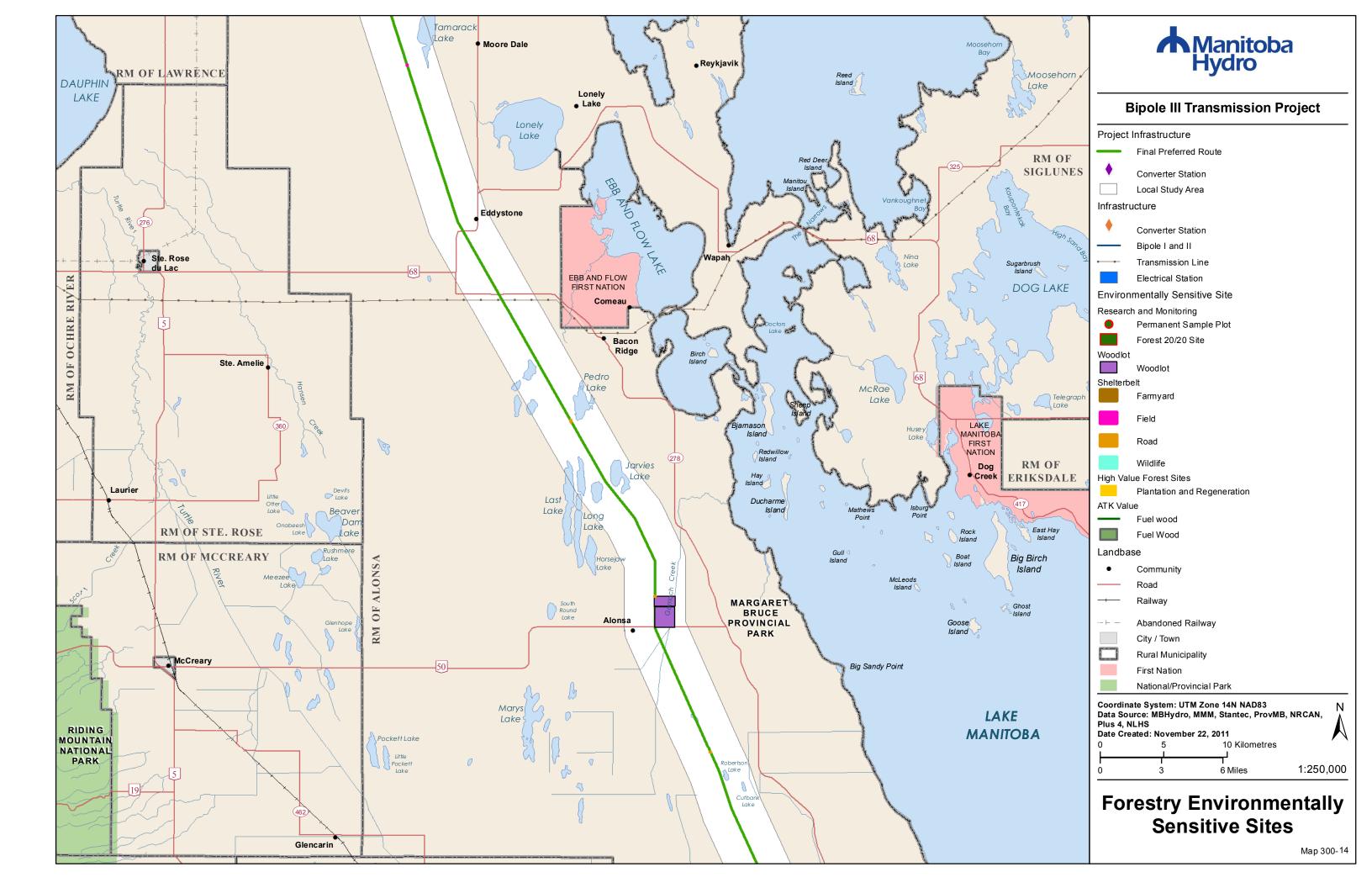


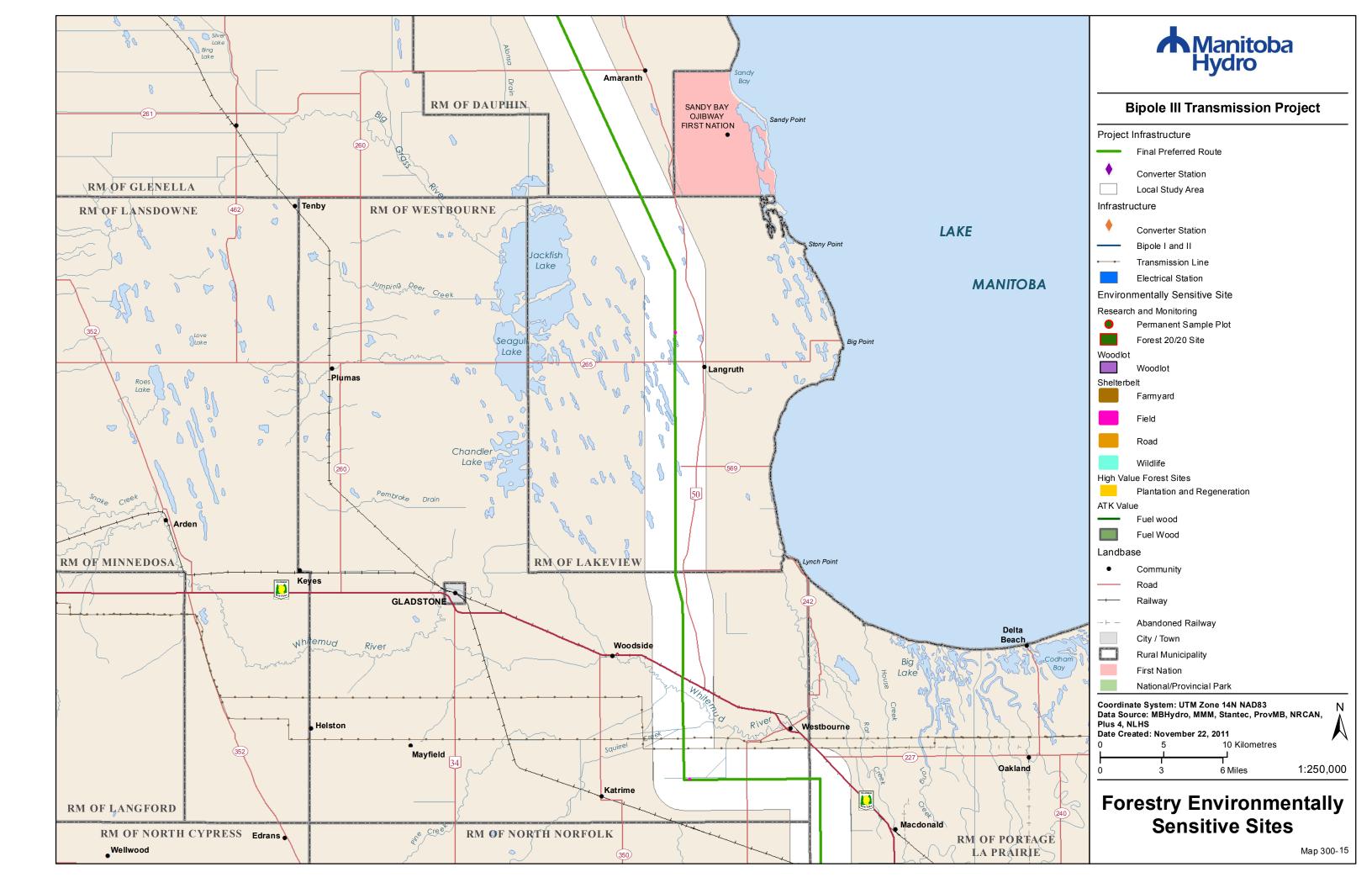


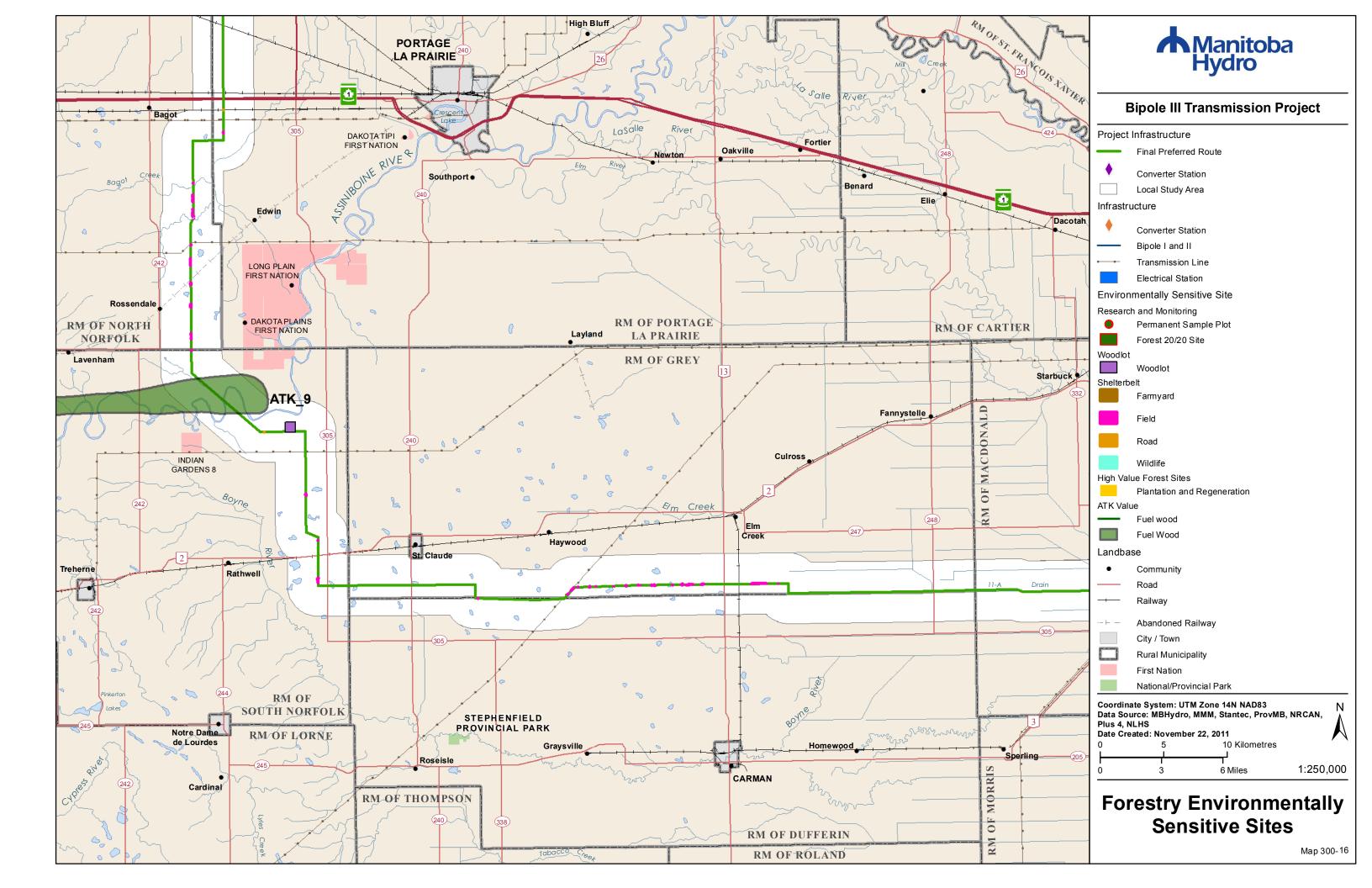


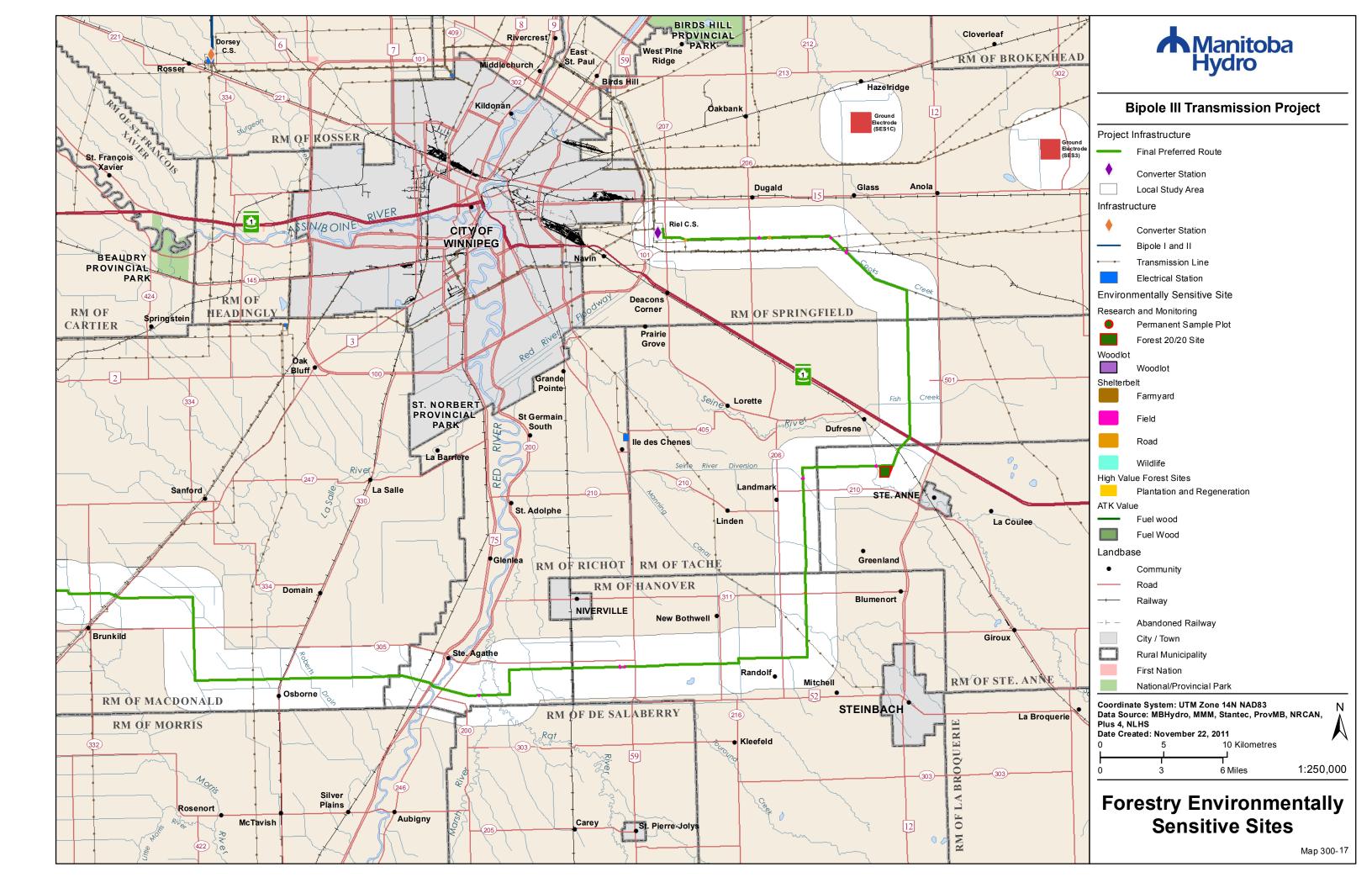












APPENDIX A

Forest Management License Agreements – Withdrawal of Lands

Forest Management License Agreements - Withdrawal of Lands

A1.0 Tolko Industries Ltd. Forest Management License

Agreement signed May 4, 1989, amended April 15, 1996 and January 31, 2006.

Expiry date December 31, 2009, at end of current 13 year Forest Management Plan, thereafter followed by 10 year Plans, once approved will extend FMLA to Dec. 31, 2019.

The Forest Management Plan calls for an Annual Operating Plan (AOP) to be submitted to Manitoba Conservation Forestry Branch with comprehensive detail on where and how harvesting, access and forest renewal operations are to be conducted in the current year and with less detail for two years thereafter.

The AOP must be compliant with all requirements of fisheries, wildlife, timber harvesting, forest renewal and any other relevant current or new guidelines for forest operations in Manitoba.

An Annual Report is required on operations from the preceding year by April 30th each year as well as an annual meeting between the Parties.

A1.1 Tolko Section 11(A) Withdrawals

Sec. 11 (a) Manitoba reserves the right to withdraw certain areas within the FML Area for hydro-electric development, recreation, roads, uses pursuant to the Northern Flood Agreement, treaty land entitlement, and/or other uses which Manitoba deems to be in the public interest. The right to withdrawal shall be exercised so as to cause the least possible disturbance to or interference in the Company's enjoyment of the rights granted to it under this Agreement. Manitoba shall make every reasonable effort to replace areas withdrawn in accordance with the provisions of this Section with other uncommitted areas containing Crown timber of equivalent value and accessibility, provided that the withdrawal of such area or areas in the aggregate do not materially, either operationally, affect the Plant. Except as provided by the provisions of Schedule "C", Manitoba shall not be obligated to incur any costs or pay any damages should areas of equivalent value or accessibility not be available. In the event that suitable areas are available, but inaccessible the Company and Manitoba will discuss ways and means to provide access to such areas on a mutually acceptable basis.

Sec. 11 (B) In the event that land withdrawals affect the continuing operation of the Plant and necessitate cessation of operations then the Company will notify Manitoba of its intent to cease operations. Should Manitoba concur, Manitoba will then pay compensation to the Company equal to the market value on a going concern basis of the Company's business, capital assets and investments in Manitoba contemplated by the agreement valued as if no such land withdrawals

had been made. In the absence of agreement, compensation shall be settled by arbitration pursuant to the provisions of Section 30.

- Sec. 11(C) Where a withdrawal of lands is made under this Section, the Company agrees to remove from such lands within such reasonable period of time as is specified in writing by Manitoba, all chattels, all portable buildings and structures, and such other non-profitable buildings and structures, if any, that the Company desires to remove, and Manitoba agrees to compensate the Company for:
 - i. all reasonable costs of removing and re-establishing the chattels, buildings and structures removed;
 - ii. the non-portable buildings and structures which are not removed on the basis of fair market value;
 - iii. the cost of all silvicultural treatments, except final felling, which have been carried out on the withdrawn lands at the sole expense of the Company;
 - iv. compensation for roads constructed and to the extent paid for by the Company within the withdrawn area in an amount to be agreed to by the parties and failing agreement as settled by arbitration pursuant to the provisions of Section 30.

Sec. 11 (D) All withdrawals of lands will be subject to the Provisions set out in Schedule "C."

A1.2 Tolko Schedule "C":

- (A) The Minister may, for any purpose whatsoever, withdraw any land in parcels greater that five hectares from the Forest Management License Area, by sending the Company notice of such withdrawal. Such notice is to include the purpose of the withdrawal, the location, and the total area involved. Such withdrawal shall take effect one hundred and eighty (180) days from the date upon which such notice is given to the Company, and the said land shall, upon expiration of the said one hundred and eighty (180) days, be withdrawn from the Forest Management License Area.
- (B) The Minister may, for any purpose whatsoever, withdraw any land in parcels of five hectares or less (incidental withdrawals) from the Forest Management License Area. Notice of such withdrawals shall be sent cumulatively to the Company by June 30 and December 31 each year, unless the withdrawal would affect the Company's operation's as identified in the current approved Ten year Forest Management Plan, in which case notice will be given immediately. Notice under this subsection is to include the purpose of the withdrawal, the location, and the total area involved. Such withdrawals shall take effect 30 days from the date of approval by the Minister.

- (C) Prior to withdrawing any lands under Subsection (A); the Minister shall consult with the Company and shall make reasonable efforts to accommodate the requirements of the Company in respect to areas withdrawn.
- (D) Both the Company and the Minister shall keep a listing of locations and areas withdrawn after the date of signing this Agreement. When the cumulative level of withdrawals has reduced the productive forestland base by:
 - i. 5% of the FML Area over a total rotation period (which for the purpose of this section shall be deemed to be any 100 year period); or
 - ii. 0.5% of the FML Area during any 10 year period during the term hereof; the Minister shall, within 180 days of the effective date of the last of such withdrawals;
 - iii. Add new productive forestland to the Forest Management License Area such that full allowable levels are restored, such land to be comparable to that withdrawn when judged in terms of the Company's operating costs; and/or
 - iv. Provide for the supply of additional timber acceptable to and for the needs of the Company to offset the reduction in timber volume, such timber to be comparable to the timber on the withdrawn land when judged in terms of the Company's operating costs with reference "inter alia: to species, growth rate and distance from the Plant.

The 10 year periods referred to in this Schedule shall be determined by reference to each tenth anniversary of the date of the Agreement.

- (E) The Minister shall compensate the Company for 100% of the current replacement costs of any fixed, sunk or capital costs in the area withdrawn pursuant to subsection (A) or (B) including, but not limited to, costs of roads, bridge works, camps, buildings, structures or costs preparatory or incidental to the development thereof and the direct cost of forest management and reforestation actually incurred;
- (F) In the case the Minister is unable to allocate additional productive forestland or timber to the Company pursuant to subsection (D), the Minister shall compensate the Company for the withdrawal of productive forestland from the Forest Management License Area as follows:
 - i. where the company's operating costs in respect of the additional timber or lands allocated by the Minister to the Company under subsection (D) are higher than the Company's operating costs in respect of the withdrawn lands, the Minister shall compensate the Company for such differences; or
 - ii. where the Minister is unable to provide additional land or timber acceptable to the Company, the Minister shall compensate the Company

for the portion of the reduction in productive forestland in excess of withdrawal limits identified in subsection (D) and described in (H)

(G) The FML Area is divided into Forest Sections designated and made up as follows:

Forest Section	Productive Land	Non-Productive Land	Water	Total
				(hectares)
Mountain	364,800	349,200	339.000	1,053,000
Interlake	291,900	331,300	707,800	1,331,000
Saskatchewan	761,300	1,123,900	696,300	2,581,500
River				
Highrock	1,793,300	1,237,000	475,800	3,506,100
Nelson River	1,073,000	1,014,000	306,000	2,393,000
Total	4,284,300	4,055,400	2,524,900	10,864,600

(H) Withdrawal Limits Based on Productive Area in Hectares (Provincial Crown Land Open Zone) are as follows:

Forest Section	Productive Land (Hectares) 100 Year Period (5%)	Productive Land (Hectares) 10 Year Period (0.5%)
Mountain	18,200	1,820
Interlake	14,600	1,460
Saskatchewan River	38,100	3,810
Highrock	89,700	8,970
Nelson River	53,600	5,360
Total	214,200	21,420

- (I) Access to harvest areas where formerly permitted will not be prevented by land withdrawals.
- (J) Where the parties are unable to agree upon the compensation required to be paid under subsection (E) or (F), either party may require that the matter be submitted to arbitration in accordance with paragraph 30 of the Forest Management Agreement.

A2.0 LP Canada Ltd.

Signed September 1, 1994, renewed every 10 years with expiry December 31, 2014

The Forest Management Plan calls for an Annual Operating Plan (AOP) to be submitted to Manitoba Conservation Forestry Branch with comprehensive detail on where and how harvesting, access and forest renewal operations are to be conducted in the current year and with less detail for two years thereafter.

The AOP must be compliant with all requirements of fisheries, wildlife, timber harvesting, forest renewal and any other relevant current or new guidelines for forest operations in Manitoba.

Annual report for operations conducted in the preceding year required by Sept. 30th as well as an annual meeting between the Parties, the minutes being filed with the Director of the Forestry Branch

Sec. 8 Forest Management License 3 Area as described on plan number 19635 filed in the office of the Director of Surveys, and consisting of FMU's 10, 11 and 13

A2.1.0 LP Canada Ltd. Section 11 Withdrawals

Sec. 11 (A) Manitoba reserves the right to withdraw certain areas within the FML #3 for hydro-electric development, recreation, roads, and/or other uses which Manitoba deems to be in the public interest. The right to withdrawal shall be exercised so as to cause the least possible disturbance to or interference in the Company's enjoyment of the rights granted to it under this Agreement. Changes in cutting practices deemed appropriate by Manitoba that result in a reduction of wood supply to the O.S.B. Mill below 900,000 cubic metres per year from Crown and private lands will be deemed a withdrawal for purposes of this section. Manitoba shall make every reasonable effort to replace areas withdrawn in accordance with the provisions of this paragraph with other uncommitted areas containing Crown timber of equivalent value and accessibility, provided that the withdrawal of such area or areas in the aggregate do not materially, either financially or operationally, affect the O.S.B. Mill. Except as provided by the provisions of Schedule "C", Manitoba shall not be obligated to incur any costs or pay any damages should areas of equivalent value or accessibility not be available. In the event that suitable areas are available, but inaccessible the Company and Manitoba will discuss and implement ways and means to provide access to such areas on a mutually acceptable basis.

Sec. 11 (B) In the event that land withdrawals affect the continuing operation of the O.S.B. Mill and necessitate curtailment or cessation of operations, then the Company will notify Manitoba of its intent to do so. Should Manitoba concur, Manitoba will then pay compensation to the Company equal to the market value on a going concern basis of the Company's business, capital assets and investments in Manitoba contemplated by the agreement valued as if no such land withdrawals had been made and the Company shall transfer the O.S.B. Mill

and all assets, rights and privileges thereto appertaining. Manitoba shall not unreasonably withhold its concurrence. In the absence of agreement, compensation shall be settled by arbitration pursuant to the provisions of Paragraph 30.

- Sec. 11(C) Where a withdrawal of lands is made under this paragraph, the Company agrees to remove from such lands within such reasonable period of time as is specified in writing by Manitoba, all chattels, all portable buildings and structures, and such other non-profitable buildings and structures, if any, that the Company desires to remove, and Manitoba agrees to compensate the Company for:
 - i. all reasonable costs of removing and re-establishing the chattels, buildings and structures removed;
 - ii. the non-portable buildings and structures which are not removed on the basis of fair market value;
 - iii. the cost of only those stand tending treatments that have been undertaken after the area has been declared successfully reforested, except final felling, which have been carried out on the withdrawn lands at the sole expense of the Company;
 - iv. compensation for roads constructed and to the extent paid for by the Company within the withdrawn area in an amount to be agreed to by the parties and failing agreement as settled by arbitration pursuant to the provisions of Paragraph 30.
- Sec. 11 (D) Withdrawals of areas or changes in cutting practices, in FMU's 12 and 14 that result in a reduction of wood supply to the O.S.B. Mill below 900,000 cubic metres per year from Crown and private lands will nbe deemed a withdrawal for purposes of this Section.
- Sec. 11 (E) All withdrawals of lands will be subject to the Provisions set out in Schedule "C."

A2.2.0 Louisiana-Pacific Schedule C

(A) Manitoba may, for any purpose whatsoever, withdraw any land in parcels greater that five hectares from the Forest Management License 3 Area, by sending the Company notice of such withdrawal. Such notice is to include the purpose of the withdrawal, the location, and the total area involved. Such withdrawal shall take effect one hundred and eighty (180) days from the date upon which such notice is given to the Company, and the said land shall, upon expiration of the said one hundred and eighty (180) days, be withdrawn from the Forest Management License Area.

- (B) Manitoba may, for any purpose whatsoever, withdraw any land in parcels of five hectares or less (incidental withdrawals) from the Forest Management License 3 Area. Notice of such withdrawals shall be sent cumulatively to the Company by June 30 and December 31 each year, unless the withdrawal would affect the Company's operation's as identified in the current approved Ten (10) Year Forest Development Plan, in which case notice will be given immediately. Notice under this subsection is to include the purpose of the withdrawal, the location, and the total area involved. Such withdrawals shall take effect 30 days from the date of approval by Manitoba.
- (C) Prior to withdrawing any lands under Subsection (A); Manitoba shall consult with the Company and shall make all reasonable efforts to accommodate the requirements of the Company in respect to areas withdrawn.
- (D) Both the Company and Manitoba shall keep a listing of locations and areas agriculture and non-agriculture coded forestlands withdrawn after the date of signing this Agreement.
- 1. For withdrawn agriculture coded forestlands, Manitoba shall not be required to provide the Company with alternate or replacement forestlands or timber supplies. However, Manitoba will compensate the Company for costs as set out in subsection (E).
- 2. When the cumulative level of non-agriculture coded forestland withdrawals has reduced the productive forestland base by:
 - i. 5% of the FML #3 Area over a total rotation period (which for the purpose of this section shall be deemed to be any 100 year period); or
 - ii. 0.5% of the FML Area during any 10 year period during the term hereof;
 Manitoba shall, within 180 days of the effective date of the last of such withdrawals;
 - iii. add new productive forestland to Forest Management License 3 such that full allowable levels are restored, such land to be comparable to that withdrawn when judged in terms of the Company's operating costs; and/or
 - iv. Provide for the supply of additional timber acceptable to and for the needs of the Company to offset the reduction in timber volume, such timber to be comparable to the timber on the withdrawn land when judged in terms of the Company's operating costs with reference "inter alia: to species, growth rate and distance from the Plant.
 - v. The 10-year periods referred to in this Schedule shall be determined by reference to each tenth anniversary of the date of the Agreement.
- (E) Manitoba shall compensate the Company for 100% of the current replacement costs of any fixed, sunk or capital costs in the area withdrawn pursuant to subsection (A) or (B) including, but not limited to, costs of roads, bridge works, camps, buildings, structures or costs preparatory or incidental to the development thereof and the direct cost of forest management and reforestation actually incurred;

- (F) In the event Manitoba is unable to allocate additional productive forestland or timber to the Company pursuant to subsection (D)(2), Manitoba shall compensate the Company for the withdrawal of productive forestland from non-agriculture coded Provincial Crown lands in Forest Management License 3 as follows:
 - where the company's operating costs in respect of the additional timber or lands allocated by the Minister to the Company under subsection (D)(2) are higher than the Company's operating costs in respect of the withdrawn lands, Manitoba shall compensate the Company for such differences; or
 - ii. where Manitoba is unable to provide additional land or timber acceptable to the Company, Manitoba shall compensate the Company for that portion of the reduction in productive forestland in excess of withdrawal limits identified in subsection (D)(2) and described in (G).
- (G) The FML #3 Area is divided into three Forest Management Units (FMU's) designated and made up of the following non-agriculture coded Provincial Crown forestland (area in hectares):

Forest Management	Productive	Non-Productive	Water	Total
Units	Land	Land		(hectares)
M.U. 10	8,600	5,700	0	14,300
M.U. 11	106,600	84,700	16,500	207,800
M.U. 13	274,600	74,600	13,000	362,200
TOTAL	389,800	165,000	29,500	584,300

(H) Withdrawal Limits are as follows:

Forest Managemer Units (Area in Hectares)	t 100 Year Period (5%)	10 Year Period (0.5%)
M.U. 10	400	40
M.U. 11	5,400	540
M.U. 13	13,700	1,370
TOTAL	19,500	1,950

- (I) Access to harvest areas where formerly permitted will not be prevented by land withdrawals.
- (J) Where the parties are unable to agree upon the compensation required to be paid under subsection (E) or (F), either party may require that the matter be submitted to arbitration in accordance with paragraph 30 of the Agreement.

APPENDIX B

Non-Commercial Forest Zone Photo/Video Assessment

Non-commercial Forest Zone Photo/Video Assessment

Video	Easting	Northing	Forest Merchantability Comment*
			Small area (< 25 ha) of small diameter, short Black
	641208	6235165	Spruce suitable only for chip production for pulping.
29001			Very small (<10 ha), isolated area of mature,
			merchantable Black Spruce and Aspen (BS8TA2 - cutting
	645916	6239403	class 4).
			Very small (<10 ha), isolated area of Black Spruce and
			Aspen with marginally merchantable diameter and
30001	658908	6244324	height (BS8TA2 - cutting class 3).
31001			No areas of commercial value identified.
32001			No areas of commercial value identified.
			Entire video segment through recent forest fire area. No
33001			areas of commercial value identified.
34001			No areas of commercial value identified.
			Small area (<25 ha) of small diameter, short Black
35001	360115	6272943	Spruce suitable only for chip production for pulping.
			Small (<25 ha), isolated area of mature, merchantable
36001	370964	627447	Black Spruce (BS10 – cutting class 4).
			Entire video segment through recent forest fire area. No
37001			areas of commercial value identified.
			Entire video segment through recent forest fire area. No
37002			areas of commercial value identified.
38001			No areas of commercial value identified.
			Small area (<25 ha) of small diameter, short Black
39001	410464	6282959	Spruce suitable only for chip production for pulping.
41001			No areas of commercial value identified.

^{*} Areas given are an approximation. They represent an area that the Bipole III Transmission Project right-of-way cuts through, NOT of area that will be affected.

APPENDIX C

Aboriginal Traditional Knowledge Forestry Values

Aboriginal Traditional Knowledge Forestry Values

IDUITE	NTS	ID	iai Knowledge Forestry Va	liucs	
FMU	Мар	#	Value Identification	Location	Pot. Effect
	тобр		Prendiville Sawmill - shut		1 001 211000
86	63P15	2	down	east of Arnot	none
				trail from Pikwitonei to area	
85	63P11	11	Local Wood Source	91 on 63P12	yes
85	63P11	53	Forest Burnt - dry wood	north-west of Pikwitonei	none
85	63P11	55	Local Wood Source	north-west of Pikwitonei	none
85	63P11	57	Local Wood Source	north of Pikwitonei	none
85	63P11	65	Sawmill (personal)	beside Pikwitonei	none
85	63P11	68	Local Wood Source	area surrounding Pikwitonei	none
85	63P11 & 63P12	91	Logging	Large area overlain by Bipole III	yes
84/85	63P05	109	Logging Roads (have an effect on creeks and wildlife)	Large area around Wintering Lake overlain by Bipole	Not a Bipole forestry effect
84	63P05	75	Sawmills in city (approximately 5 remembered - timber sold to Inco for underground, shipped out on trains)	in Thicket Portage	none
84	63P05	105	Fuelwood (spruce, birch, poplar, jack pine)	south of Landing Lake	none
84	63P05	106	Wood left behind by Tolko (approximately 200 cords left to rot)	south west of Wintering Lake	none
84	63P05	128	Last year's fire wood collection area (dry wood) - during summer, transport by boat	south of Landing Lake	none
84	63P05	141	Logging area (possibly a company that came into the area)	between Wintering and Landing Lakes	none
84	63P06	123	Spruce Trees that have fallen due to fire	south of Landing Lake	none
61	63J12	3	Timber and lumber to mill route	winter road on Wekusko Lake	none
61	63J13	8	Timber and lumber to mill route	winter road on Wekusko Lake	none
	63K02 &				
57	63K07	184	First Island - logging	Island on Cormorant Lake	none
57	63K03	137	Logging chute (still visible)	on shore of east central portion of Cormorant Lake	none

	NTS	ID			
FMU	Мар	#	Value Identification	Location	Pot. Effect
				Large area bisected by	
				Bipole III between	
E7/EE	62802	66	Logging (jack pine, spruce -	Cormorant and Clearwater	.vos
57/55	63K02	66	black & white spruce)	Lakes and south of area 97	yes
				Large area between Cormorant and Clearwater	
				Lakes intersected by Bipole	
			Logging area (jack pine,	III at the extreme southern	
57/55	63K02	97	spruce)	end of polygon	yes
	63K01				
	63K02			Between North Moose Lake	
	63K07			and Cormorant Lake	
	&			intersects Bipole III on 63K1	
55	63K08	65	Logging	& 8	yes
52	63F08	43	Poplar, spruce, jack pine; picking was all over	south-west shore of cedar Lake	none
32	03108	43	Roads (logging, not shown on	Lake	none
14	63C11	59	map) are in the area	west of Mafeking & PPR	none
			Area of Ash Tree Harvest,	All on west side of Red Deer	
12	63C13	125	Area outfitters use	Lake. PPR on east side	none
				All on west side of Red Deer	
12	63C13	138	Tamarack fuelwood	Lake. PPR on east side	none
12	C2C12	140	Towns and five loves and	All on west side of Red Deer	
12	63C13	140	Tamarack fuelwood	Lake. PPR on east side All on west side of Red Deer	none
12	63C13	142	Logging Area/work/economic	Lake. PPR on east side	none
			Maple Trees/Maple Sugar	All on west side of Red Deer	
12	63C13	153	Harvest	Lake. PPR on east side	none
				All on west side of Red Deer	
12	63C13	154	logging	Lake. PPR on east side	none
4.2	62642	470	Logs (1930s logging	All on west side of Red Deer	
12	63C13	172	operations) - filled the Bay	Lake. PPR on east side On west side of Red Deer	none
12	63C14	41	Ash harvest for artwork	Lake	none
				On west side of Red Deer	
12	63C14	53	mill sites along shore	Lake	none
				South of west side of Red	
12	63C14	55	Old sawmills	Deer Lake	none
4.5			sawmills - one near Barrows	South of west side of Red	
12	63C14	58	turned into baseball diamond	Deer Lake	none
12	63C14	64	Maple	South of west side of Red Deer Lake	none
12	03C14	04	sawmills - one near Barrows	South of west side of Red	none
12	63C14	65	turned into baseball diamond	Deer Lake	none
	33317	- 55	Table 11100 baseball didillolla	South of west side of Red	
12	63C14	66	Saw Mill - Pinkerton's - 1950s	Deer Lake	none

	NTS	ID			
FMU	Мар	#	Value Identification	Location	Pot. Effect
			Maple Trees/Maple syrup	South of west side of Red	
12	63C14	67	harvest	Deer Lake	none
				South of west side of Red	
12	63C14	68	Old Saw Mills	Deer Lake	none
12	63C14	82	Two saw mills (1970s-1980s)	South of Red Deer Lake	none
12	63C14	92	Saw Mill	near Dawson Bay	none
			Logging (1960s - area still		
12	63C14	102	logged a bit today)	east shore of Red Deer Lake	none
12	63C14	107	Tamarack (fuelwood)	South of Red Deer Lake	none
12	62614	152	Logs filled bay during 1930s	cannot find in lake	nana
12	63C14	152	logging operations Area of Ash Harvest for	cannot find - in lake	none
12	63C14	156	artwork	South of Red Deer Lake	none
	03011	130	Logging (late 1960s) - still use	north shore of Red Deer	Hone
12	63F03	38	area a bit today	Lake	none
			Old Machinery possibly		
			related to pulping found along		
			old road (likely close to Red		
12	63C14	9	Deer Lake)	near Red Deer Lake	none
				West of PTH 10 and north of	
12	63C14	37	Pulping (in the past).	PTH 77	none
12	63C14	39	Ash trees to make sleds	adjacent to PTH10	none
12	63C14	42	Timbor Aroa (tamarask birsh)	N & S area west of PTH 10	vos
12	63C14	81	Timber Area (tamarack, birch) Timber Area (tamarack, birch)	and overlain by PPR near Red Deer Lake	yes none
12	03C14	01	Timber Area (tamarack, birch)	East of PPR on shore of NW	none
12	63C15	58	Ash trees to make sleds	portion of Dawson Bay	none
	00010		, and a cook of make order	East of PPR on shore of NW	
12	63C15	59	Maple sugar trees	portion of Dawson Bay	none
			. 3	East of PPR on shore of NW	
12	63C15	65	Maple sugar trees	portion of Dawson Bay	none
			Old Mill - "Manwap" - White	near Pelican Rapids - south-	
12	63C10	34	Poplar	east corner Dawson Bay	none
			Unloading site for timber		
12	63C14	25	along tracks south of Barrows	south of Barrows	none
				huge area south and east of	
			Tamarack harvested for	Red Deer lake with a portion	
12	63C14	51	fuelwood	intersecting PPR	yes
12	C2C4.4	F 2	Maple trees for maple syrup	anuth of Dod Describely	
12	63C14	52	harvesting	south of Red Deer Lake In or adjacent to	none
11	62N16	3	Sawmill	Camperville	none
	02.110			In or adjacent to	
11	62N16	4	Old Sawmill Pelletier	Camperville	none
				In or adjacent to	
11	62N16	10	Old Sawmill Pelletier	Camperville	none

	NTS	ID			
FMU	Мар	#	Value Identification	Location	Pot. Effect
				In or adjacent to	
11	62N16	11	Sawmill	Camperville	none
11	62N16	33	Wood gathering	on Red Deer Point	none
11	62N16	39	Wood gathering	near Camperville	none
				In or adjacent to	
11	62N16	3	Sawmill	Camperville	none
			Wagon road used to access		
11	62N16	17	harvest area	PTH480 crossing PPR	none
			Area of camping to access	West of PPR & north of	
11	62N16	55	harvest	PTH217	none
			Area used to harvest maple		
			syrup - maple trees, done in		
11	63C01	30	past	Adjacent to Camperville	none
			Area used to harvest maple		
			syrup - maple trees, done in		
11	63C01	35	past	on Red Deer Point	none
			Crooked Tree - landmark used		
11	63C01	38	for travel	Adjacent to Duck Bay	none
4.4	62604	20	Crooked tree standing, ridge -		
11	63C01	39	directional marker	Adjacent to Duck Bay	none
11	63C02	77	Sawmill	West of PTH 10 & Cowan	none
			Historic timber harvest area		
11	62016	06	including fuelwood, rails and	West of Duck Boy	nono
11	62N16	96	fence posts Historic timber harvest area	West of Duck Bay	none
			including fuelwood, rails and		
11	62N16	97	fence posts	West of Duck Bay	none
2, 4	62G15	22	Some fuelwood harvested	Southwest of Dakota Plains	yes
2, 4	62G15	32	Some fuelwood harvested	Southwest of Dakota Plains	yes

APPENDIX D

Significance Assessment Procedures

Bipole III

Determining the Significance of Residual Environmental Effects (i.e., after mitigation)

Preamble

The significance of residual environmental effects will be assessed using the following eight assessment factors as identified in the Scoping Document:

- 1. Direction
- 2. Ecological Importance
- 3. Societal Importance
- 4. Magnitude

- 5. Geographic Extent
- 6. Duration
- 7. Frequency
- 8. Reversibility

Complete the following nine steps in sequence for all positive and negative residual environmental effects and record rating criteria information on the appended table. For positive effects; however, do not assign a rating for reversibility. It is suggested that assessors work in teams of two or more persons to reach consensus on individual ratings. The actual determination of significance will be made based on the information provided and consideration of uncertainty and likelihood of occurrence.

Step 1. Residual Environmental Effect

An environmental effect is a change in the environment caused by the project. A residual environmental effect is the resultant change in the environment after the application of mitigation measures. Residual environmental effects should be expressed using the same units of measure as those used for environmental effects.

Record the predicted residual environmental effect, stated as a change in the environment, in column 1 of the summary table. See example table for environmental effects, ratings and rationale.

Step 2. Direction of Residual Effect

The direction of the effect describes the difference or trend compared with existing baseline or pre-project conditions. The direction of the residual environmental effect will be assessed as:

Criteria	Explanation
Positive	- Beneficial or desirable change in the
	environment.
Negligible	- No detectable or measurable change in the
	environment.
Negative	- Adverse or undesirable change in the
	environment.

Determine whether the predicted residual environmental effect would be positive, negligible or negative and record the direction of the effect in column 2 of the summary table.

Step 3. Ecological Importance

Ecological context includes the rarity, uniqueness and fragility within the ecosystem, and importance to scientific studies. Ecological importance of the residual environmental effect will be assessed as:

Criteria	Explanation
High	- Protected species or habitat (i.e., threatened).
	- Fragile area, ecosystem or habitat
	- Important ecological function or relationships.
	- Important to scientific investigation (i.e., ongoing
	research/study).
Moderate	- Moderately rare, unique or fragile.
	- Moderately/seasonally fragile environmental component.
	- Somewhat important to ecosystem function or relationships.
	- Some importance to scientific investigations.
Low	- Not rare or unique (i.e., common).
	- Resilient environmental component.
	- Minor ecosystem importance.
	- Limited scientific importance (i.e., no research/study).

Determine whether the ecological importance of the predicted residual environmental effect would be high, moderate or low, and record the importance of the effect in column 3 of the summary table.

Step 4. Societal Importance

Societal importance, context or value includes the value that individuals/communities place on components of the affected socio-economic and biophysical environments that are necessary for economic, social and cultural well-being. Societal importance of the residual environmental effect will be assessed as:

Criteria	Explanation
High	 Designated areas (e.g., parks) or infrastructure that is protected nationally or internationally.
	 Areas, activities, infrastructure and services, or components of the biophysical environment that have been identified as
	being important to sustaining the economic, social and
	cultural well-being of communities through the EA public consultation/ATK processes or EA regulatory guidance.
Moderate	 Designated areas or infrastructure that are protected (locally, regionally or provincially).
	 Areas, activities, infrastructure and services, or components of the biophysical environment that have been identified as
	being somewhat important to sustaining the economic, social and cultural wellbeing of individuals (e.g., domestic resource
	use, sport fishing/hunting) through the EA public
Low	consultation/ATK processes or EA regulatory guidance Areas or infrastructure that have no formal designation.
25.0	 Public has not identified through the EA consultation/ATK processes that affected components of the socio-economic
	environment or biophysical environment as important for individuals' overall well-being.

Determine whether the social importance of the predicted residual environmental effect would be high, moderate or low, and record the importance of the residual effect in column 4 of the summary table.

Step 5. Magnitude of Residual Effect

Magnitude is the predicted degree of disturbance the effect has on a component of the biophysical or socio-economic environment. Magnitude of the residual environmental effect will be assessed as:

Criteria	Explanation
Large	- Effect on a population in sufficient magnitude to cause a
	decline in abundance and or change in distribution lasting several generations.
	- For socio-economics, effect on an entire community.
	 Effect on the physical environment exceeds regulated limits, standards or guidelines.
	 Effect can be easily observed, measured and described, and may be widespread.
Medium	- Effect on part of a population/community that result in a
	short-term change in abundance and/or distribution over one
	or more generations.
	- For socio-economics, effect on part of a community.
	- Effect on the physical environment meets and may
	occasionally exceed regulated limits, standards or guidelines.

Criteria	Explanation					
	- Effect can be measured with a well-designed monitoring					
	program.					
Small	 Effect on a group of individuals within a population/community or stock over one generation or less; similar to random changes in the population. For socio-economics, effect on a group of individuals. 					
	 Effect on the physical environment does not exceed regulated limits, standards or guidelines. No measurable effect on population as a whole. 					

Determine whether the magnitude of the residual environmental effect would be large, medium or small, and record magnitude of the residual effect in column 1 of the summary table.

Step 6. Geographic Extent of Residual Effect

Geographic extent is the spatial boundary where the residual environmental effect is expected to occur. Geographic extent of the residual environmental effect will be assessed as:

Criteria	Explanation				
Regional Assessment	- Effect extends into regional study area.				
Area	- Area where indirect or cumulative effects may occur.				
Local Assessment Area	- Effect extends beyond the project footprint into the				
	surrounding areas, including potentially affected communitie				
	within a $^{\sim}$ 5 km wide corridor of the route (i.e., $^{\sim}$ 2.5 km) on				
	either side of the ROW and around other project components.				
	- Area where direct and indirect effects may occur.				
Project Site/Footprint	- Effect confined to the footprint for all project components				
	(ROW 66 m). Effects would be limited to directly affected				
	environmental components.				
	- Area where direct effects would occur.				

Determine whether the geographic extent of the residual environmental effect would occur in the regional, local or project site/footprint assessment area, and record the geographic extent of the residual effect in column 6 of the summary table.

Step 7. Duration of Residual Effect

Duration is how long the predicted residual environmental effect would last.

Criteria	Explanation			
Long term	- Effect is greater than 50 years.			
Medium-term	- Effect extends throughout the construction and operation phases of the project (up to 50 years).			
Short-term	- Effect occurs during the site-preparation or construction phase of the project (i.e., one to five years).			

Determine whether the duration of the predicted residual environmental effect would be short, medium-, or long term, and record the duration of the residual effect in column 7 of the summary table.

Step 8. Frequency of Residual Effect

Frequency is how often the predicted residual environmental effect would occur. Frequency of the residual environmental effect will be assessed as:

Criteria	Explanation			
Regular/Continuous	- Effect may occur continuously or periodically during the life of			
	the project or more than once per day.			
Sporadic/Intermittent	- Effect may occur without any predictable pattern during the			
	life of the project (e.g., wildlife-vehicle collisions) or less than			
	once per week.			
Infrequent	- Effect may occur only once during the life of the project or less			
	than once per year (e.g., clearing).			

Determine whether the frequency of the residual environmental effect would be regular, sporadic or infrequent, and record frequency of the residual effect in column 8 of the summary table.

Step 9. Reversibility

Reversibility is how long it would take for the site to be restored to an acceptable condition. Reversibility of the residual environmental effect will be assessed as:

Criteria	Explanation				
Irreversible	- A long-term effect that is permanent (i.e., remains indefinite as				
	a residual effect).				
Reversible	- Effect is reversible during the life of the project.				

Determine whether the predicted residual environmental effect would be irreversible or reversible, and record reversibility of the residual effect in column 9 of the summary table.

Comments

Include any comments that clarify the assumptions made or the rationale used.

	Bipole III Residual Environmental Effect Assessment Summary Table								
1. Residual Environmental Effect	2. Direction	3. Ecological Importance	4. Societal Importance	5. Magnitude	6. Geographic Extent	7. Duration	8. Frequency	9. Reversibility	Comments

APPENDIX E

First Nation Domestic Wood Use Estimation

First Nation Domestic Wood Use Estimation

		d Use Estimation		Est. Firewood
Forest Section	FMU	Community	Dwellings*	Use (M3) ¹
	1	Roseau River	155	78
	2	Dakota Tipi	40	20
	4	Dakota Plains	30	
	4	Swan Lake	120	
	4	Subtotal	150	75
	5	Sandy Bay	510	255
	6	Canupawakpa Dakota - Oak Lake	100	
	6	Sioux Valley	335	
Aspen Parkland	6	Subtotal	435	218
	7	Birdtail Sioux	100	
	7	Gamblers	20	
		Keeseekoowenin - Bottle Lake - Clear		
	7	Lake	175	
	7	Rolling River	115	
	7	Waywayseecappo	325	
	7	Subtotal	735	368
	FS Subtl		2025	1,013
	10	Ebb & Flow	290	
	10	O-Chi-Chak-Ko-Sipi - Crane River	105	
	10	Valley River	100	
	10	Subtotal	495	248
Mountain	11	Pine Creek	205	103
	12	Indian Birch - Swan Lake	30	
	12	Sapotaweyak Cree - Shoal River	185	
	12	Subtotal	215	108
	FS Subtl		915	458
	52	Opaskwayak Cree	190	95
Saskatchewan R.	53	Mosakahiken Cree - Moose Lake	165	83
IV.	FS Subtl		355	178
	64	Mathias Colomb - Pukatawagan	315	158
Highrock	66	Mathias Colomb - Highrock	20	10
	FS Subtl		335	168
	83	Cross Lake	345	173
	85	War Lake - Mooseocoot	285	143
	86	York Factory	98	49
Nelson River		Nisichawayasihk - Kapawasihk, Nelson		
	87	House, Monahawuhkan Wapasihk	420	210
	88	Tataskweyak Cree - Split Lake	115	58
	FS Subtl		1263	632
Non commercial	76	Fox Lake Cree Nation	51	26
	All	Total	4795	2,398

^{*}Source: Canada, Government of (A) & (I) websites, 2011.

1 - Based on 10 % of dwellings using 2.0 cords (5 m³) each.

APPENDIX F

Manitoba Conservation Forest Damage Appraisal and Valuation Guide

Manitoba Conservation Forest Damage Appraisal and Valuation Guide

On all Crown land regardless of Crown Land Classification Committee (C.L.C.C.) or other land use zoning or designation, the Crown controls timber rights. All operations on these lands causing the disturbance or destruction of any timber whether young growth, mature timber, or plantations must receive Regional Operations and\or Integrated Resource Management Teams (IRMT) approval and be covered by all necessary work permits and authorizations required by legislation. The requirements of authorization and valid permits apply to all users, whether they are members of the public, private agencies or other Departments and Crown Corporations. The only exception is the clearing of leased Agricultural Crown Lands which is covered by different procedures - although timber charges levied can be calculated using the attached procedures (See Circular FBTM - 28-2).

The intent of this procedure is to encourage the planning and orderly removal of timber products during any forest operation. If regional staff are given enough time and the removal follows proper procedures, including all applicable mitigating conditions, only the basic charges of timber dues, and the Forest Renewal and Fire Protection charges will be levied. If, however, timber whether merchantable or unmerchantable is destroyed and\or not salvaged, or areas which have had significant forestry investment, are disturbed, additional charges as identified in this document will be applied.

The MNR Forestry Branch and Regional Operations requests that a minimum of 12 months notice be given by the 'user' (permitee\proponent) to allow for the orderly harvest of the merchantable timber off the lands to be cleared. Regional Operations and Forestry Branch staff will determine the method of timber disposal. The wood may be removed as part of existing industrial FML or quota commitments by a third party. Or it may be that the 'user' will have the option of cutting and marketing the timber themselves under the authority of a Timber Permit once all dues and charges have been paid. If the 'user' does not wish the timber, they may be directed to cut and pile the timber in tree length or other form as directed by Regional Operations staff at approved locations. In this case, Regional Operations staff will auction or dispose of the timber following normal procedures. If, due to urgency or other reason, insufficient notice is provided, the 'user' will be directed to make every attempt to harvest the merchantable timber while clearing the land. If after all attempts, the merchantable timber can not be salvaged or if immature stands or established plantations are disturbed resulting in non-merchantable material being produced, the 'user' will be assessed a forest damage appraisal charge using the procedures outlined in the following pages.

As timber dues, gross merchantable volumes, mean annual increments and age classes vary from Forest Management Unit to Forest Management Unit and by Forest Section; each region should use the attached formula to calculate their own yearly growth and timber values. With the anticipated changes underway in the Forest Resource Management Section including the new

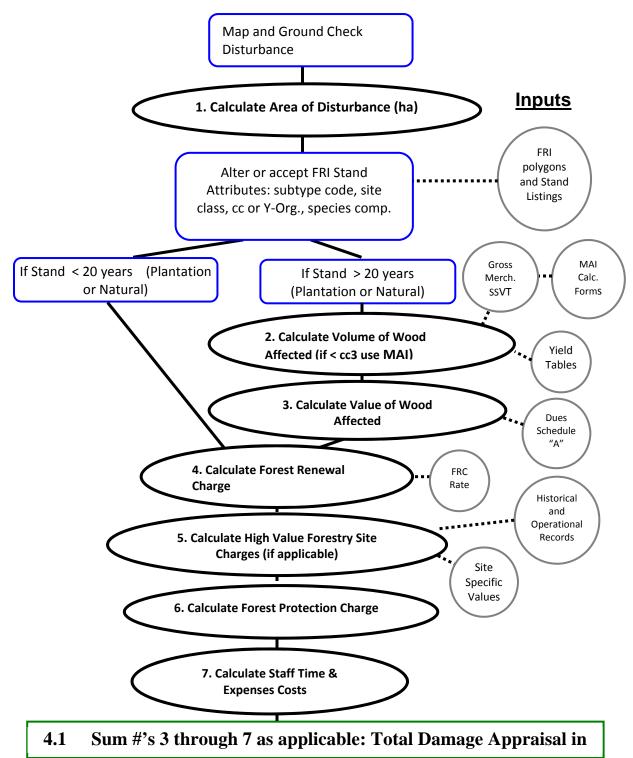
techniques and calculations of forest growth, the attached process will be modified when yield tables and year of origin data is available. Attached for present use are the Forest Section and mean annual increment and age distribution data.

Due to the wide range of site types, conditions and methods, values such as Silvicultural treatment costs have been derived on a regional basis and incorporated into a provincial Forest Renewal Charge (FRC) and a provincial Establishment Cost and are included. The FRC is used to calculate the cost to replace disturbed mature forest. Due to the lack of volume growth over the short-term and the high cost of plantation establishment, Plantations if damaged are much more costly to replace and the Establishment Cost has been set based on actual regional average costs. Other Forestry operations such as permanent and research sample plots, intensively managed sites, tree improvement sites fall into the category of 'High Value Forestry Sites'. The cost assessed for these will be calculated from project records and will be in addition to the FRC. It is intended that these values will be updated regularly to incorporate current costs.

In addition, as the time and effort to perform this type of valuation resulting from poorly planned or unauthorized timber destruction is outside the normal day to day activities of Regional Operations staff, the 'user' will be charged for the investigating staffs' time and expenses.

There may be cases where due to inaccessibility or remoteness, the marketing of the merchantable timber might be difficult. In this event, salvage or other dues rates might be applied instead of full stumpage rates. Again, this is at the Regional Operations and Forestry Branches' discretion. However, the operations and access to these remote areas is likely winter-season only, consequently, the removal of the timber products would still be possible and the onus still on the 'user' to utilize it.

APPENDIX I: Forest Damage Appraisal and Valuation Flowchart



APPENDIX II

A) PROVINCIAL FOREST PROTECTION COST (1989)

Protection Cost cost per cubic meter
- calculated by Forest Management Section
--applied to Primary Protection Zone only

Average Volume average merchantable volume per hectare for all cover types = 150 m³/ha

=\$25.50/ha

B) FOREST RENEWAL CHARGE (2009): Softwood Hardwood \$5.75 /m³
Softwood Softwood

C) YEARLY GROWTH VALUE (Use attached Spreadsheet)

Mean Annual Increment x (M³\ha\yr)

Mean Annual Increment per species, by Forest Section, by working group by site -see tables attached

Age Class Midpoint by Forest Section -see tables attached

Dues by Forest Section -see Schedule "A" (Revision _____) of

Forest Act Regulations.

D) ESTABLISHMENT COST (based on 1999 FRC Review)

Provincial Average: \$882.35 per ha

APPENDIX III

STAFF TIME A Investigating St	ND EXPENSE COST aff:			
Position	, Wage Rate /hr	X_	hrs = \$	
Position	, Wage Rate /hr	X_	hrs = \$	
Position	, Wage Rate /hr	X_	hrs = \$	
Position	, Wage Rate /hr	X_	hrs = \$	
Position	, Wage Rate /hr	X_	hrs = \$	
Position	, Wage Rate /hr	X_	hrs = \$	
Position	, Wage Rate /hr	X_	hrs = \$	
		Total Wage E	xpense	
Vehicle Mileage	Э :			
Vehicle	, Mileage Rate	/km X	kms = \$	
Vehicle	, Mileage Rate	/km X	kms = \$	
Vehicle	, Mileage Rate	/km X	kms = \$	
Vehicle	, Mileage Rate	/km X	kms = \$	
		Total Mileage	e Expense	
Itemized Misce	llaneous Expenses:		¢	
-			\$ \$	
-			\$	
-			\$	
-				
-			\$	
		Total Misc. E	xpenses \$	
	Total Staff	Time and Expen	se Costs \$	

Assessment Summary:

1)	Area	of	Distur	bance:
----	------	----	---------------	--------

Stand Number	Area Affected (ha)				

Total

2) Establishment Cost (from Calcs. Sheet).

=\$_____

3) Timber Volume (from Calcs. Sheet),

Softwood = _____, Hardwood = ____ = ____m³

4) Total Timber Value (from Calcs. Sheet) =\$ _____

5) FRC Calculation: Soft. Volume (m³) x \$5.75 =\$ _____ Hard. Volume (m³) x \$0.50 =\$ ____

6) Fire Protection: Volume (m³) x \$0.17 =\$ _____

7) High Value Forestry Site: (actual costs) =\$ _____

8) Staff Time & Expense Cost: (actual costs) =\$ _____

Total Damage Appraisal =\$ _____

Signature:_____
Investigating Officer
Approved:_____

Regional Forester

APPENDIX IV: Age Distribution in years by Cutting Class and Working Group

FOREST SECTION: 0 - Aspen Parkland

	CUTTING CLASS				
WORKING GROUP / SITE	1	2	3	4	5
Jack Pine, Scots Pine / All	1 – 10 (5)*	11 – 25(18)	26 - 50	51 - 70	71+
Black Spruce / 1	1 – 15 (8)	16 – 35 (25)	36 - 70	71 - 90	91+
Black Spruce / 2 & 3	1 – 25 (13)	26 – 70 (48)	71 - 120	121 - 160	161+
White Spruce / All	1 – 10 (5)	11 – 25 (18)	26 - 70	71 - 90	91+
Tamarack / 1	1 – 10 (5)	11 – 30 (20)	31 - 70	71 - 110	111+
Tamarack / 2	1 – 25 (13)	26 – 70 (48)	71 - 120	121 - 160	161+
Hardwoods / All	1 – 10 (5)	11 – 20 (15)	21 - 50	51 - 70	71+

^{*} Age Class Midpoints ()

FOREST SECTION: 1 - Mountain

	CUTTING CLASS				
WORKING GROUP / SITE	1	2	3	4	5
Jack Pine, Scots Pine / All	1 – 10 (5)	11 – 25 (18)	26 - 50	51 - 70	71+
Black Spruce / 1	1 – 15 (8)	16 – 35 (25)	36 - 70	71 - 90	91+
Black Spruce / 2 & 3	1 – 25 (13)	26 – 70 (48)	71 - 120	121 - 160	161+
White Spruce / All	1 – 15 (8)	16 – 30 (23)	31 - 90	91 - 110	111+
Balsam Fir / All	1 – 10 (5)	11 – 25(18)	26 - 50	51 - 70	71+
Tamarack / 1	1 – 15 (8)	16 – 30 (23)	31 - 70	71 - 110	111+
Tamarack / 2	1 – 25 (13)	26 – 70 (48)	71 - 120	121 - 160	161+
Hardwoods / All	1 – 10 (5)	11 – 20 (15)	21 - 50	51 - 70	71+

FOREST SECTION: 2 – Pineland

	CUTTING CLASS				
WORKING GROUP / SITE	1	2	3	4	5
Red Pine / All	1 – 10 (5)	11 – 25 (18)	26 - 70	71 - 90	91+
Jack Pine, Scots Pine / All	1 – 10 (5)	11 – 25 (18)	26 - 50	51 - 70	71+
Black Spruce / 1	1 – 15 (8)	16 – 35 (25)	36 - 70	71 - 90	91+
Black Spruce / 2 & 3	1 – 25 (13)	26 – 70 (48)	71 - 120	121 - 160	161+
White Spruce / All	1 – 10 (5)	11 – 25 (18)	26 - 70	71 - 90	91+
Balsam Fir / All	1 – 10 (5)	11 – 25 (18)	26 - 50	51 - 70	71+
Tamarack / 1	1 – 10 (5)	11 – 30 (20)	31 - 70	71 - 110	111+
Tamarack / 2	1 – 25 (13)	26 – 70 (48)	71 - 120	121 - 160	161+
Eastern Cedar / 1	1 – 15 (8)	16 – 35 (25)	36 - 70	71 - 90	91+
Eastern Cedar / 2	1 – 25 (13)	26 – 70 (48)	71 - 120	121 - 160	161+
Hardwoods / All	1 – 10 (5)	11 – 20 (15)	21 - 50	51 - 70	71+

FOREST SECTION: 3 – Lake Wpg. East

	CUTTING CLASS				
WORKING GROUP / SITE	1	2	3	4	5
Red Pine / All	1 – 10 (5)	11 – 25 (18)	26 - 70	71 - 90	91+
Jack Pine / All	1 – 10 (5)	11 – 25 (18)	26 - 70	71 - 90	91+
Black Spruce / 1	1 – 15 (8)	16 – 30 (23)	31 - 70	71 - 90	91+
Black Spruce / 2 & 3	1 – 30 (15)	31 – 75 (53)	76 - 120	121 - 160	161+
White Spruce / All	1 – 20 (11)	21 – 30 (26)	31 - 90	91 - 110	111+
Balsam Fir / All	1 – 10 (5)	11 – 25 (18)	26 - 60	61 - 80	81+
Tamarack / 1	1 – 10 (5)	11 – 30 (20)	31 - 70	71 - 110	111+
Tamarack / 2	1 – 25 (13)	26 – 70 (48)	71 - 120	121 - 160	161+
Eastern Cedar / 1	1 – 15 (8)	16 – 35 (25)	36 - 70	71 - 90	91+
Eastern Cedar / 2	1 – 25 (13)	26 – 70 (48)	71 - 120	121 - 160	161+
Hardwoods / All	1 – 10 (5)	11 – 20 (15)	21 - 50	51 - 70	71+

FOREST SECTIONS: 6 & 8 – Highrock

& Nelson River

FOREST SECTION: 4 – Interlake

	CUTTING CLASS				
WORKING GROUP / SITE	1	2	3	4	5
Jack Pine / All	1 – 10 (5)	11 – 25 (18)	26 - 50	51 - 70	71+
Black Spruce / 1	1 – 15 (8)	16 – 35 (25)	36 - 70	71 - 90	91+
Black Spruce / 2 & 3	1 – 25 (13)	26 – 70 (48)	71 - 120	121 - 160	161+
White Spruce / All	1 – 10 (5)	11 – 25 (18)	26 - 70	71 - 90	91+
Balsam Fir / All	1 – 10 (5)	11 – 25 (18)	26 - 50	51 - 70	71+
Tamarack / 1	1 – 10 (5)	11 – 30 (20)	31 - 70	71 - 110	111+
Tamarack / 2	1 – 25 (13)	26 – 70 (48)	71 - 120	121 - 160	161+
Hardwoods / All	1 – 10 (5)	11 – 20 (15)	21 - 50	51 - 70	71+

FOREST SECTION: 5 – Saskatchewan R

	CUTTING CLASS				
WORKING GROUP / SITE	1	2	3	4	5
					
Jack Pine / All	1 – 10 (5)	11 – 25 (18)	26 - 65	66 - 85	86+
Black Spruce / 1	1 – 15 (8)	16 – 35 (25)	36 - 70	71 - 90	91+
Black Spruce / 2 & 3	1 – 25 (13)	26 – 70 (48)	71 - 120	121 - 160	161+
White Spruce / All	1 – 15 (8)	16 – 30 (23)	31 - 90	91 - 110	111+
Balsam Fir / All	1 – 10 (5)	11 – 20 (15)	21 - 70	71 - 90	91+
Tamarack / 1	1 – 15 (8)	16 – 30 (23)	31 - 70	71 - 110	111+
Tamarack / 2	1 – 25 (13)	26 – 70 (48)	71 - 120	121 - 160	161+
Hardwoods / All	1 – 10 (5)	11 – 20 (15)	21 - 50	51 - 70	71+

	CUTTING CLASS				
WORKING GROUP / SITE	1	2	3	4	5
Jack Pine / All	1 – 10 (5)	11 – 25 (18)	26 - 70	71 - 90	91+
Black Spruce / 1	1 – 15 (8)	16 – 30 (23)	31 - 70	71 - 90	91+
Black Spruce / 2 & 3	1 – 30 (15)	31 – 75 (53)	76 - 120	121 - 160	161+
White Spruce / All	1 – 20 (11)	21 – 30 (26)	31 - 90	91 - 110	111+
Balsam Fir / All	1 – 10 (5)	11 – 25 (18)	26 - 70	71 - 90	91+
Tamarack / 1	1 – 15 (8)	16 – 30 (23)	31 - 70	71 - 110	111+
Tamarack / 2	1 – 25 (13)	26 – 70 (48)	71 - 120	121 - 160	161+
Hardwoods / All	1 – 15 (8)	16 – 30 (23)	31 - 70	71 - 90	91+
	•	•	·		

FOREST SECTION: 7 – Churchill R.

	CUTTING CLASS					
WORKING GROUP / SITE	1	2	3	4	5	
Jack Pine / All	1 – 10 (5)	11 – 25 (18)	26 - 70	71 - 90	91+	
Black Spruce / 1	1 – 15 (8)	16 – 35 (25)	36 - 80	81 - 120	121+	
Black Spruce / 2 & 3	1 – 30 (15)	31 – 75 (53)	76 - 120	121 - 160	161+	
White Spruce / All	1 – 20 (11)	21 – 30 (26)	31 - 90	91 - 110	111+	
Hardwoods / All	1 – 15 (8)	16 – 30 (23)	31 - 70	71 - 90	91+	

FOREST SECTION: 9 – Hayes R.

•	CUTTING CLASS					
WORKING GROUP / SITE	1	2	3	4	5	
Jack Pine / All	1 – 10 (5)	11 – 25 (18)	26 - 70	71 - 90	91+	
Black Spruce / 1	1 – 15 (8)	16 – 30 (23)	31 - 70	71 - 90	91+	
Black Spruce / 2 & 3	1 – 30 (15)	31 – 75 (53)	76 - 120	121 - 160	161+	
White Spruce / All	1 – 20 (11)	21 – 30 (26)	31 - 90	91 - 110	111+	
Balsam Fir / All	1 – 10 (5)	11 – 25 (18)	26 - 70	71 - 90	91+	
Tamarack / 1	1 – 15 (8)	16 – 30 (23)	31 - 70	71 - 110	111+	
Tamarack / 2	1 – 25 (13)	26 – 70 (48)	71 - 120	121 - 160	161+	
Hardwoods / All	1 – 15 (8)	16 – 30 (23)	31 - 70	71 - 90	91+	

APPENDIX V: Mean Annual Increment by Working Group and Species (updated 4/1981)

FOREST SECTION: 0 – Aspen Parkland

WORKING GROUP / SITE	OTHER PINE	JACK PINE	BLACK SPRUCE	WHITE SPRUCE	BALSAM FIR	SPECIES TAMARACK	CEDAR	ASPEN	BALSAM POPLAR	WHITE BIRCH	OTHER HRDWD	TOTAL
SCOTS PINE / 1	2.36											2.36
ASPEN / 1				0.03				1.10	0.15	0.04	0.35	1.67
ASPEN / 2				0.04				0.87	0.03		0.10	1.04
WHITE BIRCH / 1		0.05		0.42		0.20		0.33	0.04	0.34	0.32	1.70
ASH / 1								0.11			2.55	2.66
ASH / 2								0.17	0.07	0.01	0.62	0.87
OAK / 2								0.10	0.01	0.01	0.96	1.08
MANITOBA MAPLE / 1											1.39	1.39
BALSAM POPLAR / 1								0.70	0.98	0.11	0.15	1.94
BASSWOOD / 1								0.03			3.25	3.28

FOREST SECTION: 1 - Mountain

				_								
				<u>-</u> "		SPECIES						
WORKING GROUP / SITE	OTHER PINE	JACK PINE	BLACK SPRUCE	WHITE SPRUCE	BALSAM FIR	TAMARACK	CEDAR	ASPEN	BALSAM POPLAR	WHITE BIRCH	OTHER HRDWD	TOTAL
JACK PINE / 1		2.42	0.51	0.04				0.23	0.08	0.02		3.30
JACK PINE / 2		1.31	0.03			0.01		0.01		0.06		1.42
WHITE SPRUCE / 1			0.22	1.03	0.07	0.07		0.23	0.24	0.06		1.92
BLACK SPRUCE / 1		0.34	1.40	0.12	0.02	0.02		0.16	0.07	0.02		2.15
BLACK SPRUCE / 2		0.01	0.54	0.01		0.02			0.01			0.59
BALSAM FIR / 1			0.10	0.55	1.20	0.01		0.15	0.15	0.29		2.45
TAMARACK / 1			0.28	0.01		0.68			0.01		0.01	0.99
ASPEN / 1		0.09	0.05	0.28	0.01			1.47	0.49	0.17	0.01	2.57
WHITE BIRCH / 1		0.02	0.03	0.35	0.09			0.38	0.22	0.93	0.01	2.03
ELM / 1								0.07	0.84	0.15	2.09	3.15
OAK / 1								0.05	0.01		0.88	0.94
MANITOBA MAPLE / 1									1.51	0.41	2.12	4.04
BALSAM POPLAR / 1		0.03	0.04	0.13	0.03			0.36	1.78	0.08	0.05	2.50

FOREST SECTION: 2 - Pineland

WORKING GROUP / SITE	OTHER PINE	JACK PINE	BLACK SPRUCE	WHITE SPRUCE	BALSAM FIR	SPECIES TAMARACK	CEDAR	ASPEN	BALSAM POPLAR	WHITE BIRCH	OTHER HRDWD	TOTAL
RED PINE / 1	1.37			0.07	0.02					0.86		2.32
JACK PINE / 1		1.82	0.03	0.01	0.01			0.10	0.01	0.04		2.02
JACK PINE / 2	0.01	1.02	0.01	0.01				0.09	0.02			1.16
BLACK SPRUCE / 1		0.05	1.17	0.01	0.02	0.03	0.04	0.02	0.03	0.01		1.38
BLACK SPRUCE / 2			0.45		0.01	0.01	0.02	0.01				0.50
BALSAM FIR / 1		0.02	0.07	0.30	0.99		0.08	0.36	0.15	0.10		2.07
TAMARACK / 1			0.18			0.61			0.01			0.80
CEDAR / 1			0.21	0.05	0.04	0.05	0.63	0.31	0.15	0.12		1.56
ASPEN / 1		0.06	0.04	0.06	0.06		0.02	1.16	0.28	0.12	0.05	1.85
ASPEN / 2		0.07	0.02	0.01				0.73	0.19	0.02	0.01	1.05
WHITE BIRCH / 1	0.01	0.05	0.04	0.03	0.28		0.03	0.18	0.07	0.73	0.03	1.45
ASH / 1	•			•	0.04		0.04	0.17	0.28	0.25	1.20	1.98
ELM / 1	•			0.11	•			0.16	0.34	0.18	0.83	1.62
BALSAM POPLAR / 1	· · · · · · · · · · · · · · · · · · ·		0.03	0.02	0.02	0.01	0.01	0.36	0.69	0.02	0.01	1.17

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FOREST SECTION: 3 – Lake Wpg. East

WORKING GROUP / SITE	OTHER PINE	JACK PINE	BLACK SPRUCE	WHITE SPRUCE	BALSAM FIR	SPECIES TAMARACK	CEDAR	ASPEN	BALSAM POPLAR	WHITE BIRCH	OTHER HRDWD	TOTAL
JACK PINE / 1		1.02	0.25	0.03	0.02			0.34	0.01	0.04		1.71
JACK PINE / 2		0.78	0.11	0.01				0.12		0.02		1.04
WHITE SPRUCE / 1		0.07	0.16	0.64	0.26			0.47	0.03	0.02		1.65
BLACK SPRUCE / 1		0.21	0.81	0.07	0.05	0.01		0.25	0.01	0.02		1.43
BLACK SPRUCE / 2			0.55	0.01	0.01	0.01	0.01		0.01	0.01		0.61
BLACK SPRUCE / 3		0.03	0.40									0.43
BALSAM FIR /1		0.05	0.17	0.26	0.66			0.30	0.05	0.13	0.01	1.63
TAMARACK / 1			0.11	0.04		0.99		0.01		0.02		1.17

TAMARACK / 2		0.27			0.36						0.63
CEDAR / 1	0.50	0.17	0.01	0.10		0.79	0.32		0.08		1.97
ASPEN / 1	0.15	0.05	0.10	0.06			1.58	0.10	0.13	0.02	2.19
ASPEN / 2	0.08	0.02	0.01	0.01			0.76	0.12	0.03	0.01	1.04
WHITE BIRCH / 1	0.02	0.01	0.08	0.07			0.37	0.08	0.71	0.02	1.36
ASH / 1		0.01	0.04	0.07			0.41	0.21	0.02	0.86	1.62
ELM / 1			0.01				0.02	0.14	0.03	0.81	1.01
BALSAM POPLAR / 1		0.01	0.27	0.11	0.02		0.33	0.65	0.05	0.03	1.47
HARDWOODS / 1	0.24	0.14	0.06	0.07	•		1.59	0.04	0.02		2.16
HARDWOODS / 2	0.11						1.13	0.08			1.32

FOREST SECTION: 4 – Interlake

WORKING GROUP / SITE	OTHER PINE	JACK PINE	BLACK SPRUCE	WHITE SPRUCE	BALSAM FIR	SPECIES TAMARACK	CEDAR	ASPEN	BALSAM POPLAR	WHITE BIRCH	OTHER HRDWD	TOTAL
RED PINE / 1	3.38	0.17	0.03									3.58
JACK PINE / 1		1.24	0.13	0.04				0.18	0.03	0.01		1.63
JACK PINE / 2		0.99	0.05	0.01				0.03	0.01	0.02		1.11
WHITE SPRUCE / 1		0.01	0.08	0.84	0.18	0.01		0.31	0.11	0.19		1.73
BLACK SPRUCE / 1		0.14	0.91	0.10	0.05	0.01		0.16	0.07	0.08		1.52
BLACK SPRUCE / 2			0.48		0.01	0.04						0.53
BALSAM FIR / 1		0.01	0.09	0.23	0.58	0.01		0.28	0.09	0.24		1.53
TAMARACK / 1			0.17	0.23		0.74			0.02			1.16
TAMARACK / 2			0.03			0.14				0.04		0.21
CEDAR / 2			0.28			0.04	0.41					0.73
ASPEN / 1		0.10	0.09	0.10	0.09			1.38	0.13	0.13	0.01	2.03
ASPEN / 2		0.19	0.02	0.01	0.01			0.74	0.04	0.02		1.03
WHITE BIRCH / 1			0.05	0.24	0.21			0.36	0.15	0.79		1.80
ELM / 1								0.09	1.14	0.20	2.34	3.77
BALSAM POPLAR / 1			0.07	0.14	0.18			0.23	0.93	0.22	0.02	1.79
BALSAM POPLAR / 2		•		0.12			•	0.19	0.24			0.55

FOREST SECTION: 5 – Saskatchewan River

WORKING GROUP / SITE	OTHER PINE	JACK PINE	BLACK SPRUCE	WHITE SPRUCE	BALSAM FIR	SPECIES TAMARACK	CEDAR	ASPEN	BALSAM POPLAR	WHITE BIRCH	OTHER HRDWD	TOTAL
JACK PINE / 1		1.06	0.24	0.06				0.15	0.02	0.04		1.57
JACK PINE / 2		0.54	0.04					0.01				0.59
WHITE SPRUCE / 1		0.07	0.23	0.89	0.08			0.30	0.09	0.22		1.88
WHITE SPRUCE / 2		0.01	0.01	0.35				0.12	0.03	0.12		0.64
BLACK SPRUCE / 1		0.16	0.88	0.15	0.01	0.01	•	0.14	0.05	0.04		1.44
BLACK SPRUCE / 2		0.01	0.37	0.02		0.01			0.01			0.42

BALSAM FIR / 1		0.10	0.40	0.87	0.02		0.31		1.70
ASPEN / 1	0.07	0.09	0.18	0.01	1.28	0.11	0.06		1.80
WHITE BIRCH / 1		0.07	0.19		0.19	0.07	0.75		1.27
WHITE BIRCH / 2		0.07	0.01	0.02	0.02		0.23		0.35
ASH / 1						0.17		2.12	2.29
ELM / 1								2.93	2.93
MANITOBA MAPLE / 1					0.01	0.67		2.10	2.78
BALSAM POPLAR / 1	0.01		0.04		0.09	1.90	0.05	0.60	2.69

FOREST SECTION: 6 – Highrock

WORKING GROUP / SITE	OTHER PINE	JACK PINE	BLACK SPRUCE	WHITE SPRUCE	BALSAM FIR	SPECIES TAMARACK	CEDAR	ASPEN	BALSAM POPLAR	WHITE BIRCH	OTHER HRDWD	TOTAL
JACK PINE / 1		1.05	0.35	0.03				0.19		0.04		1.66
JACK PINE / 2		0.60	0.16	0.02				0.05		0.03		0.86
WHITE SPRUCE / 1		0.06	0.35	0.89	0.12			0.26	0.02	0.11		1.81
WHITE SPRUCE / 3		0.11	0.15	0.33	0.01			0.09	0.03	0.09		0.81
BLACK SPRUCE / 1		0.23	1.07	0.08	0.01			0.12	0.01	0.04		1.56
BLACK SPRUCE / 2		0.05	0.43	0.02				0.01		0.02		0.53
BLACK SPRUCE / 3		0.11	0.38	0.04						0.02		0.55
BALSAM FIR / 1		•	0.27	0.46	1.27			0.07		0.14		2.21
HARDWOODS / 1		0.13	0.19	0.13		·		1.17	0.09	0.05		1.76
HARDWOODS / 2		0.02	0.08	0.17	·	·		0.70		0.10	·	1.07

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FOREST SECTION: 7 – Churchill River

WORKING GROUP / SITE	OTHER PINE	JACK PINE	BLACK SPRUCE	WHITE SPRUCE	BALSAM FIR	SPECIES TAMARACK	CEDAR	ASPEN	BALSAM POPLAR	WHITE BIRCH	OTHER HRDWD	TOTAL
IA OK DINE / /			0.00					0.04		0.04		
JACK PINE / 1		0.33	0.22					0.04		0.01		0.60
JACK PINE / 2		0.29	0.04							0.02		0.35
WHITE SPRUCE / 1			0.53	0.95						0.03		1.51
BLACK SPRUCE / 1		0.04	0.51	0.01				0.01		0.01		0.58
BLACK SPRUCE / 2		0.06	0.43	0.02	•		•	0.01	•	0.02		0.54
HARDWOODS / 1		0.67	0.23					0.65	0.19	0.35		2.09

FOREST SECTION: 8 – Nelson River

WORKING GROUP / SITE	OTHER PINE	JACK PINE	BLACK SPRUCE	WHITE SPRUCE	BALSAM FIR	SPECIES TAMARACK	CEDAR	ASPEN	BALSAM POPLAR	WHITE BIRCH	OTHER HRDWD	TOTAL
JACK PINE / 1		1.06	0.30	0.03				0.27	0.03	0.04		1.73
JACK PINE / 2		0.96	0.13	0.05					0.01	0.04		1.19
WHITE SPRUCE / 1		0.04	0.37	1.02	0.16			0.28	0.04	0.11		2.02
BLACK SPRUCE / 1		0.14	1.07	0.10	0.02			0.11	0.02	0.03		1.49
BLACK SPRUCE / 2		0.02	0.43	0.01				0.01	0.01			0.48
BLACK SPRUCE / 3		0.03	0.42	0.13				0.06	0.02	0.01		0.67
BALSAM FIR / 1			0.13	0.45	0.85			0.35	0.02	0.15		1.95
HARDWOODS / 1		0.13	0.14	0.20	0.02			1.13	0.10	0.07		1.79
HARDWOODS / 2		0.13	0.04					1.07	0.06	0.01		1.31
HARDWOODS / 3		0.03	0.38					0.92	0.33			1.66

FOREST SECTION: 9 – Hayes River

						SPECIES						
WORKING GROUP / SITE	OTHER PINE	JACK PINE	BLACK SPRUCE	WHITE SPRUCE	BALSAM FIR	TAMARACK	CEDAR	ASPEN	BALSAM POPLAR	WHITE BIRCH	OTHER HRDWD	TOTAL
JACK PINE / 1		1.32	0.36	0.01	0.01			0.25	0.01	0.06		2.02
JACK PINE / 2		0.76	0.19					0.11		0.02		1.08
WHITE SPRUCE / 1		0.02	0.23	0.78	0.37			0.19	0.01	0.21		1.81
BLACK SPRUCE / 1		0.22	1.03	0.04	0.04			0.12	0.02	0.06		1.53
BLACK SPRUCE / 2		0.02	0.43		0.01					0.01		0.47
BLACK SPRUCE / 3		0.12	0.50	0.05				0.03		0.04		0.74
BALSAM FIR / 1			0.35	0.21	0.75			0.08	0.04	0.20		1.63
HARDWOODS / 1		0.30	0.33	0.05	0.02			1.25	0.25	0.09		2.29

APPENDIX G

Composite Timber Dues Table

Manitoba Crown Timber Dues for February 2011

i.

Commodity	Short Distance Dues Rate (\$m³)		Medium Distance Dues Rate (\$/m³)	FMU	Long Distance Dues Rate (\$/m³)	FMU
Softwood Lumber	\$ 1.75	A	\$ 1.40	•	\$ 1.15	•
Kraft	\$ 2.92	A	\$ 2.12	•	\$ 1.34	*
Newsprint	\$ 1.75	A	\$ 1.40	•	\$ 1.15	•
OSB	\$ 1.75	A	\$ 1.40	•	\$ 1.15	•

ii. Other Commodities and Species — April 1, 2010 - March 31, 2011

Other Commodities and Species	Short Distance Dues Rate (\$m³)	FMU	Medium Distance Dues Rate (\$/m³)	FMU	Long Distance Dues Rate (\$/m³)	FMU
Post and Rails (any species)	\$ 1.40		N/A		N/A	
Hardwood lumber	\$ 1.75	•	\$ 1.40	•	\$ 1.15	*
Tamarack used for any commodity or product	\$ 1.75	*	\$ 1.40	*	\$ 1.15	*
Fuelwood	\$ 1.75		N/A		N/A	
Bio-product	\$ 1.75		N/A		N/A	

[♣] A listing of applicable MUs is provided in Table 1 below.

The Crown timber dues listed in the above tables have been extracted from the Manitoba Conservation website (Manitoba Government of (I) website, 2011) and reflects the February 2011 timber dues rates applied to forest products. The rates reflect the influence of the markets' product price index.

The composite dues rate, presented in Table 1, has been developed for the application of the Forest Damage Appraisal and Valuation Policy for the crown timber estimated for salvage within the Bipole III Transmission Project footprint (Manitoba Conservation, 2002).

^{*} Dues Rates for Tamarack will be based on the Forest Management Units (FMU) as listed for the commodity or product it is used for

Table 1 FDA&V Composite Dues Rates for the Bipole III Project

ми	Softwood Lumber Base Rate (\$)	Kraft Base Rate (\$)	OSB Base Rate (\$)	Hardwood Lumber Base Rate (\$)	Larch Cedar Base Rate (\$)	Softwood Composite Rate (\$)	Hardwood Composite Rate (\$)
1	1.4	1.15	1.15	1.15	1.4	1.4	1.15
2	1.4	1.15	1.15	1.15	1.4	1.4	1.15
4	1.4	1.15	1.15	1.15	1.4	1.4	1.15
5	1.4	1.15	1.15	1.15	1.4	1.4	1.15
10	1.4	1.15	1.4	1.4	1.4	1.4	1.15
11	1.75	1.15	1.75	1.75	1.75	1.75	1.75
12	1.75	1.4	1.75	1.75	1.75	1.75	1.75
52	1.75	1.75	1.75	1.75	1.75	1.75	1.15
53	1.75	1.75	1.15	1.15	1.75	1.75	1.15
54	1.75	1.75	1.15	1.15	1.75	1.75	1.15
55	1.75	1.75	1.15	1.15	1.75	1.75	1.15
61	1.15	1.15	1.15	1.15	1.75	1.15	1.15
74	1.15	1.15	1.15	1.15	1.75	1.15	1.15
83	1.15	1.15	1.15	1.15	1.75	1.15	1.15
84	1.15	1.15	1.15	1.15	1.75	1.15	1.15
85	1.15	1.15	1.15	1.15	1.75	1.15	1.15
87	1.15	1.15	1.15	1.15	1.75	1.15	1.15

Source: Manitoba, Government of (K) website, "2010-2011 Timber Dues Tables - Base Rate", 2011

The rationale for developing the composite dues rates for all softwood and hardwood products, present in Table 1, lies in the current timber pricing methodology, the uncertainty of predicting the end use of the timber harvested and the influence of a product's timber price index on the dues rate at any point in time in the future. The timber price index is reviewed monthly and timber dues rates are adjusted to reflect market conditions. The closure of the newsprint mill in Pine Falls, the downsizing of the OSB plant in Swan River and the shutdown of the dimension lumber mill in The Pas limits the options available for the disposition of harvested timber. Presently, the demand for hardwood is largely governed by the oriented strand board (OSB) market and the Swan River mill requirements. The demand for OSB is seen as improving while the demand for hardwood lumber remains low and is virtually non existent in distant and remote FMUs. Newsprint demand has disappeared with the closing of the newsprint mill in Pine Falls. However the demand for softwood timber by the Kraft Mill in The Pas and saw mill in Swan River remains stable and the pricing is expected to remain above the base rate well into 2011.

The composite dues rates, presented in Table 1 for softwood and hardwood, was not developed to reflect the influence of mill demand, distance from mills and market price index on viable market alternatives of the timber harvested. The rates have been developed, in consultation with Manitoba Conservation (pers. comm. Epp, Thorpe and Swanson, 2011), and along with the estimates of volume, are only approximations. Final dues valuation will occur at point of delivery when volume, product and current market price index can be accurately assessed.

APPENDIX H

Forest Damage Appraisal and Valuation Determination

Table 1 Sum of Productive Hectares by FMU, Ownership and Covertype

Table	ble 1 Sum of Productive Hectares by FMU, Ownership and Covertype													
						FRI Ov	vnership (Code						
FMU	0 (F	0 (Ha)		1 (Ha)		5 (Ha)			6 (H	a)	Total			
	н	S	Н	М	N	Plant	S	Н	N	Plant	S	Н	S	(Ha)
1			5.1					113.5			39.8			158.4
2			0.7					75.2						75.9
4	0.1		0.3					28.1						28.6
5	2.9		26.5					83.7				12.7		125.7
10	5.0		245.5		2.5			81.6			0.1	88.7		423.3
11	29.2	4.2	141.2	1.0	4.6		69.8	21.0	2.0		0.0	11.6		284.5
12	2.1		42.3	2.7	14.3	2.0	113.5	12.6	0.9	0.3	1.7	0.0	1.8	194.3
52			5.5		0.9	3.3	24.6	3.2						37.5
54			2.1	18.1	1.7	2.8	138.2				7.3			170.2
55			0.8	22.8	5.5	4.2	191.2							224.5
61					3.9		47.4				0.0			51.3
74							120.0							120.0
83			10.2	9.4	12.3	5.9	103.9							141.7
84			5.4	11.2	19.1	49.1	126.7				0.0			211.5
85			26.1	13.5	36.0	35.2	102.8		0.0		0.0			213.7
87				3.6	9.5	23.2	52.4							88.8
88			10.3	12.8	7.4		196.0							226.5
Total	39.5	4.2	522.0	95.2	117.7	125.8	1286.7	418.9	3.0	0.3	48.9	112.9	1.8	2776.6

Ownership classifications, determined at time of inventory (Table 2-1), have been sourced from Provincial FRI. Columns may not sum to total due to rounding.

Softwood – S & M

Hardwood – H & N

 Table 2
 Plantation Establishment Cost

FMU		FRI Ownership	Code		Total (\$)
FIVIO	0	1	5	6	iotai (\$)
1					\$0.00
2					\$0.00
4					\$0.00
5					\$0.00
10					\$0.00
11					\$0.00
12		\$1,783.32	\$263.21		\$2,046.53
52		\$2,915.09			\$2,915.09
54		\$2,447.24			\$2,447.24
55		\$3,733.15			\$3,733.15
61					\$0.00
74					\$0.00
83		\$5,229.81			\$5,229.81
84		\$43,337.62			\$43,337.62
85		\$31,062.03			\$31,062.03
87		\$20,462.16			\$20,462.16
88					\$0.00
Total	\$0.00	\$110,970.41	\$263.21	\$0.00	\$111,233.62
Total Cro	own Ownership	\$110,970.41			

Ownership classifications, determined at time of inventory (Table 2-1), have been sourced from Provincial FRI. Columns may not sum to total due to rounding.

FDA&V applicable to Crown Land ownership codes 1 & 2.

Based on 1999 Plantation Establishment Cost of \$882.35/ha.

Table 3 Gross Merchantable Softwood Volume Subject to Valuation

1 able 3	Table 5 Gross Wer Chantable Softwood Volume Subject to Valuation								
FMU	Gros	Total							
FIVIU		Ownership							
	0	1	5	6					
1		2.481	2,338.343		2,340.824				
2		0.264	24.378		24.642				
4	0.167	0	6.0369		6.204				
5	1.860	11.863	52.835	0.326	66.885				
10	1.509	247.963	39.071	67.958	356.502				
11	1,420.930	4,828.374	170.796	117.031	6,537.130				
12	105.970	8,873.759	253.129	62.732	9,295.590				
52		1,502.319	21.488		1,523.807				
54		3,495.278	71.898		3,567.176				
55		14,122.662			14,122.662				
61		3,588.847	0.009		3,588.856				
74		2,528.492			2,528.492				
83		10,121.516			10,121.516				
84		12,990.799	0.553		12,991.352				
85		14,026.858	0.089		14,026.947				
87		5,975.051			5,975.051				
88		10,596.660			10,596.660				
Total	1,530.437	92,913.184	2,978.627	248.047	97,670.294				
Total Cı	rown Ownership	94,443.621							

Ownership classifications, determined at time of inventory (Table 2-1), have been sourced from Provincial FRI. Columns may not sum to total due to rounding.

FDA&V applicable to Crown Land ownership codes 1 & 2.

Table 4 Gross Merchantable Softwood Volume Valuation

FMU		Ownership Code						
	0	1	5	6				
1		\$3.47	\$6.24		\$9.71			
2		\$0.37	\$34.13		\$34.50			
4	\$0.23	\$0.00	\$8.45		\$8.69			
5	\$2.60	\$16.61	\$73.97	\$0.46	\$93.64			
10	\$2.11	\$347.15	\$54.70	\$95.14	\$499.10			
11	\$2,486.63	\$8,449.65	\$298.89	\$204.80	\$11,439.98			
12	\$185.45	\$15,529.08	\$442.98	\$109.78	\$16,267.28			
52		\$2,629.06	\$37.60		\$2,666.66			
54		\$6,116.74	\$125.82		\$6,242.56			
55		\$24,714.66			\$24,714.66			
61		\$4,127.17	\$0.01		\$4,127.18			
74		\$2,907.77			\$2,907.77			
83		\$11,639.74			\$11,639.74			
84		\$14,939.42	\$0.64		\$14,940.05			
85		\$16,130.89	\$0.10		\$16,130.99			
87		\$6,871.31	•		\$6,871.31			
88		\$12,186.16	•		\$12,186.16			
Total	\$2,677.03	\$126,609.24	\$1,083.53	\$410.18	\$130,779.97			
Total Cro	wn Ownership	\$129,282.79						

Ownership classifications, determined at time of inventory (Table 2-1), have been sourced from Provincial FRI. Columns may not sum to total due to rounding.

FDA&V applicable to Crown Land ownership codes 1 & 2.

Based on timber dues as per Table 1, Appendix G.

Table 5 Gross Merchantable Hardwood Volume Subject to Valuation

Table 3	GI OSS MIC	bject to valuatio	1		
FD 411	Gross	Total			
FMU		Total			
	0	1	5	6	
1		245.034	5,491.792		5,736.827
2		41.490	4,320.516		4,362.006
4	5.153	20.878	1,677.171		1,703.203
5	157.850	963.665	4,230.011	456.253	5,807.779
10	168.525	8,389.778	2,800.766	3,112.331	14,471.400
11	261.899	8,169.140	1,110.874	848.002	10,389.915
12	1.196	3,478.119	787.695	3.470	4,270.480
52		667.148	208.870		876.018
54		515.110	3.079		518.189
55		1,890.053			1,890.053
61		355.745	0.001		355.746
74		109.830			109.830
83		2,196.016			2,196.016
84		2,783.270	0.079		2,783.350
85		5,341.782	0.0268		5,341.809
87		1,076.890			1,076.890
88		2,277.899			2,277.899
Total	594.624	38,521.847	20,630.882	4,420.056	64,167.408
Total Cı	rown Ownership	39,116.471			

Ownership classifications, determined at time of inventory (Table 2-1), have been sourced from Provincial FRI. Columns may not sum to total due to rounding.

FDA&V applicable to Crown Land ownership codes 1 & 2.

Table 6 Gross Merchantable Hardwood Valuation

FMU		Ownership Code						
	0	1	5	6				
1		\$281.79	\$6,315.56		\$6,597.35			
2		\$47.71	\$4,968.59		\$5,016.31			
4	\$5.93	\$24.01	\$1,928.75		\$1,958.68			
5	\$181.53	\$1,108.21	\$4,864.51	\$524.69	\$6,678.95			
10	\$193.80	\$9,648.24	\$3,220.88	\$3,579.18	\$16,642.11			
11	\$458.32	\$14,295.99	\$1,944.03	\$1,484.00	\$18,182.35			
12	\$2.09	\$6,086.71	\$1,378.47	\$6.07	\$7,473.34			
52		\$767.22	\$240.20		\$1,007.42			
54		\$592.38	\$3.54		\$595.92			
55		\$2,173.56			\$2,173.56			
61		\$409.11	\$0.00		\$409.11			
74		\$126.30			\$126.30			
83		\$2,525.42			\$2,525.42			
84		\$3,200.76	\$0.09		\$3,200.85			
85		\$6,143.05	\$0.03		\$6,143.08			
87		\$1,238.42			\$1,238.42			
88		\$2,619.58			\$2,619.58			
Total	\$841.67	\$51,288.48	\$24,864.66	\$5,593.95	\$82,588.76			
Tota	l Crown Ownership	\$52,130.15						

Ownership classifications, determined at time of inventory (Table 2-1), have been sourced from Provincial FRI.

Columns may not sum to total due to rounding.

FDA&V applicable to Crown Land ownership codes 1 & 2.

Based on timber dues as per Table 1, Appendix G.

 Table 7
 Softwood Forest Renewal Charge Valuation

		Owner			
FMU	0	1	5	6	Total
1		\$14.27	\$13,539.01	-	\$13,553.37
2		\$1.52	\$141.15		\$142.68
4	\$0.96	\$0.00	\$34.95		\$35.92
5	\$10.70	\$68.21	\$305.92	\$1.89	\$387.26
10	\$8.68	\$1,425.79	\$226.22	\$393.48	\$2,064.15
11	\$8,170.35	\$27,763.15	\$988.91	\$677.61	\$37,849.98
12	\$609.33	\$51,024.11	\$1,465.62	\$363.22	\$53,821.47
52		\$8,638.34	\$124.42		\$8,822.84
54		\$20,097.85	\$416.29		\$20,653.95
55		\$81,205.31			\$81,770.21
61		\$20,635.87	\$0.05		\$20,779.47
74		\$14,538.83			\$14,639.97
83		\$58,198.71			\$58,603.58
84		\$74,697.09	\$3.20		\$75,219.93
85		\$80,654.43	\$0.52		\$81,216.02
87		\$34,356.54			\$34,595.54
88		\$60,930.80			\$61,354.66
Total	\$8,800.01	\$534,250.81	\$17,246.25	\$1,436.19	\$565,511.00
Total Crov	vn Ownership	\$543,050.82	\$543,050.82		

Ownership classifications, determined at time of inventory (Table 2-1), have been sourced from Provincial FRI. Columns may not sum to total due to rounding.

FDA&V applicable to Crown Land ownership codes 1 & 2.

Based on 2009 Softwood forest renewal charge of \$5.75/m³.

 Table 8
 Hardwood Forest Renewal Valuation

FMU		Own	er Ship		Total	
FIVIO	0	1	5	6	Total	
1		\$122.52	\$2,745.90		\$2,868.41	
2		\$20.75	\$2,160.26		\$2,181.00	
4	\$2.58	\$10.44	\$838.59		\$851.60	
5	\$78.92	\$481.83	\$2,115.01	\$228.13	\$2,903.89	
10	\$84.26	\$4,194.89	\$1,400.38	\$1,556.17	\$7,235.70	
11	\$130.95	\$4,084.57	\$555.44	\$424.00	\$5,194.96	
12	\$0.60	\$1,739.06	\$393.85	\$1.73	\$2,135.24	
52		\$333.57	\$104.44		\$438.01	
54		\$257.56	\$1.54		\$259.09	
55		\$945.03			\$945.03	
61		\$177.87	\$0.00		\$177.87	
74		\$54.92			\$54.92	
83		\$1,098.01			\$1,098.01	
84		\$1,391.64	\$0.04		\$1,391.67	
85		\$2,670.89	\$0.01		\$2,670.90	
87		\$538.45			\$538.45	
88		\$1,138.95			\$1,138.95	
Total	\$297.31	\$19,260.92	\$10,315.44	\$2,210.03	\$32,083.70	
Total Crowr	n Ownership	\$19,558.24				

Ownership classifications, determined at time of inventory (Table 2-1), have been sourced from Provincial FRI. Columns may not sum to total due to rounding.

FDA&V applicable to Crown Land ownership codes 1 & 2.

Based on 2009 Hardwood forest renewal charge of \$0.50/m³.

Table 9 Fire Protection Cost Valuation

FMU		Owner	ship		Total	
FIVIU	0	1	5	6	TOTAL	
1		\$42.08	\$1,331.12		\$1,373.20	
2		\$7.10	\$738.63		\$745.73	
4	\$0.90	\$3.55	\$286.15		\$290.60	
5	\$27.15	\$165.84	\$728.08	\$77.62	\$998.69	
10	\$28.91	\$1,468.42	\$482.77	\$540.65	\$2,520.74	
11	\$286.08	\$2,209.58	\$217.88	\$164.06	\$2,877.60	
12	\$18.22	\$2,099.82	\$176.94	\$11.25	\$2,306.23	
52		\$368.81	\$39.16		\$407.97	
54		\$681.77	\$12.75		\$694.51	
55		\$2,722.16			\$2,722.16	
61		\$670.58	\$0.00		\$670.58	
74		\$448.51			\$448.51	
83		\$2,093.98			\$2,093.98	
84		\$2,681.59	\$0.11		\$2,681.70	
85		\$3,292.67	\$0.02		\$3,292.69	
87		\$1,198.83			\$1,198.83	
88		\$2,188.68			\$2,188.68	
Total	\$361.26	\$22,343.96	\$4,013.62	\$793.58	\$27,512.41	
Total Crow	n Ownership	\$22,705.22				

Ownership classifications, determined at time of inventory (Table 2-1), have been sourced from Provincial FRI. Columns may not sum to total due to rounding.

FDA&V applicable to Crown Land ownership codes 1 & 2.

Based on 1989 Forest Protection Charge of \$0.17/m³.

Table 10 Crown Land Forest Damage Appraisal and Valuation Summary Table

140	Table 10 Crown Land Forest Damage Appraisal and Valuation Summary Table									
FMU	Total Area (ha)	Plantation Area (ha)	Plantation Cost (\$)	Total Softwood (m³)	Total Hardwood (m³)	Softwood Dues (\$)	Hardwood Dues (\$)	FRC Charge (\$)	FP Charge (\$)	Total Valuation (\$)
1	5.06	0.00	\$0.00	2.48	245.03	\$3.47	\$281.79	\$136.88	\$42.08	\$464.22
2	0.69	0.00	\$0.00	0.26	41.49	\$0.37	\$47.71	\$22.27	\$7.10	\$77.45
4	0.48	0.00	\$0.00	0.17	26.03	\$0.23	\$29.94	\$13.98	\$4.45	\$48.60
5	29.41	0.00	\$0.00	13.72	1,121.51	\$19.21	\$1,289.74	\$640.22	\$192.99	\$2,142.16
10	252.96	0.00	\$0.00	249.47	8,558.30	\$349.26	\$9,842.05	\$5,723.60	\$1,497.32	\$17,412.23
11	249.97	0.00	\$0.00	6,249.30	8,431.04	\$10,936.28	\$14,754.32	\$40,398.99	\$2,495.66	\$68,585.25
12	177.01	2.02	\$1,783.32	8,979.73	3,479.32	\$15,714.53	\$6,088.80	\$53,732.29	\$2,118.04	\$79,436.98
52	34.37	3.30	\$2,915.09	1,502.32	667.15	\$2,629.06	\$767.22	\$9,032.00	\$368.81	\$15,712.18
54	162.85	2.77	\$2,447.24	3,495.28	515.11	\$6,116.74	\$592.38	\$20,495.21	\$681.77	\$30,333.33
55	224.52	4.23	\$3,733.15	14,122.66	1,890.05	\$24,714.66	\$2,173.56	\$82,715.24	\$2,722.16	\$116,058.77
61	51.31	0.00	\$0.00	3,588.85	355.74	\$4,127.17	\$409.11	\$20,957.30	\$670.58	\$26,164.16
74	120.04	0.00	\$0.00	2,528.49	109.83	\$2,907.77	\$126.30	\$14,694.88	\$448.51	\$18,177.47
83	141.70	5.93	\$5,229.81	10,121.52	2,196.02	\$11,639.74	\$2,525.42	\$59,701.58	\$2,093.98	\$81,190.53
84	211.53	49.12	\$43,337.62	12,990.80	2,783.27	\$14,939.42	\$3,200.76	\$76,608.36	\$2,681.59	\$140,767.75
85	213.68	35.20	\$31,062.03	14,026.86	5,341.78	\$16,130.89	\$6,143.05	\$83,886.40	\$3,292.67	\$140,515.03
87	88.76	23.19	\$20,462.16	5,975.05	1,076.89	\$6,871.31	\$1,238.42	\$35,133.99	\$1,198.83	\$64,904.71
88	226.52	0.00	\$0.00	10,596.66	2,277.90	\$12,186.16	\$2,619.58	\$62,493.61	\$2,188.68	\$79,488.03
Total	2,190.60	125.77	\$110,970.41	94,443.62	39,116.47	\$129,286.27	\$52,130.15	\$566,386.80	\$22,705.22	\$881,478.85

APPENDIX I

Bipole III Transmission Project

Forestry Environmentally Sensitive Sites

Bipole III Transmission Project - Forestry Environmentally Sensitive Sites

		Location (UTM 14 NAD 83)		
Source_ID	ESS Name	Easting	Northing	
Plantations				
PL_12	Plantation	536027	6085893	
PL_22	Plantation	362549	5914861	
PL_30	Plantation (adjacent)	538573	6089824	
PL_32	Plantation (adjacent)	538298	6088736	
PL_40	Plantation (adjacent)	537463	6087980	
PL_41	Plantation	537750	6088070	
PL_42	Plantation (adjacent)	357022	5879632	
PL_43	Plantation (adjacent)	356651	5879761	
PL_52	Plantation (adjacent)	362427	5861522	
PL_54	Plantation	362815	5863214	
PL_59	Plantation (adjacent)	359539	5895101	
PL_60	Plantation (adjacent)	359219	5895169	
PL_64	Plantation (adjacent)	477631	6051096	
PL_75	Plantation	473832	6049580	
PL_84	Plantation	548531	6116826	
PL_86	Plantation	548869	6117663	
PL_87	Plantation	549295	6118547	
PL_88	Plantation (adjacent)	548965	6119359	
PL_89	Plantation (adjacent)	550791	6120644	
PL_90	Plantation	550724	6121003	
PL_91	Plantation (adjacent)	551528	6121608	
PL_92	Plantation	551327	6121671	
PL_93	Plantation (adjacent)	551715	6122036	
PL_94	Plantation (adjacent)	552017	6122150	
PL_95	Plantation (adjacent)	551944	6122284	
PL_96	Plantation (adjacent)	552254	6122377	
PL_97	Plantation (adjacent)	552102	6122484	
PL_98	Plantation (adjacent)	557206	6128818	
 PL_99	Plantation (adjacent)	558621	6128392	
PL_100	Plantation	557738	6127881	
PL_101	Plantation (adjacent)	558175	6127441	
PL_102	Plantation (adjacent)	555155	6124953	
 PL_103	Plantation (adjacent)	554868	6124575	
PL_104	Plantation	554367	6124423	
 PL_105	Plantation (adjacent)	554635	6124201	
PL 106	Plantation (adjacent)	554386	6124173	

		Location (UTM 14 NAD 83)	
Source_ID	ESS Name	Easting	Northing
PL_107	Plantation (adjacent)	554123	6123937
PL_108	Plantation (adjacent)	554287	6123868
PL_120	Plantation	579658	6147984
PL_122	Plantation	579884	6147288
PL_123	Plantation (adjacent)	579989	6147112
PL_124	Plantation (adjacent)	555028	6124748
PL_132	Plantation	359547	5896440
PL_133	Plantation (adjacent)	359700	5896289
PL_134	Plantation (adjacent)	588061	6153595
PL_135	Plantation	586931	6152584
PL_136	Plantation	585684	6151756
PL_138	Plantation (adjacent)	578932	6145836
PL_139	Plantation (adjacent)	578630	6145935
PL_143	Plantation (adjacent)	565812	6137043
PL_144	Plantation	566570	6136993
PL_146	Plantation	566159	6136179
PL_147	Plantation (adjacent)	564908	6136079
PL_149	Plantation	565197	6135772
PL_150	Plantation (adjacent)	565913	6134896
PL_151	Plantation	564942	6135591
PL_152	Plantation	563963	6134919
PL_153	Plantation	564284	6134977
PL_155	Plantation	562796	6133494
PL_156	Plantation	555001	6125066
PL_160	Plantation (adjacent)	359400	5895813
PL_161	Plantation (adjacent)	359548	5895711
PL_166	Plantation	584564	6150822
PL_167	Plantation (adjacent)	584378	6150188
PL_168	Plantation	583804	6149670
PL_169	Plantation (adjacent)	582835	6149647
PL_170	Plantation (adjacent)	581492	6149124
PL_171	Plantation (adjacent)	582969	6149529
PL_172	Plantation (adjacent)	583369	6148553
PL_173	Plantation	582361	6149075
PL_174	Plantation (adjacent)	583024	6148998
PL_175	Plantation (adjacent)	581688	6148143
PL_179	Plantation (adjacent)	581431	6147577
PL_185	Plantation (adjacent)	563092	6133131
PL_186	Plantation (adjacent)	562520	6132907

		Location (UTM 14 NAD 83)	
Source_ID	ESS Name	Easting	Northing
PL_187	Plantation	559559	6131428
PL_188	Plantation	560754	6131439
PL_191	Plantation (adjacent)	560872	6130840
PL_193	Plantation	559555	6130311
PL_201	Plantation (adjacent)	528151	6071567
PL_211	Plantation (adjacent)	359632	5896082
PL_212	Plantation (adjacent)	359527	5895803
PL_213	Plantation (adjacent)	359034	5894594
PL_220	Plantation (adjacent)	549581	6115033
PL_221	Plantation (adjacent)	548928	6113421
PL_227	Plantation (adjacent)	358879	5893972
PL_233	Plantation (adjacent)	357609	5933842
PL_235	Plantation (adjacent)	358151	5938384
PL_238	Plantation (adjacent)	358507	5938669
PL_239	Plantation (adjacent)	357546	5939096
PL_243	Plantation (adjacent)	357122	5939872
PL_250	Plantation (adjacent)	577056	6145724
PL_251	Plantation	576241	6145401
PL_252	Plantation (adjacent)	577072	6146023
PL_259	Plantation (adjacent)	586396	6150912
PL_264	Plantation (adjacent)	354695	5884403
PL_265	Plantation	417040	6016135
PL_274	Plantation (adjacent)	566920	6138055
PL_279	Plantation	593323	6176018
PL_281	Plantation (adjacent)	360870	5850491
PL_283	Plantation (adjacent)	360996	5850611
PL_284	Plantation	360685	5851040
PL_285	Plantation (adjacent)	416747	6016110
PL_294	Plantation	549740	6119425
PL_295	Plantation	549568	6119827
PL_307	Plantation	594390	6175113
PL_309	Plantation	596482	6182454
PL_316	Plantation (adjacent)	595686	6181800
PL_320	Plantation (adjacent)	595546	6181224
PL_324	Plantation (adjacent)	595597	6181015
PL_326	Plantation (adjacent)	595577	6180962
PL_329	Plantation (adjacent)	595564	6180883
PL_330	Plantation (adjacent)	596242	6180186
PL_331	Plantation (adjacent)	596100	6179702

		Location (UTM	14 NAD 83)
Source_ID	ESS Name	Easting	Northing
PL_337	Plantation	593989	6172397
PL_348	Plantation (adjacent)	357179	5950080
PL_349	Plantation (adjacent)	356055	5950184
PL_358	Plantation	359512	5933522
PL_360	Plantation	359384	5931383
PL_362	Plantation (adjacent)	548124	6116660
PL_364	Plantation	360413	5850154
PL_366	Plantation	360471	5850333
PL_368	Plantation	595472	6181536
Research and Monitoring			
RM_1	Research & monitoring; Permanent Sample Plot	535490	6084222
RM_2	Research & monitoring; Forest 2020 site	665701	5506623
RM_3	Research & monitoring; Forest 2020 site	666181	5506851
Aboriginal Traditional Knowledge			
ATK_1	ATK-11 Pikwitonei	600607	6162273
ATK_2	ATK-91 Pikwitonei	592450	6168106
ATK_3	ATK-65 Cormorant	407942	6013401
ATK_4	ATK-97 Cormorant	378533	5994769
ATK_5	ATK-66 Cormorant	381688	5991643
ATK_6	ATK-42 Dawson Bay	362309	5867384
ATK_7	ATK-51 Barrows2	352429	5860466
ATK_8	ATK-97 Duck Bay	401545	5758417
ATK_9	ATK-22 Dakota Plains	527976	5512358
Woodlots			
WL_1	Alonsa Woodlots	504338	5628549
WL_2	Alonsa Woodlots	504343	5629787
WL_3	South Norfolk Woodlots	537658	5510159
Shelterbelts			
SB_1	Shelterbelts	538819	5509747
SB_2	Shelterbelts	503539	5629210
SB_3	Shelterbelts	503540	5628701
SB_4	Shelterbelts	659437	5497127
SB_5	Shelterbelts	529997	5529363
SB_6	Shelterbelts	574487	5497833
SB_7	Shelterbelts	665018	5507085
SB_8	Shelterbelts	437192	5716545
SB_9	Shelterbelts	530022	5526606
SB_10	Shelterbelts	576032	5497857

		Location (UTM 14 NAD 83)	
Source_ID	ESS Name	Easting	Northing
SB_11	Shelterbelts	529811	5519708
SB_12	Shelterbelts	655808	5525058
SB_13	Shelterbelts	650016	5524880
SB_14	Shelterbelts	366694	5827809
SB_15	Shelterbelts	432726	5718704
SB_16	Shelterbelts	476349	5690963
SB_17	Shelterbelts	424915	5722435
SB_18	Shelterbelts	496942	5643984
SB_19	Shelterbelts	503566	5630189
SB_20	Shelterbelts	656642	5525076
SB_21	Shelterbelts	529997	5526705
SB_22	Shelterbelts	372491	5806004
SB_23	Shelterbelts	655007	5525039
SB_24	Shelterbelts	552401	5496667
SB_25	Shelterbelts	552402	5496704
SB_26	Shelterbelts	561192	5497591
SB_27	Shelterbelts	566079	5497716
SB_28	Shelterbelts	539819	5501233
SB_29	Shelterbelts	659269	5506101
SB_30	Shelterbelts	532372	5533361
SB_31	Shelterbelts	561682	5497640
SB_32	Shelterbelts	565004	5497701
SB_33	Shelterbelts	565201	5497706
SB_34	Shelterbelts	633779	5489060
SB_35	Shelterbelts	560294	5497575
SB_36	Shelterbelts	563070	5497628
SB_37	Shelterbelts	564058	5497669
SB_38	Shelterbelts	661452	5525049
SB_39	Shelterbelts	644848	5491285
SB_40	Shelterbelts	645248	5491295
SB_41	Shelterbelts	559496	5497020
SB_42	Shelterbelts	567713	5497722
SB_43	Shelterbelts	566286	5497720
SB_44	Shelterbelts	539816	5498098
SB_45	Shelterbelts	662682	5523906
SB_46	Shelterbelts	520862	5584275
SB_47	Shelterbelts	559487	5497018
SB_48	Shelterbelts	529787	5523092
SB_49	Shelterbelts	529811	5524485

		Location (UTM 14 NAD 83)	
Source_ID	ESS Name	Easting	Northing
SB_50	Shelterbelts	529981	5526859
SB_51	Shelterbelts	529966	5527268
SB_52	Shelterbelts	407358	5746216
SB_53	Shelterbelts	375402	5789164
SB_54	Shelterbelts	372427	5795642
SB_55	Shelterbelts	372440	5795784
SB_56	Shelterbelts	372395	5795875
SB_57	Shelterbelts	372546	5806977
SB_58	Shelterbelts	367724	5808213
SB_59	Shelterbelts	367727	5808316
SB_60	Shelterbelts	367733	5808542
SB_61	Shelterbelts	367736	5808615
SB_62	Shelterbelts	367831	5813229
SB_63	Shelterbelts	529864	5516201
SB_64	Shelterbelts	410883	5740239
SB_65	Shelterbelts	538882	5504754
SB_66	Shelterbelts	538856	5504840
SB_67	Shelterbelts	529830	5517068
SB_68	Shelterbelts	529822	5517131
SB_69	Shelterbelts	529823	5517296
SB_70	Shelterbelts	529821	5517317
SB_71	Shelterbelts	529822	5517381
SB_72	Shelterbelts	529821	5517485
SB_73	Shelterbelts	529813	5521438
SB_74	Shelterbelts	407507	5745964
SB_75	Shelterbelts	442370	5713059
SB_76	Shelterbelts	442345	5713105
SB_77	Shelterbelts	459555	5698314
SB_78	Shelterbelts	459281	5698498
SB_79	Shelterbelts	443881	5711891
SB_80	Shelterbelts	443469	5712225
SB_81	Shelterbelts	443152	5712473
SB_82	Shelterbelts	484057	5671991
SB_83	Shelterbelts	455300	5701311
SB_84	Shelterbelts	455250	5701348
SB_85	Shelterbelts	439404	5715462
SB_86	Shelterbelts	570133	5497786
SB_87	Shelterbelts	570011	5497783
SB_88	Shelterbelts	568477	5497764

		Location (UTM 14 NAD 83)	
Source_ID	ESS Name	Easting	Northing
SB_89	Shelterbelts	569059	5497752
SB_90	Shelterbelts	559762	5497314
SB_91	Shelterbelts	559852	5497413
SB_92	Shelterbelts	559933	5497502
SB_93	Shelterbelts	529979	5527986
SB_94	Shelterbelts	529978	5528320
SB_95	Shelterbelts	522006	5549112
SB_96	Shelterbelts	367755	5809348
SB_97	Shelterbelts	367756	5809403
SB_98	Shelterbelts	650044	5524882
SB_99	Shelterbelts	372560	5807759
SB_100	Shelterbelts	535607	5509777
SB_101	Shelterbelts	532371	5535100
SB_102	Shelterbelts	398121	5761872
SB_103	Shelterbelts	372357	5799762
SB_104	Shelterbelts	367715	5807969
SB_105	Shelterbelts	367721	5808124
SB_106	Shelterbelts	367768	5811148
SB_107	Shelterbelts	368202	5825402
SB_108	Shelterbelts	366706	5828021
SB_109	Shelterbelts	367813	5811673
SB_110	Shelterbelts	367893	5814875
SB_111	Shelterbelts	367915	5815945
SB_112	Shelterbelts	464157	5695034
SB_113	Shelterbelts	456854	5700216
SB_114	Shelterbelts	478004	5690735
SB_115	Shelterbelts	478005	5690793
SB_116	Shelterbelts	477992	5690798
SB_117	Shelterbelts	478003	5690876
SB_118	Shelterbelts	478004	5690906
SB_119	Shelterbelts	477992	5690894
SB_120	Shelterbelts	477956	5690921
SB_121	Shelterbelts	477992	5690936
SB_122	Shelterbelts	507932	5617908
SB_123	Shelterbelts	451376	5704078
SB_124	Shelterbelts	434189	5718005
SB_125	Shelterbelts	434120	5718033

APPENDIX J

Manitoba Conservation

Forest Inventory Manual (1.2)



Manitoba Conservation FOREST INVENTORY MANUAL 1.2

1992 – 1996 FOREST INVENTORY &



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FOREST INVENTORY MANUAL

1.2

INTRODUCTION

The Forest Resource Inventory Instructions have been prepared to provide personnel with a basic set of instructions with which to follow through the procedures and codes used in the Forest Inventory program in Manitoba.

Information concerning timber cruising methods or Permanent Sample Plot (PSP) establishment is available in another manual. All inventories related to this manual are based on township and range basemaps.

This manual applies to Management Units (MU) 40, 41, 43, 45, 46, 47, 51, 52, 53, 54, 55, 56 and 57.

ACKNOWLEDGEMENT

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Updated by Robert Frank, David Vande Vyvere and Brenda Robinson, 2007

I FOREST SECTIONS AND MANAGEMENT UNITS

There are ten (10) Forest Sections in the Forest Zone. The Forest Sections are divided into Management Units as follows:

0	Aspen – Parkland Section	Management Units 01 – 07
1	Mountain Section	Management Units 10 – 15
2	Pineland Section	Management Units 20 – 23
3	Lake Winnipeg East Section	Management Units 30 – 39
4	Interlake Section	Management Units 40 – 47
5	Saskatchewan River Section	Management Units 51 – 57
6	Highrock Section	Management Units 60 – 66
7	Churchill River Section	Management Units 71 – 75
8	Nelson River Section	Management Units 82 – 89
9	Hayes River Section	Management Units 90 – 99

The boundaries and numbers of Management Units and Forest Sections are shown on the attached map (Appendix I)

II AREA CLASSIFICATION

This classification applies to the Wooded and Aspen-Parkland Area of the Province only. The transition zone and tundra are not presently classified by area.

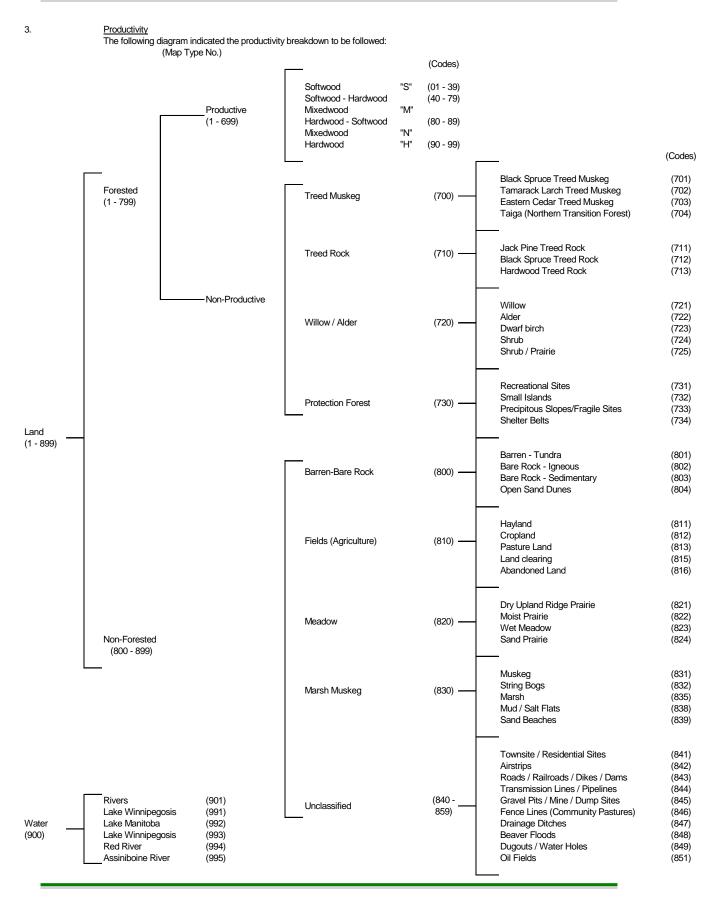
The total area is divided according to status of land, ownership and productivity.

1.	Status of Land*	<u>Code</u>
	Agriculture	0
	Provincial Forest	1
	Permanent Forest	2
	National Park	3
	Wildlife management Area	4
	Forest Management Licence	5
	Specified Area	6
	Provincial Park	7
	INCO Land	8
	Other Land	9

^{*} Note: Status of land may have a double digit code. The first digit will be the primary status with the second digit secondary in nature, but occupying the same land.

Example – code 17 will be Provincial Forest (1) with Provincial Park (7) the secondary status.

2.	<u>Ownership</u>	<u>Code</u>	
	Provincial Crown Land – Closed		0
	Provincial Crown Land – Open		1
	Provincial Crown Land – Restricted		2
	Federal Crown Land		3
	Municipal Land		4
	Patented Land		5
	Local Government District		6
	Indian Reserve		7
	Other (include Community Pasture)		8



Explanation of terms used:

a) <u>Productive Forested Land</u>

Includes all forest land capable of producing merchantable wood regardless of its existing stage of productivity.

- 1) Softwood: (S' (Cover Type 0 3) Includes all stands where 76 percent and over of the total basal area consists of coniferous species.
- 2) Mixedwood: 'M' (Cover Type 4 7) Includes all stands where the basal area of all the coniferous species is between 51 percent and 75 percent of the total basal area.
- 3) Mixedwood: 'N' (Cover Type 8) Includes all stands where the basal area of all coniferous species is between 26 percent and 50 percent of the total basal area.
- 4) Hardwood: 'H' (Cover Type) Includes all stands where the basal area of all coniferous species is less than 25 percent of the total basal area.

b) Non-Productive Forested Land

Includes all forest land not capable of producing merchantable timber due to very low productivity.

i) Treed Muskeg (700) – similar to open muskeg, except that the area is supporting semi-stagnated or stagnated trees. Some of the trees may produce "Christmas" trees or fence posts, but will not produce pulpwood size trees within a rotation age of 140 years (9.0+cm d.b.h., height over 10.0m and 20m³ of net merchantable volume per hectare). At least 10 percent of the area will be tree covered.

701 – Black spruce Treed Muskeg 51 percent of species Composition

702 – Tamarack Larch Treed Muskeg 51 percent of species Composition

703 – Eastern Cedar Treed Muskeg 51 percent of species Composition

704 - Taiga (Northern Transition Forest)

ii) Treed Rock (710) – Rock with a very shallow soil, supporting semistagnated or stagnated trees. At least 26 percent of the area will be tree covered. These sites do not produce merchantable stands.

711 – Jack Pine Treed Rock 51 percent of species Composition

712 – Black Spruce Treed Rock 51 percent of species Composition

713 – Hardwood Treed Rock 51 percent of species Composition

iii) Willow/Alder (720) – Low lying areas with a saturated water table presently supporting Willow or Alder growth. Without improvements these sites are not capable of producing merchantable timber stands. At least 51 percent of the area must be shrub covered.

51 percent of species Composition
51 percent of species Composition

- iv) Protection Forest (730) Presently developed or reserved recreational areas and small islands (less than 2 hectares).
- 731 Recreational sites
- 732 Small islands (less than 2 ha.)
- 733 Precipitous slopes / Fragile sites
- 734 Shelter Belts

c) Non-Forested Land

Includes areas withdrawn from timber production for a long period of time, such as cultivated fields, hay meadows, pastures, settlements, right-of-ways, gravel pits, beaches, wide ditches, summer resorts, bare rock, barren, mines, marsh and muskeg.

- i) Barren-Bare Rock (800) Tundra and rock with less than 25 percent tree cover.
- 801 Barrens Tundra
- 802 Bare Rock Igneous
- 803 Bare Rock Sedimentary
- 804 Open Sand Dunes
- ii) Fields (Agriculture) (810) Areas of private and leased land cleared of tree cover and presently under an agricultural use. Less than 10 percent of the area will be tree covered.
- 811 Hayland cultivated
- 812 Cropland cultivated
- 813 Pastureland domestic animals
- 815 Land clearing in progress
- 816 Abandoned cultivated land

- iii) Meadow (820) Moist to wet grassland suitable for hay production (natural hay land), at least 51 percent of the area is covered by grass.
- 821 Dry Upland Ridge Prairie
- 822 Moist Prairie
- 823 Wet Meadow
- 824 Sand Prairie
- iv) Marsh Muskeg (830)
- 831 Muskeg Wetland which has a vegetative cover consisting mainly of sphagnum moss and heath plants with very scattered brush. Black Spruce, Tamarack or Cedar cover does not exceed 10 percent.
- 832 String Bogs.
- 835 Marsh Wetland completely or partially covered with tall grass, rushes, or sedges, unsuitable for hay but can be used as a habitat for furbearing animals.
- 838 Mud / Salt Flats.
- 839 Sand Beaches.
- v) Unclassified (840 859) Right-of-way, roads, gravel pits, beaches, summer resorts, mines, oil fields, etc.
- 841 Townsites, Residential sites, Hydro and Telephone Stations, cemeteries.
- 842 Airstrips.
- 843 Roads, Railroads, Dikes, Dams.
- 844 Transmission lines, Pipelines.
- 845 Gravel pits, Mine sites, Dump sites.
- 846 Fence lines (Community Pastures), fire guards.
- 847 Drainage ditches
- 848 Beaver Floods
- 849 Dugouts, water holes.
- 851 Oil Fields oil wells, all structures pertaining to.

d) <u>Water (900)</u>

- i) Includes lakes and rivers, measured at the high water mark, able to be delineated with a double line on the aerial photographs. Narrow rivers and creeks marked by a single blue line are not to be considered as separate types, nor as type boundaries.
- 901 Rivers, arrows showing direction of flow.
- 991 Lake Winnipeg
- 992 Lake Manitoba
- 993 Lake Winnipegosis
- 994 Red River
- 995 Assiniboine River

III SUBDIVISION OF FORESTED PRODUCTIVE LAND

1. <u>Type Aggregate</u>

This tem is used in reference to all productive stands or potentially productive areas in a Forest Management Unit or Forest Section which have common characteristics as to cover type, subtype, site, cutting class and crown closure.

Cover Type

Four broad cover types are recognized – Softwood 'S', Softwood-Hardwood 'M', Hardwood-Softwood 'N', Hardwood 'H'. The first number of the sup-type code indicates the type aggregate.

<u>Code</u>

- 0-3 Softwood 'S' includes all stands where at least 76 percent of the total basal area consists of coniferous species.
- <u>4 7</u> Softwood-Hardwood Mixedwood 'M' includes all stands where the basal area of all the coniferous species is between 51 percent and 75 percent of the total basal area.
- <u>8</u> Hardwood-Softwood Mixed wood 'N' includes all stands where the basal area of all coniferous species is between 26 and 50 percent of the total basal area.
- Hardwood 'H' includes all stands where the basal area of all coniferous species is less than25 percent of total basal area.

The above cover types are to be determined by the percent of the basal area of softwood tally in proportion to the total basal area found on all plots taken within a stand.

2. Subtype

This term indicates the species composition in broad groups within the cover type. Subtype is determined by the proportion of basal area of two or three main species in the stand as found on sample plots to the total basal area of all species. To determine the subtype, the basal area of individual species must be computed and rounded off to the nearest ten percent.

The percentage range marked after the species symbol indicates the proportion of the basal area of this particular species in comparison to the total basal area of all species in the type. The second number of the type aggregate code identifies the subtype.

On the following pages are a list of the Species Codes and recognized subtypes:

SPECIES CODES

SPECIES White Pine	SYMBOL WP
	RP
	JP
Scots Pine	SP
Black Spruce	BS
White Spruce	WS
Balsam Fir	BF
Tamarack	TL
Cedar	EC
Trembling Aspen	TA
Large Tooth Aspen	LA
Balsam Poplar	BA
Eastern Cottonwood	CO
Willow	W
White Birch	WB
Hackberry	HB
Basswood	В
Manitoba Maple	MM
Ash	AS
White Elm	E
Hop-hornbeam	HH
Bur Oak	ВО
	White Pine Red Pine Jack Pine Scots Pine Black Spruce White Spruce Balsam Fir Tamarack Cedar Trembling Aspen Large Tooth Aspen Balsam Poplar Eastern Cottonwood Willow White Birch Hackberry Basswood Manitoba Maple Ash White Elm Hop-hornbeam

SUBTYPE CODE

<u>Cover type 'S' > 76% S</u>	<u>Code</u>	Cover type 'M' 51-75% S	<u>Code</u>
Red Pine 71-100%	01	Red Pine 51%+	41
Red Pine 40-70%-jp	02	Red Pine 50% or less-jp	42
Jack Pine 71-100%	04	White Pine 51%+	43
Jack Pine 40-70%-rp, sp	05	Jack Pine 51%+	44
Jack Pine 40-70%-spr	06	Jack Pine 50% or less-rp	45
Scots Pine 71-100%	08	Jack Pine 50% or less-spr	46
Scots Pine 40-70%-jp	09	Scots Pine 51%+	48
		Scots Pine 50% or less	49
White Spruce 71-100%	10		
White Spruce 40-70%-bf, jp, bs	11	White Spruce 51%+	50
Black Spruce 71-100%	13	White Spruce 50% or less-bf, jp, bs	51
Black Spruce 40-70%-jp	14	Black Spruce 51%+	53
Black Spruce 40-70%- bf, ws	15	Black Spruce 50% or less-jp	54
Black Spruce 40-70%-tl	16	Black Spruce 50% or less-bf	55
Black Spruce 40-70%-ec	17	Black Spruce 50% or less-tl	56
·		Black Spruce 50% or less-ec	57
Balsam Fir 71-100%	20	Black Spruce 50% or less-ws	58
Balsam Fir 40-70%-spr	21	•	
Balsam Fir 40-70%-ec	22	Balsam Fir 51%+	60
		Balsam Fir 50% or less-spr	61
Tamarack 71-100%	30	Balsam Fir 50% or less-ec	62
Tamarack 40-70%-spr	31		-
Tamarack 40-70%-ec	32	Tamarack 51%+	70
	-	Tamarack 50% or less-spr	71
Cedar 71-100%	36	Tamarack 50% or less-ec	72
Cedar 40-70%	37		. –
		Cedar 51%+	76
Cover Type 'N' 26-50% S		Cedar 50% or less	77
Trembling Aspen-rp	80		
Trembling Aspen-jp	81	Cover Type 'H'< 25% S	
Trembling Aspen-spr, bf, tl	82	Trembling Aspen	90*
		Trembling Aspen < 50%, wb (20%+)	91
Birch-rp	85		3-
Birch-jp	86	Birch	92
Birch-spr & bf	87	Basswood	93
		Ash	94
Balsam Poplar-spr, bf, tl	88	Elm	95
		Oak	96
Northern Region ***		Manitoba Maple	97
Hardwood - Pine	83	Balsam Poplar	98**
Hardwood - Spruce	84	Largetooth Aspen	9A
Tidianood Sprace	0.	Eastern Cottonwood	9B
		Hackberry	9C
		Hop Hornbeam	9D
		Willow	9E
			<i>J</i> L
		Northern Region ***	
		All Hardwoods	99
gere Asnen and Ralsam Ponlar together equal 5	1% and Asnen are		33

^{*} Code 90 - Where Aspen and Balsam Poplar together equal 51% and Aspen predominates

** If ba is 50% or less with 20% + wb then classify as 91

*** Special Note - Code 83, 84, and 99 will remain in effect until such time as an area is re-inventoried, at that time the full range of Cover Type 'N' and 'H' codes will be implemented.

WORKING GROUP CLASSIFICATION

Working Groups	<u>Subtype</u> <u>Code</u>	Cover Type	Species Content
Red Pine	01	Softwood (S)	Red Pine 71 – 100%
	02	Softwood (S)	Red Pine 40 – 70% : 2nd major species Jack Pine
	41	Softwood Hardwood (M)	Red Pine 51% + : 2nd Major species Hardwood
	42	Softwood Hardwood (M)	Red Pine 50% or less: 2nd major species Jack Pine; 3rd
			major species Hardwood
White Pine	43	Softwood Hardwood (M)	White Pine 51% + : 2nd major species Hardwood
Jack Pine	04	Softwood (S)	Jack Pine 71 – 100%
	05	Softwood (S)	Jack Pine 40 – 70%; 2nd major species Red Pine
	06	Softwood (S)	Jack Pine 40 – 70%; 2nd major species spruce
	44	Softwood–Hardwood (M)	Jack Pine 51% + : 2nd major species Hardwood
	45	Softwood–Hardwood (M)	Jack Pine 50% or less : 2nd major species Red Pine : 3rd major species Hardwood
	46	Softwood–Hardwood (M)	Jack Pine 50% or less : 2nd major species Spruce; 3rd major species Hardwood
Scots Pine	08	Softwood (S)	Scots Pine 71 – 100%
	09	Softwood (S)	Scots Pine 40 – 70% : 2nd major species Jack Pine
	48	Softwood–Hardwood (M)	Scots Pine 51 % + : 2nd major species Hardwood
	49	Softwood–Hardwood (M)	Scots Pine 50% or less : 2nd major species Jack Pine; 3rd
		(,	major species Hardwood
White Spruce	10	Softwood (S)	White Spruce 71 – 100%
	11	Softwood (S)	White Spruce 40 – 70% : 2nd major species Jack Pine,
			Balsam Fir or Black Spruce
	50	Softwood–Hardwood (M)	White Spruce 51% + : 2nd major species Hardwood
	51	Softwood Hardwood (M)	White Spruce 50% or less : 2nd major species Balsam Fir, Jack Pine or Black Spruce; 3rd major species Hardwood
Black Spruce	13	Softwood (S)	Black Spruce 71 – 100%
·	14	Softwood (S)	Black Spruce 40 – 70% : 2nd major species Jack Pine
	15	Softwood (S)	Black Spruce 40 – 70% : 2nd major species Balsam Fir, White Spruce
	16	Softwood (S)	Black Spruce 40 – 70% : 2nd major species Tamarack Larch
	17	Softwood (S)	Black Spruce 40 – 70% : 2nd major species Eastern Cedar
	53	Softwood Hardwood (M)	Black Spruce 51% + : 2nd major species Hardwood
	54	Softwood Hardwood (M)	Black Spruce 50% or less : 2nd major species Jack Pine; 3rd major species Hardwood
	55	Softwood Hardwood (M)	Black Spruce 50% or less : 2nd major species Balsam Fir; 3rd major species Hardwood
	56	Softwood–Hardwood (M)	Black spruce 50% or less : 2nd major species Tamarack Larch; 3rd major species Hardwood
	57	Softwood–Hardwood (M)	Black Spruce 50% or less: 2nd major species Eastern Cedar; 3rd major species Hardwood
	58	Softwood–Hardwood (M)	Black spruce 50% or less : 2nd major species White Spruce; 3rd major species Hardwood

WORKING GROUP CLASSIFICATION (continued)

Working Groups	Subtype Code	Cover Type	Species Content
Balsam Fir	20	Softwood (S)	Balsam Fir 71 – 100%
	21	Softwood–Hardwood (M)	Balsam Fir 40 – 70% : 2nd major species Spruce
	22	Softwood–Hardwood (M)	Balsam Fir 40 – 70% : 2nd major species Eastern Cedar
	60	Softwood–Hardwood (M)	Balsam Fir 51% + : 2nd major species Hardwood
	61	Softwood–Hardwood (M)	Balsam Fir 50% or less : 2nd major species Spruce; 3rd major species Hardwood
	62	Softwood–Hardwood (M)	Balsam Fir 50% or less : 2nd major species Eastern Cedar; 3rd major species Hardwood
Tamarack Larch	30	Softwood (S)	Tamarack Larch 71 – 100%
	31	Softwood (S)	Tamarack Larch 40 – 70% : 2nd major species Spruce
	32	Softwood–Hardwood (M)	Tamarack Larch 40 – 70% : 2nd major species Eastern Cedar
	70	Softwood-Hardwood (M)	Tamarack Larch 51% + : 2nd major species Hardwood
	71	Softwood–Hardwood (M)	Tamarack Larch 50 % or less : 2nd major species Spruce; 3rd major species Hardwood
	72	Softwood–Hardwood (M)	Tamarack Larch 50% or less : 2nd major species Eastern Cedar; 3rd major species Hardwood
Eastern Cedar	36	Softwood (S)	Eastern Cedar 71 – 100%
	37	Softwood (S)	Eastern Cedar 40 – 70%
	76	Softwood–Hardwood (M)	Eastern Cedar 51% + : 2nd major species Hardwood
	77	Softwood–Hardwood (M)	Eastern Cedar 50% or less : 2nd major species Hardwood
Trembling Aspen	90	Hardwood (H)	Trembling Aspen 51% +
	91	Hardwood (H)	Trembling Aspen 50% or less : 2nd major species White Birch 20% +
	80	Hardwood-Softwood (N)	Trembling Aspen 26 -50%: 2nd major species Red Pine
	81	Hardwood-Softwood (N)	Trembling Aspen 26 -50% : 2nd major species jack Pine
	82	Hardwood-Softwood (N)	Trembling Aspen 26 -50% : 2nd major species Spruce, Balsam Fir, Tamarack Larch
Balsam Poplar	98	Hardwood (H)	Balsam Poplar less than 25% Softwood
•	88	Hardwood-Softwood (N)	Balsam Poplar 26 -50% : 2nd major species Spruce,
		` ,	Balsam Fir, Tamarack Larch
White Birch	92	Hardwood (H)	White Birch less than 25% Softwood
	85	Hardwood-Softwood (N)	White Birch 26 -50% : 2nd major species Red Pine
	86	Hardwood-Softwood (N)	White Birch 26 -50% : 2nd major species Jack Pine
	87	Hardwood-Softwood (N)	White Birch 26 -50% : 2nd major species Spruce, Balsam Fir

WORKING GROUP CLASSIFICATION (continued)

Working Groups	<u>Subtype</u> <u>Code</u>	Cover Type	Species Content
Basswood	93	Hardwood (H)	Basswood
Ash	94	Hardwood (H)	Ash
Elm	95	Hardwood (H)	Elm
Oak	96	Hardwood (H)	Bur Oak
Manitoba Maple	97	Hardwood (H)	Manitoba Maple
Hardwoods	83	Hardwood-Softwood (N)	Northern Region – Hardwoods – 2nd major species Pine
	84	Hardwood-Softwood (N)	Northern Region – Hardwoods – 2nd major species Spruce
	99	Hardwood (H)	Northern Region - All Hardwoods
Largetooth Aspen	9A	Hardwood (H)	Largetooth Aspen
Eastern Cottonwood	9B	Hardwood (H)	Eastern Cottonwood
Hackberry	9C	Hardwood (H)	Hackberry
Hop Hornbeam	9D	Hardwood (H)	Hop Hornbeam
Willow	9E	Hardwood (H)	Willow

3. <u>Vegetation Types - Forest Ecosystem Classification</u>

Mainly Hardwood

- V1 Balsam Poplar Hardwood and Mixedwood
- V2 Black Ash (White Elm) Hardwood
- V3 Miscellaneous Hardwoods
- V4 White Birch Hardwood and Mixedwood
- V5 Aspen Hardwood
- V6 Trembling Aspen-Balsam Fir / Mountain Maple / Herb-Rich
- V7 Trembling Aspen-Balsam Fir / Shrub- and Herb-Poor
- V8 Trembling Aspen Mixedwood / Tall Shrub
- V9 Trembling Aspen Mixedwood / Low Shrub
- V10 Trembling Aspen Mixedwood / Feather Moss

Conifer Mixedwood

- V11 White Pine Mixedwood
- V12 Red Pine Mixedwood
- V13 White Spruce Mixedwood
- V14 White Spruce Mixedwood / Feather Moss
- V15 Jack Pine Mixedwood / Shrub-Rich
- V16 Jack Pine Mixedwood / Feather Moss
- V17 Black Spruce Mixedwood / Shrub- and Herb-Rich
- V18 Black Spruce Mixedwood / Feather Moss

Conifer

- V19 Cedar Conifer and Mixedwood
- V20 Tamarack Larch / Labrador Tea
- V21 White Spruce / Balsam Fir Shrub
- V22 White Pine Conifer
- V23 Red Pine Conifer
- V24 Jack Pine Conifer
- V25 Jack Pine / Feather Moss
- V26 Jack Pine Black Spruce / Lichen
- V27 Black Spruce / Shrub- and Herb-Rich
- V28 Jack Pine Black Spruce / Feather Moss
- V29 Black Spruce / Feather Moss
- V30 Black Spruce / Labrador Tea / Feather Moss (Sphagnum)
- V31 Black Spruce / Herb-Rich / Sphagnum (Feather Moss)
- V32 Black Spruce / Herb-Poor / Sphagnum (Feather Moss)
- V33 Black Spruce / Sphagnum (Feather Moss)

See the Forest Ecosystem Classification for Manitoba (Field Guide) for descriptions of the vegetation types.

4. <u>Site Class</u>

MOISTURE REGIME	LANDFORM	INDICATOR PLA		SUBT	YPE AN	D SITE	CLASS		
		ABUNDANT	JP	ws	BF	BS	TL	TA	
ARID	rock outcrop, higher gravel beach ridges	reindeer moss, creeping savin	bearberry	2	3	-	-	-	3
DRY	higher beach, outwash and moraine ridges	bearberry, creeping savin, reindeer moss, slender mountain rice	common juniper, soapberry	2	3	3	3	-	2
MOIST (ground water and vadose water types)	low positions and flaring-out margins on beach and outwash OR till plains, lacustrine flats and higher flood plains	Red-osier dogwood, bunchberry, Ribes sp. naked miterwort, creep- ing snowberry	buffalo berry, common juniper, rough grained mountain rice, alder	1	1	1	1	-	1
VERY MOIST	depressional positions on beach and outwash and lacustrine deposits	red-osier dogwood, naked miterwort, bunch- berry, Ribes sp., alder	bog cranberry	1	1	1	1	1	1
WET	depressional positions on till and lacustrine material	alder, marsh marigold, bog cranberry		-	-	-	1	1	1
SATURATED	deep organic terrain	sphagnum sp., labrador tea, marsh marigold		-	-	-	2	2	-

NOTE: - Arid sites are generally devoid of tree cover.

5. <u>Cutting Class</u>

Cutting class is base on size, vigour, state of development and maturity of a stand for harvesting purposes.

- a) <u>Class 0</u> Forest land not restocked following fire, cutting, windfall or other major disturbances (potentially productive land). Some reproduction or scattered residual trees (with net merchantable volume less than 20 m³ per hectare) may be present.
- b) <u>Class 1</u> Stands which have been restocked either naturally or artificially. There may be scattered residual trees present as in Cutting Class 0.

To be in Cutting Class 1, the average height of the stand must be less than 3 meters.

- c) <u>Class 2</u> Advance young growth of post size, with some merchantable volume. The average height of the stand must be 3 to 10 meters in order to be in this cutting class.
- d) <u>Class 3</u> Immature stand with merchantable volume growing at or near its maximum rate, which should not be cut. The average height of the stand should be over 10 metres and the average diameter should be over 9.0 centimetres (9.0 cm) at dbh (1.3 m).
- e) <u>Class 4</u> Mature stands which may be cut as they have reached rotation age. (Refer to table on page 15)
- f) <u>Class 5</u> Overmature stands, which should be given priority in cutting.

ROTATION AGES

	·	Forest Management Unit							CC 4		
SPECIES	SITES	01-07	10-15	20,23	30-39	40-47	51-57	60-66	71-75	82-99	+ -
Jack Pine/Scots Pine	All Sites	60	60	60	80	60	75	80	80	80	10
Red Pine/White Pine	All Sites	-	-	80	-	80	-	-	-	-	10
Black Spruce	Site 1	80	80	80	80	80	80	80	100	80	10
	Site 2	140	140	140	140	140	140	140	140	140	20
	Site 3	-	140	140	140	140	140	140	140	140	20
White Spruce	All Sites	80	100	80	100	80	100	100	100	100	10
Balsam Fir	All Sites	-	60	60	70	60	80	80	-	80	10
Tamarack Larch	Site 1	90	90	90	90	90	90			-	20
	Site 2	140	140	140	140	140	140			-	20
Eastern Cedar	Site 1	-	-	80	-	80	80	-	-	-	10
	Site 2	-	-	140	-	140	140	-	-	-	20
Hardwoods	All Sites	60	60	60	60	60	60	80	80	80	10

6. Crown Closure Class

Crown closure will be estimated from the photographs by the photo-interpreter. Four classes will be recognized and entered onto the stand description sheet for each township as part of the photo-interpreter type aggregate. Changes of this estimate can be made only under exceptional circumstances.

Code

- 0 0 % 20 % crown closure
- 2 21 % 50 % crown closure
- 3 51 % 70 % crown closure
- 4 71 % and over

Example of type aggregate written in full

$$04 - 1 - 3 - 4$$

Where:

0 = Cover Type : Softwood

4 = subtype : Jack Pine 71% - 100%

1 = site 1

3 = Cutting Class 3

4 = Crown Closure 71% and over

Type Aggregate for example: BS10 13-2-3-4

Species Composition	Cover Type Subtype	<u>Site</u>	<u>Cutting</u> <u>Class</u>	Crown Closure
BS10	13	2	3	4
Although species	It is softwood subtype when	Poor	Immature	71% + ground
composition is not part of	the basal area of	saturated	growth	covered by tree
type aggregate, it must be	Black Spruce represents			crown
included to aid	more than 71% of the total			
compilation.	softwood basal area			

Note: Crown Closure will be taken from the photo interpreted data on the stand description sheet.

7. F.E.C. Soil Types

Deep Mineral

- S1 Moderately Dry/Sandy
- S2 Fresh/Fine Sandy
- S3 Fresh/Course Loamy
- S4 Fresh/Silty-Loamy
- S5 Fresh/Fine Loamy
- S6 Fresh/Clayey
- S7 Moist/Sandy
- S8 Moist/Coarse Loamy
- S9 Moist/Silty-Silty Sand
- S10 Very Moist/Fine Loamy-Clayey
- S11 Very Moist/Peaty Phase

Deep Organic

- S12F Wet/Organic (Feather Moss)
- S12S Wet/Organic (Sphagnum)

Very Shallow

- SS1 Discontinuous Organic Mat on Bedrock
- SS2 Extremely Shallow Soil on Bedrock
- SS3 Very Shallow Soil on Bedrock
- SS4 Very Shallow Soil on Boulder Pavement

Shallow to Moderately Deep

SS5	Show-Moderately Deep/Sandy
SS6	Show-Moderately Deep/Course Loamy
SS7	Show-Moderately Deep/Silty-Fine Loamy-Clayey
SS8	Show-Moderately Deep/Mottles-Gley
SS9	Show-Moderately Deep/Organic-Peaty Phase

See the Forest Ecosystem Classification for Manitoba (Field Guide) for description of the soil types.

8. <u>Year of Origin</u>

Year of Origin is when the stand starts to grow as estimated by the photo interpreter. Fire, cutover, plantation records, field checks and other data sources are used to increase the accuracy of the estimate. A stand that has a year of origin in the future (example: year of photography 1996, year of origin 2006) is because of an event like fire or cutover and 2006 is an estimate of when that stand is expected to regenerate. This will happen on potentially productive sites where trees are not yet visible.

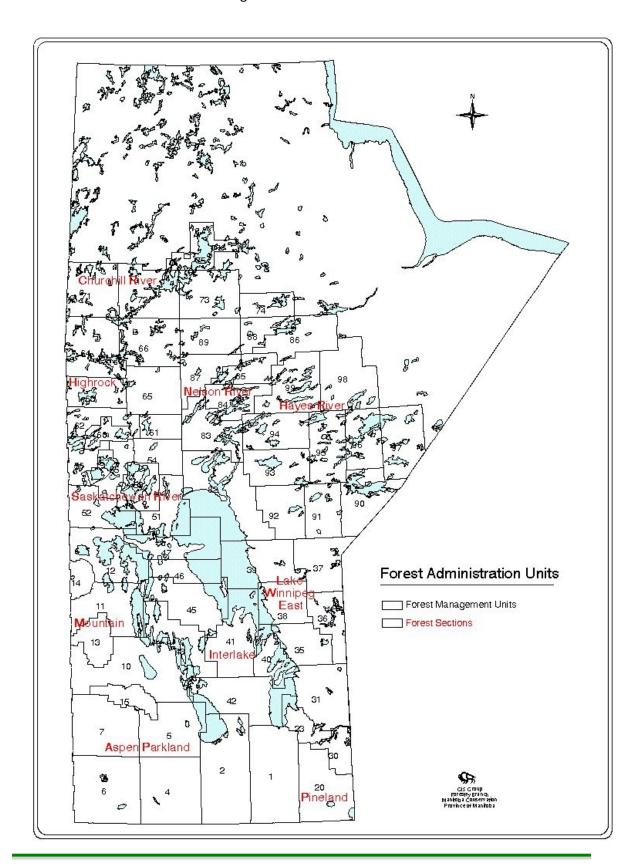
IV INVENTORY MAINTENANCE – Based on year of photography

	Forest Management	First Maintenance of	
FMU	Inventory - FRI 1.0	Inventory - FRI 1.1 *	Second Maintenance of Inventory
01		1979	
02		1979 & 1980	
04		1977 & 1980	
05		1980 & 1981	
06		1977, 1980 & 1982	
07		1980 & 1982	
10		1980 & 1981	Updated with 1997 Orthophotos & 2002 Satellite Imagery for land change
11	1962	1980 & 1981	2001 - FLI 1.1
12	1964	1980 & 1981	2001 - FLI 1.1
13	1973	1983	1998 - FLI Pilot Project FLI 1.0
14	1964	1980 & 1981	2000 - FLI Pilot Project FLI 1.0
15	1959	1980, 1981 & 1982	
20	1970	1983	1996 - FRI 1.3
23	1970	1983	1996 - FRI 1.3
30	1970	1983	1996 - FRI 1.3
31	1977	1986	1997 - FRI 1.3
35	1966 & 1967	1984	1997 - FRI 1.3 minus Atikaki portion
36	1965 & 1966	1986	
37	1967	1984 & 1986	
38	1967	1984	
39	1967	1984	
40	1959	1976 - FRI 1.0	1992 - FRI 1.2
41	1960	1976 & 1978 - FRI 1.0	1992 - FRI 1.2
42		1981	
43	1961	1978, 1979 & 1980 - FRI 1.0	1992 & 1993 - FRI 1.2
45	1961 & 1963	1978 & 1979 - FRI 1.0	1992 & 1993 - FRI 1.2
46	1963	1979 - FRI 1.0	1993 - FRI 1.2
47	1964	1980 & 1981	1996 - FRI 1.2
51	1966	1982	1996 - FRI 1.2
52	1966	1982	1995 & 1996 - FRI 1.2
53	1966	1982	1995 & 1996 - FRI 1.2
54	1966	1982	1996 - FRI 1.2
55	1966	1982	1995 & 1996 - FRI 1.2
56	1966	1982	1995 - FRI 1.2
57	1966	1982	1995 - FRI 1.2
60	1966	1982, 1983 & 1995	2007
61	1966	1987 & 1988	2007
62	1966	1983	2007
63	1968	1983	2007

64	1969	1983 & 1987	
65	1970	1987 & 1988	2007
EN ALL	Forest Management	First Maintenance of	Cooped Maintenance of Inventory
FMU	Inventory - FRI 1.0	Inventory - FRI 1.1 *	Second Maintenance of Inventory
66	1969	1987 & 1988	
71	1975		
72	1969 & 1975		
73	1969 & 1975		
74	1975		
75	1969		
82	1966 & 1967	1986 & 1990	
83	1965	1985	
84	1965	1985	
85	1965	1985	
86	1965	1991	
87	1970	1985	
88	1970	1991	
89	1970	1989 & 1991	
90	1973		
91	1973		
92	1973		
93	1973		
94	1969		
95	1973		
96	1973		
97	1973		
98	1973		
99	1967		

^{*} FRI 1.1 unless otherwise noted.

- FRI 1.0 Based on original Forest Resource Inventory. Last year 1975.
- FRI 1.1 Expanded codes for non-productive forested land, non-forested land and water.
- FRI 1.2 Added Year of Origin, Vegetation (V) and Soil (S) Type based on MB FEC Classification.
- FRI 1.3 Added Moisture Class, Landform, Height, 10 percent Crown Closure Classes, no S Type.
- FLI 1.0 Forest Lands Inventory Pilot Project with Louisiana-Pacific and Manitoba Conservation Forestry Corp March 31, 2003, FLI User Guide April 27, 2004.
- FLI 1.1 Added additional classifications mainly for agriculture purposes. Some attributes optional as per discussions with Forest Lands Inventory Technical Advisory Committee (FLITAC).



APPENDIX K

Permanent Roads as Percent of FML #1

Table 1. Road Density by Watershed for FML #1 $\,$

Watershed	Area of Watershed (km2)	Class 1 Roads (km)	Class 2 Roads (km)	Class 3A Roads (km)	Class 3B Roads (km)	Class 4 Roads (km)	Class 4 Major Roads (km)	Total Length of Road (km)	Density of Roads per Watershed (km/km2)	Remaining Length of Road (km)	Length of Road Allowed (km)
Lower Beaver Creek	293.3		32,97	18.49	21.92	71.88		145.3	0.50	24.9	170.1
Manigotagan - Quesnel Lakes	173.8		19.59		17.58	47.39		84.6	0.49	16.3	100.8
Gold Creek	123.9		8.29		11.22	35.12		54.6	0.44	17.2	71.8
Peterson Creek	152.1		18.84		7.3	29.49	9.23	64.9	0.43	23.3	88.2
Lake Winnipeg Shoreline - Traverse Bay	341.2	6.25	4.06	3.99	1.47	128.32		144.1	0.42	53.8	197.9
Ross River	102.6		4.79		4.35	33.34		42.5	0.41	17.1	59.5
Cat Creek	105.4	14.33	16.46		2.26	3.14	6.22	42.4	0.40	18.7	61.1
Mid Wanipigow River	232.1		23.57		9.88	58.14		91.6	0.39	43.0	134.6
Upper Maskwa River	370.5	10.96	19.94	31	16	59.28	5.24	142.4	0.38	72.4	214.9
Upper Sandy River	178.8		22.02		23.22	17.67		62.9	0.35	40.8	103.7
English Brook	279.2	2.28	23.48	14.52	30.58	22.24		93.1	0.33	68.8	161.9
Moose Creek	177.5	8.37	1.46	3.67	27.8	10.24		51.5	0.29	51.4	103.0
Upper Bird River	120.0		16.88			13.19	4.2	34.3	0.29	35.3	69.6
Lake Winnipeg Shoreline - Loon Straits	256.2	22.54	3.34		5.41	41.38		72.7	0.28	75.9	148.6
Coca Cola Creek	247.5			2.65		13.18	42.04	57.9	0.23	85.7	143.5
Lower Sandy River	167.0		20.3			15.58		35.9	0.21	61.0	96.9
Lake Winnipeg Shoreline - Black River	195.5		2.63	0.84		38.04		41.5	0.21	71.9	113.4
O'Hanley River	335.0		16.82	20.52	5.15	19.22		61.7	0.18	132.6	194.3
Lower Black River	431.5		49.55	4.46	3.35	20.1		77.5	0.18	172.8	250.3
Pine Creek	203.3	9.08	7.65	3.28	2.71	13.48		36.2	0.18	81.7	117.9
Lower Maskwa River	215.1			1.65		10.87	25.59	38.1	0.18	86.6	124.8
Lake Winnipeg Shoreline - Observation Point	206.0			2.25	9.57	24.22		36.0	0.17	83.4	119.5
Lake Winnipeg Shoreline - Black Island	291.5	33.78		1.12		9.45	2.2	46.6	0.16	122.5	169.1
Garner Lake	271.6		6.29	1.99	1.09	32.84		42.2	0.16	115.3	157.5
Lower Manigotagan River	342.0		14.34	3.43	5.42	24.96		48.2	0.14	150.2	198.4
Lac Du Bonnet	129.9					4.2	13.98	18.2	0.14	57.2	75.4
McGregor - Elbow - Tulabi Lakes	147.0		0.55		7.64	7.5	4.58	20.3	0.14	65.0	85.2
Lower Wanipigow River	174.5	7.52	4.63	4.29	4.56	2.86		23.9	0.14	77.3	101.2
Point Du Bois - Ryerson Lake	128.6		6.08			8.54	0.01	14.6	0.11	60.0	74.6
Upper Manigotagan River	258.8		4.28	1.19		22.34		27.8	0.11	122.3	150.1
Moose River	225.2		9.06		6.24	7.61		22.9	0.10	107.7	130.6
Lower Bird River	221.0		6.24		1.31	9.83	2.89	20.3	0.09	107.9	128.2
Lee River	127.3					9.69	2.00	9.7	0.08	64.2	73.9
Rice River	316.1	3.98				11.19		15.2	0.05	168.1	183.3
Upper Black River	308.9		8.2		0.41			8.6	0.03	170.6	179.2
Lower Bloodvein River	193.4					3.3		3.3	0.02	108.9	112.2
Broadleaf River	149.0					0.0				86.4	86.4
Lower Gammon River	326.4									189.3	189.3
Obukowin Lake	82.4							.	7811	47.8	47.8
Upper Beaver Creek	231.8							.		134.4	134.4
Upper Wanipigow River	174.1							.		101.0	101.0
Total	9,006.8	119.1	372.3	119.3	226.4	879.8	116.2	1,833.2	0.20	3,390.7	5,223.9

(Source: PFRA, 2004 & Tembec, 2008)

Source: Manitoba Model Forest website, 2011

Table 2. Tembec Road Construction Standards with ROW Widths

Road	Term of	Detail Plan	Field	Design and	d Constructi	on Guidelines	3			
Class	Life	Preparation	Layout	Right-of-Way			Alignment			Borrow Pits
				Clearing Width	Min. Road Surface	Drainage Ditch	Min. Sight Distance	Min. Slope of Road / Ditch	Design Speed	ie .
	Permane nt year- round access for 20+ years	Detailed design plan on air photo of photo mosaics. Cross sectional profiles for major stream crossings. Types of structures for structures for stream crossings, erosion control measures, revegetation and reclamation plans required. Right-of-way requirements specified. Any additional requirements necessary will be identified.	Centreline marked.	45 m	8-9 m	Rounded or scraper	180 m	2:1*	80 km/h	To the greatest extent possible, locations are identified before construction commences and site tested for materials and ground water levels before clearing of borrow areas Dog-legged access or access constructed at arrangle will incorporate a buffer to off right-off way borrow pits. Pits located on the right of-way should be incorporated by variable width and recontouring.
II	Permane nt year- round access for up to 20 years.	See Class I	See Class I	40 m	6-8 m	Rounded or scraper	180 m	2:1	70 km/h	See Class I
Ш	Permane nt dry or frozen periods for 2-20 years.	See Class I	See Class I	35 m	6-8 m	Rounded or scraper as required.	180 m	2:1	60 km/h	Use of small borrow pits incorporated intright-of-way where possible.
IV	Seasonal Frozen period access for up to 10 years.	Road alignment plan on aerial photographs and forest cover maps.	Centreline marked if site conditions indicate necessity.	20-30 m	6-9 m	n/a	180 m	2:1	40 km/h	Use of small borrow pits incorporated intright-of-way when required.

Source: FML 01, 2010-2029 Forest Stewardship Plan

Table 3. Permanent Roads as Percent of FML #1

Road Class	Length (km)	ROW (m)	Area (ha)	FML #1 (ha)	% FML #1
1	119.1	45	536.0	900,680	0.05
2	372.3	40	1,489.2	900,680	0.16
Total	491.4		2,025.2	900,680	0.22

APPENDIX L

FML #3 Road Construction History 1999-2008

Table 1. FML #3 All-Weather Road Construction History 1999-2008

			-	
Year	FMU 10 (km)	FMU 11 (km)	FMU 12 (km)	Total
1999-2000	0.0	0.0	0.0	0.0
2000-2001	0.0	0.0	0.0	0.0
2001-2002	0.0	1.4	0.0	1.4
2002-2003	1.4	0.0	0.0	1.4
2003-2004	0.9	0.0	0.0	0.9
2004-2005	0.0	2.2	0.0	2.2
2005-2006	0.0	1.2	0.0	1.2
2006-2007	0.0	0.0	0.0	0.0
2007-2008	0.4	0.5	0.0	0.9
2008-2009	0.0	0.0	0.0	0.0
Total	2.7	5.3	0.0	8.0
Km/Year	0.27	0.53	0.00	0.80
ROW (m)	20.0	20.0	20.0	20.0
Total Area (ha)	5.4	10.6	0.0	16.0

Source: Louisiana Pacific Canada Ltd (A) website, 2011

Table 2. FML #3 Dry Weather or Frozen Road Construction History 1999-2008

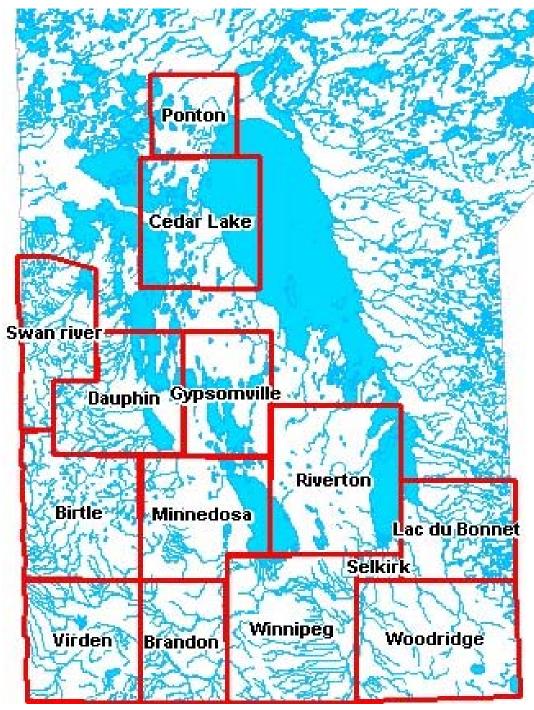
Year	FMU 10 (km)	FMU 11 (km)	FMU 12 (km)	Total
1999-2000	0.0	0.5	0.0	0.5
2000-2001	0.0	0.0	5.0	5.0
2001-2002	0.0	5.8	0.0	5.8
2002-2003	0.0	6.1	0.0	6.1
2003-2004	0.0	0.5	0.0	0.5
2004-2005	0.0	0.0	4.6	4.6
2005-2006	0.0	9.9	1.9	11.8
2006-2007	0.0	4.2	1.2	5.4
2007-2008	2.4	4.3	6.2	12.9
2008-2009	0.0	7.0	0.0	7.0
Total	2.4	38.3	18.9	59.6
Km/Year	0.24	3.83	1.89	5.96
ROW (m) ¹	15.0	15.0	15.0	15.0
Total Area (ha)	3.6	57.5	28.4	89.4

¹ – Row widths ranged from 8 to 20 meters

Source: Louisiana Pacific Canada Ltd (A) website, 2011

APPENDIX M

Landsat Thematic Mapper TM Land Use Dataset Analysis



Source: Manitoba, Government of (H) website, 2011

Figure 1 Manitoba Conservation Landsat Thematic Mapper TM Assessment Areas

Table 1. Manitoba Conservation Landsat Thematic Mapper TM Dataset Analysis

le 1. Manitoba Conservation Landsat Thematic Mapper ^{1M} Dataset Analysis										
Location/Land Cover	LTM Year (ha) Variance									
Swan River	1994	2002	Hectares	Percent						
Deciduous Open	40,200	34,465	-5,735	-14.3%						
Deciduous	141,135	147,949	6,814	4.8%						
Mixedwood	215,949	214,441	-1,508	-0.7%						
Conifer	74,560	73,854	-706	-0.9%						
Cutblocks	7,611	10,178	2,567	33.7%						
Swan River Forested	479,455	480,887	1,432	0.3%						
Total Swan River Area	1.3 million									
Dauphin	1994	2002	Hectares	Percent						
Deciduous Open	61,449	50,129	-11,320	-18.4%						
Deciduous	255,994	266,742	10,748	4.2%						
Mixedwood	48,604	60,995	12,391	25.5%						
Conifer	23,948	22,524	-1,424	-5.9%						
Cutblocks	1,989	8,489	6,500	326.8%						
Dauphin Forested	391,984	408,879	16,895	4.3%						
Total Dauphin Area	1.4 million									
Minnedosa	1994	2000	Hectares	Percent						
Deciduous Open	59,899	43,986	-15,913	-26.6%						
Deciduous	173,735	201,772	28,037	16.1%						
Mixedwood	43,889	41,694	-2,195	-5.0%						
Conifer	15,711	11,718	-3,993	-25.4%						
Cutblocks	0	716	716	n/a						
Total Minnedosa	293,234	299,886	6,652	2.3%						
Total Minnedosa Area	1.4 million									
Winnipeg	1994	2001	Hectares	Percent						
Deciduous Open	14,813	11,975	-2,838	-19.2%						
Deciduous	109,185	110,446	1,261	1.2%						
Mixedwood	7	9	2	28.6%						
Conifer	15	14	-1	-6.7%						
Cutblocks			0	n/a						
Winnipeg Forested	124,020	122,444	-1,576	-1.3%						
Total Winnipeg Area	1.6 million									
Total Forested	1,288,693	1,312,096	23,403	1.8%						
Total All Area	5.7 million									

Source: Manitoba, Government of (I) website, 2011

APPENDIX N

Woodlot Program Areas

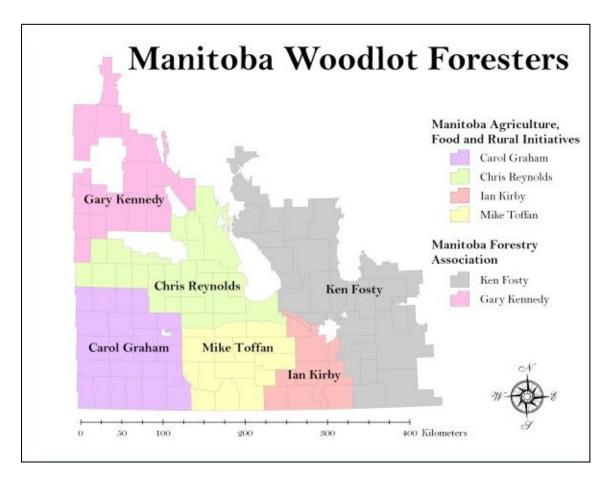


Figure 1 MAFRI and MFA woodlot Program Areas

APPENDIX O

Treaty Land Entitlement in Manitoba

Table 1. Manitoba Treaty Land Entitlement Settlement Status

First Nation	TLE Obligation ² (ha)	TLE Selected ³ (ha)	TLE Outstanding (ha)	TLE Over Selected (ha)
Barren Lands First Nation	26,879.8	11,433.7	15,446.1	
Brokenhead Ojibway Nation	1,758.0	1,388.9	369.1	
Buffalo Point First Nation	1,388.9	1,136.4	252.5	
Fox Lake First Nation ¹	10,680.3	757.0	9,923.3	
Garden Hill First Nation	18,348.4	21,909.5		-3,561.1
God's Lake First Nation	17,240.0	16,709.5	530.5	
God's River First Nation (Manto Sipi Cree)	3,531.0	4,032.1		-501.2
Mathias & Marcel Colomb	94,848.6	75,611.7	19,236.9	
Nisichawayasihk Cree Nation ¹	32,146.9	29,142.7		-4,148.4
Northlands First Nation	38,075.3	23,005.7	15,069.6	
Norway House Cree Nation ¹	42,405.5	42,879.5		-474.0
O-Pipon-Na-Piwin Cree Nation	7,152.6	16,445.9		-9,293.3
Opaskwayak Cree Nation ¹	19,286.9	19,116.6	170.3	
Oxford House First Nation (Bunibonibee Cree)	14,339.9	14,423.1		-83.1
Peguis First Nation ¹	22,273.6	14,911.3	7,362.3	
Red Sucker Lake	3,839.3	3,752.2	87.1	
Rolling River First Nation ¹	953.5	927.5	26.0	
Sapotaweyak Cree Nation ¹	43,761.2	45,240.1		-1,478.8
Sayisi Dene First Nation	9,053.8	4,741.6	4,312.3	
Shamattawa First Nation	10,081.7	7,830.8	2,251.0	
St.Theresa Point	14,127.1	16,129.3		-2,002.3
War Lake First Nation	2,896.0	2,718.8	177.2	
Wasagamack First Nation	5,507.9	5,452.6	55.3	
Wuskwi Sipihk First Nation ¹	17,874.5	18,349.2		-474.6
York Factory First Nation ¹	11,806.2	5,227.7	6,578.5	
Total	463,104.4	403,273.2	81,848.0	-22,016.8
First Nations currently selecting			24,060.3	-6,575.8

¹-First Nation communities that have currently selected TLE area or reside within the forestry cumulative effects assessment area ² - Source: Manitoba Conservation, 2011B ³ -Source: Manitoba Conservation, 2010B.

APPENDIX P

Cumulative Effect Analysis – Action Category Tables

Table 1. Deforestation Category Cumulative Effects

FMU / FS	Bipole III Footprint (prod ha)	Mine site (prod ha)	Forest industry permanent road (prod ha)	Manitoba Hydro projects (prod ha)	Beaver Activity ⁶	Climate Change ⁶
1	159					
2	76					
4	29					
5	126					
Aspen Parkland	389	0	0	0	0	0
10	424		32			
11	285		32			
12	194		44			
Mountain	903	0	108	0	0	0
52	37		63	9		
54	170		84	34		
55	225		55	278		
Saskatchewan R	431	0	202	321	0	0
Highrock 61	51	34	97	96		
Churchill R 74	120					
83	141	49	316			
84	210		237			
85	214		192			
87	89	1,253	227	477		
88	227					
Nelson River	880	1,302	971	477	0	0
Total (1990 - 2010)	n/a	1,336	1,378	894		
Estimate (2011 - 2030)	2,774	1,336	1,378	50 ⁵		
FML #2 (1990 - 2010)	1,165	1,336 ¹	1,314 ³	894		
FML #2 (2011 - 2030)		1,336 ²	1,314 ²	50 ⁵		
FML #3 (1990 - 2010)	465		64 ⁴			
FML #3 (2011 - 2030)			64 ²			

¹ – Calculated estimate for sites > 20 years old: (mine footprint/age of mine) multiplied by 20 years. Total area used where mine is operational and year of start-up is unknown.

² – Next 20 years estimated to be the same as the past 20 years
³ – Calculated estimate: FML #2 productive land by FMU multiplied by Appendix K % permanent roads (0.22%) divided by 2 (equal allocation to temporal periods past and future)

4 - Calculated area estimate based on Appendix L FML #3 All Weather Road construction (16 km)

⁵ – Unquantifiable estimate

Table 2. Land Reclassification Category Cumulative Effects

Table 2. Land Reclassification Category Cumulative Effects						
FMU / FS	Protected Areas ¹ (prod ha)	Areas of Special Interest ¹ (prod ha)	TLE Selection ² (prod ha)	TLE Outstanding (prod ha)		
1	3,344	5,454	547			
2	1,931	1,131				
4	7,924	4				
5	2,714	3,599	725			
Aspen Parkland	15,913	10,188	1,272			
10	2,046	4,855				
11	168	24,432	5,594			
12	75	33,522	36,288			
Mountain	2,289	62,809	41,881			
52	269	28,645	206			
54						
55		19,095	1,001			
Saskatchewan R	269	47,740	1,207			
Highrock 61		463				
Churchill R 74		18,755				
83		14,329	3,111			
84		67,507	-			
85		·				
87		25,010	3,443			
88		2,451	237			
Nelson River	0	109,297	6,791			
Total (1990 - 2010)	18,471	n/a	51,150	n/a		
Estimate (2011 - 2030)	n/a	249,252	n/a	7,600 ³		
FML #2 (1990 - 2010)	315	243,232	8,894	7,000		
FML #2	-		,			
(2011 - 2030)		117,142		1,3214		
FML #3						
(1990 - 2010)	2,214		5,594			
FML #3		20 200		831 ⁴		
(2011 - 2030)		29,289		921		

^{1 –} Manitoba, Government of (H) website, 2011

⁶ - unquantifiable

² – Manitoba Conservation, 2010A

³ – Calculated estimate based on percent of area awarded to date that is productive forestland and located within the assessment area (Appendix O).

⁴ - Calculated estimate: Outstanding estimated area 2011-2030 (7,600) divided by total selection area 1990-2010 (51,150) multiplied by previously selected area by FML (same as past proportional distribution).

Table 3 Afforestation Category Cumulative Effects

Table 3. Afforestation	Forest Ingress (prod ha)	Woodlot Program (prod ha)	Non-industrial Plantations ¹ 2003 – 2010 (prod ha)	Non-industrial Plantations ¹ 2011 – 2012 (prod ha)
1			543	497
2			174	142
4			80	40
5			25	25
Aspen Parkland	5,076	1,500	822	704
10			20	
11				
12				
Mountain	18,327	500	20	0
52				
54				
55				
Saskatchewan R	0	0	0	0
Highrock 61				
Churchill R 74				
83			31	31
84				
85				
87				
88				
Nelson River	0	0	31	31
Total (1990 - 2010)	23,403	2,000	873	n/a
Estimate (2011 - 2030)	0	1,000²	n/a	735 ³

¹ - Manitoba Conservation, 2010C & 2011 ² - Estimated at 50% of 1990-2010 period

³ – Trees for Tomorrow at midpoint of planned program. Remainder of program estimated to be the same distribution as the past portion.