7.0 Environmental assessment

7.1 Introduction

In addition to being a requirement in support of a licence under *The Environment Act*, the effects assessment for the Project addresses a number of important objectives, as follows:

- To assist in the planning and design of the Project by identifying and assessing potential environmental effects, identifying specific measures to mitigate adverse effects, and maximizing positive effects to the degree practicable;
- To understand and work to address concerns and issues identified by Indigenous peoples, local residents, and other stakeholders with respect to the Project; and
- To provide sufficient information about the existing environment, so that any necessary follow-up activities can be planned.

The effects assessment included consideration of the following:

- Existing biophysical and socio-economic environments in the Project area;
- Project scope and the potential interactions between the Project and the environment;
- Scientific study and analysis, local knowledge, traditional knowledge provided through self-directed studies, stakeholder perspectives, issues and concerns;
- Past and potential anthropogenic activities that may have affected the environment and how the results of these activities may interact with the Project;
- Avoidance or mitigation of adverse effects and enhancing positive effects;
- Characterizing any remaining (residual) adverse effects;
- Determining whether these adverse residual effects are significant; and
- Implementation of follow-up activities, where necessary to verify both the accuracy of the environmental assessment and the effectiveness of mitigation measures.

Integral to the assessment was providing several rounds of opportunities for engagement with landowners, Indigenous communities and organizations, public, and stakeholders, for two ends: to gather and understand local interests and concerns, and to obtain feedback for use in the route selection and environmental assessment process. Supporting and understanding self-directed studies from Indigenous

communities and organizations was an important input to the process, as was experience gained from past environmental assessments.

The environmental effects assessment included identifying the appropriate environmental (physical and ecological) and socioeconomic components and then identifying and assessing the interactions between the various Project components and the various environmental and socioeconomic components. The components were used to provide a focus to the assessment, and to characterize the nature and extent of the potential environmental effects, as well as identifying technically and economically feasible measures to mitigate any adverse effects and any measures to enhance positive effects.

Based on this iterative and interactive assessment process the residual effects were assessed as being not significant assessment. Monitoring and follow-up plans were developed to test these predictions during and after Project implementation, so that adaptations to mitigation could be applied, where required, to effectively manage the potential for significant adverse effects.

7.2 Assessment approach

7.2.1 General

The scope of the assessment defines what is being assessed, as well as where and when the Project components and activities will be interacting with the biophysical and socioeconomic environment. In order to examine the effects in a way that can be more readily understood, both the Project and the environment were divided into components so that the various interactions could be examined in a systematic way. This process began early in the planning phases, so that an awareness of potential effects could be used to influence the design to mitigate adverse effects where possible.

As the Project is a class 2 development the scope of the assessment was designed to meet the requirements of the EAPF Report Guidelines (Government of Manitoba 2015a). The assessment of the Project involved the following steps:

1) Define spatial and temporal assessment boundaries;
2) Organize the Project and environment into assessable components within the assessment boundaries;
3) Identify the potential interactions between the Project and the environment;

4) Select biophysical and socioeconomic environment components as valued components based on scientific, regulatory, public or Indigenous values and/or concerns where potential interaction may occur;
5) Examine VCs in a systematic way to characterize the effects where interactions with the Project are likely to occur;
6) Develop measures to address any adverse effects, where required; and
7) Summarize the examination to demonstrate the overall conclusion and characterize any residual effects, in terms of significance.

This section describes the various steps in the assessment process. It should be noted that the assessment includes additional components beyond those required for a provincial Class 2 Development. Additional steps were included to address concerns heard through engagement, including an assessment of significance and cumulative effects. The environmental protection program is discussed in section 9.0.

7.2.2 Assessment boundaries

7.2.2.1 Spatial boundaries

Spatial boundaries for the assessment were established to support the evaluation of alternative routes as well as the assessment of Project environmental effects. Boundaries were selected taking into account the geographic range of the anticipated environmental effects of the Project and ecological, technical, and social considerations and included the following:

- Project footprint area (PFA) - includes all areas subject to direct disturbance as a result of the Project, and consisting of the area of physical disturbance associated with the Project facilities – the 24 to 60 m wide right-of-way (ROW), and the station modification footprint at Birtle South Station.
- Local assessment area (LAA) –defined as the estimated maximum area within which Project-related environmental effects can be predicted or measured with a reasonable degree of accuracy and confidence. It includes the Project Footprint and any adjacent areas where Project-related environmental effects may reasonably be expected to occur (e.g., noise, dust) and may vary depending on the VC being assessed. The default LAA was one mile either side from the proposed centre line of the route. This was effective for examining effects in agricultural areas (in terms of property) and feedback from Project team discipline experts indicated that this was sufficient to capture indirect effects.
- Regional assessment area (RAA) – defined as the larger data planning area in

which alternative routing options were considered, but adjusted where necessary, depending on the environmental and socioeconomic component, to provide a broader perspective and context with which to assess effects (e.g., use rural municipality area to examine socioeconomic effects, or a broader or narrower area to examine effects to the sustainability of a population of a particular wildlife species).

7.2.2.2 Temporal boundaries

The primary temporal boundaries for the assessment are based on the timing and duration of the various Project activities. In some instances more detailed temporal boundaries were established for specific environmental and/or socioeconomic components being assessed, in order to adequately describe trends and variability, where necessary. These are described, where applicable, in sections 7.4 and 7.5.

The two primary temporal boundaries are:

- Construction – for this Project anticipated to be two winters; and
- Operations and maintenance – extending into the foreseeable future.

It should be noted that decommissioning was not part of the temporal boundaries for this assessment. The Project has been designed to remain in service for several decades and could be operated indefinitely with regular maintenance. It is therefore not possible to predict what specific activities will be undertaken, but if and/or when decommissioning of all or a portion of the Project is required, it will be completed in accordance with the federal, provincial and municipal regulations in force at the time.

7.2.3 Relevant Project components

The project description (chapter 2) defines the Project components (section 2.3) and activities required to construct and operate the Project's permanent facilities and to decommission temporary infrastructure not required for operations (section 2.6). The project description chapter also discusses alternative means to achieve the Project purpose chapter (section 2.2.3), including design measures to mitigate potential adverse effects. The various Project components being assessed are as follows:

- Transmission line construction:
    - Mobilization;
    - Use of local accommodations (workforce);
    - Access development;
    - Clearing;

    - Establishment and use of marshalling yards;
    - Establishment and use of borrow sources;
    - Foundation installation;
    - Structure installation;
    - Conductor installation; and
    - Demobilization.
- Transmission line operations and maintenance:
    - Physical presence;
    - Inspection patrols; and
    - Vegetation management
- Station:
    - Equipment installation; and
    - Equipment maintenance.

7.2.4 Environmental and socioeconomic components

The list of broad environmental (physical and ecological) and socioeconomic components (described in chapter 5) was based on the Environment Act proposal report guidelines (Government of Manitoba 2015a). However, the list and the interactions was also shaped through experience gained in previous environmental assessments on transmission lines, consideration of input from the public, stakeholders, and Indigenous communities and organizations, and the professional judgment of the assessment team.

The list of broad environmental (physical and ecological) and socioeconomic components consist of the following:

- Physical environment:
    - Terrain and soils;
    - Atmospheric conditions;
        - Air quality;
        - Noise;
    - Surface water;
    - Groundwater;
- Ecological environment:
    - Aquatic environment:
        - Aquatic habitat;

        - Fish resources;
        - Priority fish species;
    - Terrestrial environment:
        - Vegetation;
            - Grasslands;
            - Forests;
            - Wetlands;
        - Wildlife and wildlife habitat;
            - Terrestrial invertebrates;
            - Reptiles;
            - Amphibians;
            - Birds:
                - Songbirds and other land birds;
                - Grassland songbirds;
                - Raptors;
                - Upland game birds;
                - Waterfowl and other waterbirds;
            - Mammals:
                - Small mammals;
                - Furbearers;
                - Ungulates;
- Socioeconomic environment:
    - Employment and economy;
    - Infrastructure and services;
    - Property and residential development;
    - Agriculture;
    - Other commercial resource use;
    - Health;
    - Recreation and tourism;
    - Traditional land and resource use; and
    - Heritage resources.

7.2.5 Establishing valued components

As there were some particularly important aspects within some of the above components, including rare and endangered species, a valued component-significance approach was used for the assessment process. Canadian Environmental Assessment Agency (CEAA 2006, CEAA 2014) guidance was used, where emphasis is placed on those components having particular scientific, social, cultural, economic, historical, archaeological or aesthetic importance, with the potential to interact with Project components. Guidance from the BC Environmental Assessment Office (BC EAO 2013) was also used. It recommends that the list of VCs should be comprehensive enough to provide a good understanding of each of the types of effect, represent important features likely to be affected, be responsive to potential Project effects and concise enough so that the nature of the interaction and pathways to the Project can be understood.

Based on this guidance VCs were defined as environmental elements that have the potential to interact with the Project and that met one or more of the following criteria:

- Represent a broad environmental, ecological or human environment component that might be affected by the Project;
- Are a part of the heritage of Indigenous communities and organizations, or a part of their current use of lands for traditional purposes;
- Are of scientific, historical, archaeological importance; and/or
- Have been identified as important issues or concerns through the Project engagement process, or by other effects assessments in the region.

Based on a review of this guidance the various physical environment changes were assessed as effects pathways to ecological and socioeconomic VCs, and there were no physical environment VCs selected to reduce redundancy or double counting of effects. Ecological components were organized into three habitat VCs in order to be "*comprehensive, so that taken together, the VCs selected for an assessment should enable a full understanding of the important potential effects of the project*" (BC EAO 2013). The three ecological VCs were supplemented by selected Indicator Species used to measure and report on the condition and trend of the VC, including effects beyond spatial changes in habitat, such as physical/sensory disturbance. For example, grassland birds were identified as an indicator for the grassland VC, primarily because of issues raised by provincial wildlife biologists on the rare bird species such as the chestnut-collared longspur and Sprague's pipit that inhabit mixed grass prairie habitat. Similarly, moose were selected as an indicator for the forest VC, based on feedback

from the Indigenous engagement process and issues of ecological concern regarding the integrity/intactness of natural habitat and moose.

Based on the engagement processes, issues of socioeconomic concern included agriculture land, human health, property and residential development, aesthetics, and public safety (in relation to agricultural activities). Socioeconomic issues raised by Indigenous communities and organizations included heritage/culture and traditional land use, such as the changes in amount of land available and to resource harvest activities and the associated experience. As with the ecological VCs, several Indicator topics were established to measure and report on the condition and trend of the VC, as recommended by BC EAO (2013) and CEAA (2014)

Based on the above rationale, the following VCs were selected for the assessment:

- Ecological Environment:
    - Aquatic habitat;
    - Grassland habitat;
    - Forest habitat;
    - Wetland habitat;
- Socioeconomic Environment:
    - Employment and economy;
    - Infrastructure and services;
    - Property and residential development;
    - Recreation and tourism;
    - Agriculture
    - Other commercial resource use;
    - Traditional land and resource use;
    - Health; and
    - Heritage resources.

More details on the justification for VC selection and indicator topics are presented in the individual VC chapters.

7.2.6 Characterizing interactions

The assessment of potential Project effects on the biophysical environment and socio-economic environment is based on the identification of what Project activities and physical works will interact with them and are likely to have effects. As indicated, this is the first step in focusing the assessment on the important issues. Subdividing the biophysical environment into physical and ecological components allows the assessment to evaluate physical components as pathways of change to the various ecological and socioeconomic VCs, where assessment conclusions are reported.

Table 7-1 identifies which Project components and physical activities interact with which physical, ecological and socio-economic components. The potential for interaction was shaped through experience gained in previous environmental assessments on transmission lines, consideration of input from the public, stakeholders, and Indigenous communities and organizations, and the professional judgment of the assessment team.

For this Project the interactions focus on the various activities surrounding installing and maintaining the transmission structures and wires. As described in section 2.6, construction activities include the following:

- Mobilizing the workforce and equipment (including accommodations in the local community or work camps) and developing any necessary access to the work site;
- Establishing and using the marshalling yard and borrow areas;
- Clearing the right-of-way and geotechnical investigations;
- Establishing foundations for the towers;
- Erecting each structure and stringing the wire; and
- Demobilizing after construction and site cleanup.

Table 7-1: Project-environment interactions

Environmental Component		Transmission Line													Station	
		Construction										Operation Maintenance				
		Mobilization	Accommodations	Workforce presence	Access	Clearing	Marshalling Yards	Borrow Sources	Foundations	Structures and Conductors	Demobilization	Physical Presence	Inspection Patrols	Vegetation Management	Equipment Installation	Equipment Maintenance
Physical Environment																
	Terrain and Soils	X	X		X	X	X	X	X	X	X		X	X		
	Air Quality	X	X		X	X	X	X	X	X	X		X	X	X	X
	Noise	X	X		X	X	X	X	X	X	X		X	X	X	X
	Surface Water	X	X		X	X	X	X	X	X	X		X	X		
	Groundwater	X	X		X	X	X	X	X	X	X		X	X		
Ecological Environment																
Aquatic Habitat				X	X	X						X		X		
Vegetation	Grasslands	X		X	X				X	X	X	X	X	X		
	Forests	X		X	X	X			X	X	X	X	X	X		
	Wetlands	X		X	X				X	X	X	X	X	X		
Wildlife	Invertebrates	X		X	X	X			X	X	X	X	X	X		
	Reptiles	X		X	X	X			X	X	X	X	X	X		
	Amphibians	X		X	X	X			X	X	X	X	X	X		
	Birds	X		X	X	X			X	X	X	X	X	X		
	Mammals	X		X	X	X			X	X	X	X	X	X		
Socioeconomic Environment																
Employment and Economy		X	X	X	X	X	X	X	X	X	X					
Infrastructure and Services		X	X	X	X	X	X	X	X	X	X	X				
Property and Residential Development		X	X	X	X	X	X	X	X	X	X	X				
Recreation and Tourism		X	X	X	X	X	X	X	X	X	X					
Agriculture		X	X	X	X	X	X	X	X	X	X	X	X	X		
Other Commercial Resource Use	Mining	X	X	X	X	X	X	X	X	X	X	X	X	X		
	Oil and gas	X	X	X	X	X	X	X	X	X	X	X	X	X		
Traditional Land and Resource Use	Culturally important places	X		X	X	X	X	X	X	X	X	X	X	X		
	Harvesting activities	X	X	X	X	X	X	X	X	X	X	X	X	X		
Health		X	X	X	X	X	X	X	X	X	X	X	X	X		
Heritage Resources		X			X	X	X	X	X	X				X		

As described in section 2.6 operation and maintenance activities include the following:

- Visiting the right-of-way for inspections and maintenance; and
- Managing the vegetation in the right-of-way during the life of the Project.

Once the VCs and interactions likely to have effects are determined, the next step is to characterize the nature of those interactions. This was done based on available regulatory guidance, scientific information, the assessment team's professional judgement and understanding of the interactions, previous experience from similar types of projects and recent environmental assessments, and input from engagement with the public, Indigenous communities and organizations, and regulators.

Table 7-2 describes the factors used to characterize the interactions among the Project and various environmental components.

Where possible, these characteristics are described quantitatively for each VC. Where they cannot be expressed quantitatively, at minimum, they are described using qualitative terms that are defined specifically for the VC or environmental effect. The definitions for the magnitude of the residual effects are specific to each VC and are provided in the VC assessment chapter.

Table 7-2: Factors and criteria used to characterize interactions

Factor	Definition	Criteria	Evaluation
Direction	Describes the difference or the trend of the effect on the environment	Positive	Beneficial or desirable change
		Neutral	No expected change
		Adverse	Adverse or undesirable change
Magnitude	The predicted degree or intensity of disturbance of an effect	Small	No definable or measureable effect; or below established thresholds of acceptable change; or within the range of natural variability; or minimum impairment of an ecosystem component's function
		Moderate	Effects that could be measured and could be determined with a well-designed monitoring program; or are generally below established thresholds of acceptable change; or are marginally beyond the range of natural variability or marginally beyond minimal impairment of ecosystem component's function
		Large	Effects that are easily observable and described, and well beyond guidelines or established thresholds of acceptable change; are well beyond minimal impairment of an ecosystem component's functions.
Geographic Extent	The spatial boundary within which the residual environmental effect is expected to occur.	Project Footprint	Effects confined to the Project Footprint including the ROW.
		Local	Direct and indirect effects that extend beyond the Project Footprint but remain within the Local Study Area defined for the component for some biophysical disciplines or 1.5 km on either side of the Project Footprint for other disciplines
		Regional	Direct and indirect effects that extend into the RSA. This may include cumulative effects from other projects.
Duration	The length of time that the predicted residual effect is expected to last - until the VC returns to its existing condition or the environmental effect can no longer be measured or otherwise perceived.	Short-term	Effects that generally are limited to the construction phase of the Project (i.e., less than one year) or recovery cycle of a biological component.
		Medium-term	Effects that extend throughout the construction and into the operation phases of the Project or that occur within one or two generations of recovery cycles
		Long-term	High level effects that extend greater than 50 years or are permanent, or that extend for two or more generations or recovery cycles.
Frequency	How often/how many times the effect will occur.	Infrequent	Effect may occur once during the life of the Project.
		Sporadic/ Intermittent	Effect may occur without predictable pattern during the life of the Project.
		Regular/ Continuous	Effect may occur periodically or continuously during the life of the Project.
Reversibility	Likelihood and time required for the Project to no longer influence a component. For socio-economic components, the manageability of effects is considered rather than reversibility.	Reversible	Effect is reversible during the life of the Project.
		Permanent	Effect is a long-term permanent effect.
Resiliency	The ability of the component to withstand effects based on current status and general characteristics of the area in which the Project is located.	High	Very resilient.
		Moderate	Reasonable resilience but likely requiring active management and monitoring.
		Low	Very susceptible to impacts requiring active management and monitoring.

7.2.7 Mitigating potential effects

Mitigation measures are developed to eliminate, reduce, or control potential adverse effects to manageable levels where they do not threaten the sustainability of a VC and become significant. The process of characterizing, quantifying and mitigating effects is typically an iterative process for most environmental components. Initial measures considered in the planning and design phase include avoiding the location or critical timing for a VC, reducing the size or magnitude of the Project activity and its associated effect, reducing its geographic extent, or reducing the frequency or duration that a particular Project activity occurs (e.g., number of times a day, number of hours a day). Where residual adverse effects still occur, measures are developed to try to address them through replacement, restoration or compensation measures, by allowing natural recovery, actively facilitating recovery, or constructing something to replace what is being lost.

As an initial step, the flexible nature of transmission line routing allows for the Project team to route the line to reduce effects to people and the environment. Beyond routing, additional mitigative measures during the design, construction and operation of the Project are applied depending on the nature of interactions with the VCs. Some mitigation measures are broad measures that deal with a host of potential adverse effects for a number of VCs. For example, by conducting clearing activities in wetlands under frozen or dry conditions potential disturbance to underlying vegetation is reduced because the ground is frozen and potential disturbance to waterfowl is reduced because they are not present or are in non-critical life stages. In some cases additional VC-specific measures are also required to deal with VC-specific issues not otherwise addressed. In some instances the Project provides an opportunity to create a net positive effect for the current state of a VC.

Mitigation measures are addressed largely through implementation of the environmental protection program described in chapter 10, and in particular, the general and specific mitigation measures described in the construction environmental protection plan (CEnvPP - Appendix G) and cultural and heritage resources protection plan (CHRPP - Appendix H). Specific mitigation measures for each biophysical and socioeconomic component are described in the following two sections.

7.2.8 Characterizing residual effects and determining significance

Residual effects are those that remain after the application of mitigation measures. As indicated, the process is typically iterative and the goal in developing mitigation

measures is to reduce residual adverse effects to “acceptable” levels were they do not threaten the sustainability of a VC and become significant. Guidance is provided through the various criteria listed in Table 7-2 using results of research, field studies, engagement and professional judgement, to predict potential significance. The Canadian Environmental Assessment Agency (CEAA 2017) has developed guidance on determining whether a project is likely to cause significant effects. Guidance from the BC Environmental Assessment Office (BC EAO 2013) was also used.

Due largely to the complexity of the environment it is not always possible to fully mitigate all possible adverse effects. For any given location there may be measures that are beneficial to some aspects but detrimental to others. For example, routing the transmission line to avoid critical habitat for one wildlife species may result in the loss of habitat for another species.

One of the primary goals of this document is to demonstrate that all important aspects have been carefully considered and that potential adverse effects have been managed appropriately. Due to the complexity of some of the issues for this Project a determination of the significance of residual effects has been established for the VCs. In general, significant effects are those likely to be of sufficient magnitude, duration, frequency, geographic extent or irreversibility to cause a change in the VC that will alter its status or integrity beyond an acceptable level.

7.2.9 Cumulative effects and climate change

Information on other past, existing or planned projects or activities in the RAA are described in section 5.2, and climate change scenarios are described in chapter 5.2.3. After the significance of Project-specific effects is determined for each VC, the significance conclusion is tested by assessing cumulative effects and future resiliency due to climate change, as described below.

The cumulative effects assessment involves examining potential interactions among other projects and activities with the Project’s residual environmental effects. Where there are potential interactions there is an examination of the pathways and characteristics of these interactions and use of the same criteria to determine if residual effects are still manageable, or if they have exceeded a significance threshold requiring additional mitigation. If further mitigation is required to address risks of Project effects exceeding a significance threshold, this is described in each VC section.

In additional to testing the significance conclusions to cumulative effects, the sensitivity of Project and cumulative effects predictions to potential climate change scenarios are analyzed. The significance prediction for each VC is reviewed to evaluate if these predictions would change as a result of climate change. If there is no likely change, then

no further analysis is undertaken. If there is a change, the Project sensitivity will be analyzed and the range and extent of possible impacts on the Project and VCs and resultant potential risks to people or the environment assessed. As with the cumulative effects assessment, further mitigation is described in each VC section to address risks of Project effects exceeding a significance threshold if/where required.

7.2.10 Follow up and monitoring

Manitoba Hydro uses an adaptive management approach in dealing with potential Project effects. Best efforts are made to predict and characterize effects, but follow-up and monitoring is carried out to verify the accuracy of the environmental assessment of a project, assess the effectiveness of measures taken to mitigate adverse effects through the continuous observation, measurement or assessment of environmental conditions at and surrounding the Project and determine compliance with regulatory requirements.

Manitoba Hydro's Environmental Protection Program provides the framework for implementation, management, monitoring and follow-up of environmental protection activities in keeping with environmental effects identified in the environmental assessment as well as in regulatory requirements. The Program outlines how Manitoba Hydro is organized and functions to deliver timely, effective, and comprehensive solutions and mitigations to predicted environmental issues and effects. The Program, fully described in chapter 10, consists of the following:

- An implementation framework outlining how environmental protection is delivered and managed;
- The Construction Environmental Protection Plan (CEnvPP);
- Contractor Environmental Management Plans;
- A Culture and Heritage Resources Protection Plan; and
- An Environmental Monitoring Plan.

Adaptive management will be a core approach in implementation of the EPP. Adaptive management is a planned process for responding to uncertainty or to an unanticipated or underestimated Project effect. It applies information learned from monitoring actual Project effects and comparing them with predicted effects. If there is a variance between the actual and the predicted effects, a determination will be made as to whether modifications are required in existing mitigation measures or other actions are necessary to address the variance, or in cases where there may be no mitigating options available, the appropriate information is disseminated in a timely manner. Plans

for reporting and disseminating information regarding follow-up and monitoring activities, including any public reporting, are included in the EPP.

7.2.11 Effects of the environment on the Project

The assessment includes an evaluation of environmental effects that may occur as a result of the environment acting on the Project. Potential environmental changes and hazards may include wind, severe precipitation, ice storms, flooding, grass and forest fire, earthquakes and/or tornado. The influence that these environmental changes and hazards may have on the Project will be predicted and described as well as the measures taken to avoid potential adverse effects. The effects of the environment on the Project are presented in chapter 8.

7.2.12 Accidents, malfunctions and unplanned events

The assessment considers the effects of accidents, malfunctions or unplanned events that might occur in connection with the Project. It includes a range of potential accident, malfunction and unplanned events scenarios from the construction and operation of the Project and evaluates their environmental effects. It provides an initial basis for the development of emergency response planning and what eventual will be incorporation into the Project's emergency response plan. Accidents, malfunctions, and unplanned events scenarios were developed using historical risk assessment information where available for similar projects at a provincial, national or international scale, as appropriate. For each event considered, a possible scenario relating how the event might occur during the life of the Project was developed. Details on the types of accidents, malfunctions and unplanned events considered in this environmental assessment and the scenarios developed for this assessment, are discussed in chapter 9. Potential environmental effects on the VC due to accidents, malfunctions and unplanned events are assessed in a similar fashion to Project environmental effects. Environmental effects are characterized using the same terms used for routine project environmental effects, and mitigation measures are prescribed. The significance of the environmental effect is then determined using the same thresholds used for routine project environmental effects.

7.3 Predicted physical environment changes

7.3.1 Overview

As indicated, for this Project the various physical environment components are described as pathways or vectors of effect on the ecological and socioeconomic

receptors and VCs, where assessment conclusions are made. This section characterizes the anticipated changes in physical environment components, and the VCs likely to be affected. Mitigation measures are presented in the various VC sections.

7.3.2 Atmospheric environment - noise and visual disturbance

7.3.2.1 Summary of current status

As noted in section 5.3.3.2, the Project is located in an area predominantly used for agricultural purposes and existing noise conditions would not be expected to be an issue for the majority of the year. The exception may occur at harvest time when harvesting activities result in increased vehicular and equipment activities that would increase local noise.

7.3.2.2 Relevant Project interactions

During construction the presence of workers and equipment will generate noise and visual disturbances during activities associated with the mobilization to the site, clearing the ROW, use of the marshaling yard, establishing tower foundations and erecting/stringing conductors and demobilization. Sources of noise disturbance during construction would be typical of heavy equipment such as backhoes and haulage trucks. Construction activities are anticipated to generate intermittent noise over the construction period (two 3-4 months of construction; scheduled for fall/winter).

Noise and physical disturbance is discussed further under the various ecological VCs in section 7.4, including the Aquatic Habitat VC and for the various wildlife indicator species in the Grassland, Forest and Wetland Habitat VCs. It is also discussed in section 7.5 under various socioeconomic VCs, including Property and Residential Development, Agriculture, Recreation and Tourism, and Traditional Land and Resource Use. Table 7-3 identifies sound levels for some of the machinery that could be used for the Project during the construction phase activities for the sake of comparison.

Table 7-3: Construction noise sources (Golder Associates 2008)

Source Name	Sound Power (dBA)	Type
Blast noise	137	Highly Impulsive
Back-up alarm	115	Impulsive, tonal
Feller	111	Continuous
Skidder	105	Continuous
Wheeled loader	110	Continuous
Hand held chainsaw	110	Continuous

Track dozer	116	Continuous
Excavator/hoe	110	Continuous
Compressor	94	Continuous
Dump/highway/logging trucks	116	Continuous
Concrete truck	107	Continuous
Generator	110	Continuous
65/80t crane	116	Continuous
Medium backhoe	100	Continuous
Rough terrain crane	111	Continuous
Hydraulic hammer pile driver	137	Impulsive
Helicopter - lift type, approach and takeoff	139	Continuous
Helicopter - lift type at hover or flyover	131	Continuous

It is expected that noise levels located one mile away from construction activity, outside of the LAA, would be considerably less and likely approaching background levels for most construction equipment/activities. During construction, wildlife and homeowners in proximity to the preferred route could experience noise and visual disturbance effects. Construction will involve the use of heavy machinery such as drilling rigs, cranes and concrete trucks. It may involve a heavy lift helicopter for installing towers onto foundations. Furthermore, the use of implosives for splicing conductors is an example of an activity that is also source of noise. The higher sound levels generated during construction will be transient as equipment is moved along the ROW; therefore, nearby residents and wildlife will not be affected for prolonged periods. Noise and visual disturbance generated during construction activities will be temporary and intermittent, and noise levels will typically fall within acceptable provincial noise level guidelines or similar to activities already taking place in the area (i.e., agricultural activities).

During operations and maintenance activities noise and visual disturbance will be generated during the ROW inspections and managing the vegetation in the ROW during the life of the Project. Noise and visual disturbance effects during operation and maintenance activities are expected to be minimal, as inspection and maintenance patrols of the ROW, structures and hardware are typically undertaken only two or three times per year. Non-scheduled patrols or maintenance may also be conducted by ground or air should unexpected repairs to the lines be required. Potential effects are not expected to be a concern as the effects will be short-term in duration, intermittent in nature (consistent with fluctuations in construction effort and clearing program intensity), and localized. Given the mitigation measures proposed in the various VC assessment sections, noise effects were not assessed as being significant for this Project.

7.3.3 Atmospheric environment - air quality

7.3.3.1 Summary of current status

As indicated in section 5.3.2.2, the Project is located in an area predominantly used for agricultural purposes and air quality conditions would not be expected to be an issue for the majority of the year. The exception may occur at harvest time when harvesting activities result in increased vehicular and equipment activities that would decrease local air quality, including emissions and particulate matter from and reduced visibility from local crop residue burning programs.

7.3.3.2 Relevant Project interactions

The environmental effects of the Project on the atmospheric environment will be greatest during the construction phase and will consist of short-term, local increases in vehicle and equipment emissions, dust, particulates and smoke generated from any burning of cleared material, if this disposal approach is used. Dust and particulate matter have the potential to adversely affect air quality, primarily through use of gravel roads by vehicles during both construction and operation and maintenance, but also potentially during any stockpiling of materials, or construction activities in areas of exposed soil during dry conditions. Higher vehicle emissions can affect local air quality. In addition, air quality can be affected by emissions from engine exhaust and any burning of woody debris during the construction and maintenance activities such as materials and equipment hauling and vegetation management. It is noteworthy that very little woody material is expected as the ROW passes mainly through agricultural fields.

Potential air quality effects relate to the wildlife indicator species in the Grassland, Forest and Wetland Habitat VCs (section 7.4), as well as several socioeconomic VCs in section 7.5, such as the Health VC (section 7.5.5). As indicated, due to the routing process the activities should not be close to residences and there are few areas of natural habitat along much of the route. As the air quality in rural Manitoba is very good and the Project activities are mostly away from urban areas, there are limited effects on air quality or visibility for workers or any surrounding public, including rural residential inhabitants as well as residents of the towns and villages in the area.

The effects of operation and maintenance activities on the atmospheric environment will be minimal, as inspection and maintenance patrols of the right-of-way, structures and hardware are typically undertaken only two or three times per year. Non-scheduled patrols or maintenance may also be conducted by ground or air should unexpected repairs to the lines be required. Potential effects are not expected to be a concern as

the effects will be short-term in duration, intermittent in nature (consistent with fluctuations in construction effort and clearing program intensity), and localized. Given the mitigation measures proposed in the various VC assessment sections, air quality effects were not assessed as being significant for this Project.

7.3.4 Atmospheric environment – electromagnetic fields (EMF)

7.3.4.1 Summary of current status

Electric fields are a result of voltages applied to electrical conductors and equipment and are easily blocked by most objects (e.g., fences, vegetation, buildings). Magnetic fields are produced by the flow of electric current and are not blocked by most materials (Exponent 2015). Sources of electromagnetic fields (EMF) include the generation and transmission of electricity, and so exposure to EMF is considered in this assessment, as there have been concerns expressed about potential health effects.

7.3.4.2 Relevant Project interactions

Electric and magnetic field (EMF) levels measured near any source depend upon a number of factors but diminish rapidly with increasing distance from the source. Canadian (Manitoba Clean Environment Commission 2001) and international studies including World Health Organization (2007) and International Agency for Research on Cancer (2001) have concluded that there is insufficient scientific evidence showing exposure to low EMFs can cause adverse health effects. Health Canada (2004) states that there is no conclusive evidence of any harm caused by exposures at levels normally found in Canadian living environments. While Manitoba Hydro is sensitive to public concerns regarding potential health effects from electric and magnetic fields, there is at present no scientific evidence to justify modification of existing practices respecting facilities for the generation, transmission and distribution of electricity.

7.3.5 Terrain and soils

7.3.5.1 Summary of current status

Potential effects to terrain and soils can occur during construction as the workforce and equipment mobilize to the site, during the establishment and use of the marshalling yard, clearing the right-of-way, installing the towers and demobilizing from the Project site. Potential effects during operations and maintenance can occur during regular inspections and in managing the vegetation in the right-of-way.

Effects relate to soil compaction and mixing, erosion, and contamination. There is greater potential for effects when vehicles and equipment mobilize to the Project site to conduct clearing, and tower installations. Activities during operations and maintenance are much less frequent but also involve vegetation management measures. Potentially affected VCs include the Aquatic Habitat VC (section 7.4.2), the Grassland, Forest and Wetland Habitat VCs (sections 7.4.3, 7.4.4, and 7.4.5, respectively), and the Agriculture VC (section 7.5.3).

7.3.5.2 Relevant Project interactions

Water erosion

Water erosion of soil involves the detachment of soil particles and transport during runoff events. Construction activities can expose soils to increased risk of erosion by water. Beside the ground cover, risk depends on surface texture, organic matter content and permeability. Water erosion can affect fields as rills and gullies causing site specific damage not only as soil loss but also as physical cuts that can affect equipment manoeuvrability.

Water erosion can severely reduce the soil productivity by removal of the surface fertile soil layer containing organic matter and other nutrients. Soil loss leads to reduced productivity and crop loss diminishing the capability for agriculture. Natural restoration of topsoil loss can take centuries to replace, depending on the location, climate and the severity of loss. Prevention of water erosion in high risk areas is essential during construction to maintain productivity of the land.

Water erosion risk data was compiled for the RMs in the RAA based on soil texture and bare ground conditions. Water erosion can severely reduce the soil productivity by removal of the surface fertile soil layer containing organic matter and other nutrients. Eighteen to twenty percent of the RMs of Ellice-Archie and Prairie View have high to severe water erosion risk (Table 7-4). In the RM of Russell-Binscarth almost half (47.8%) of the land area is classified as high-to severe risk of water erosion. Most of the severe risk areas are in the Assiniboine River and tributary stream valleys in the area. There is also a wide area in the north portion of the region on both sides of PTH 41 that are classed as severe risk due to rolling topography and slopes of 5-9%. The Project Footprint passes through a portion of this zone east of PTH 41 and south of PR 475 for approximately 5 km of transmission line route.

Table 7-4: Water erosion risk in the RAA

Water Erosion Risk Category	RM of Ellice - Archie		RM of Prairie View		RM of Russell-Binscarth	
	Area (ha)	Percent	Area (ha)	Percent	Area (ha)	Percent
Very Low	20,819	18.0	35,569	20.9	5,908	10.3
Low	42,150	36.5	28,734	16.9	2,818	4.9
Moderate	31,200	27.0	72,298	42.6	21,255	37.2
High	3,606	3.1	22,045	13.0	5,906	10.3
Severe	17,791	15.4	14,342	8.4	21,407	37.5

Source: (AAFC 1998 a-e)

Water erosion risk data was further evaluated using SoilAid data from Manitoba Land Initiative (MLI 2017). Details can be found in Appendix D. Water erosion risk is either high or severe for almost 30% of the PFA and of that 25% is severe risk (Table 7-5). In addition to stream and river valleys where risk is severe, there is a large area where the final preferred route turns west toward PTH 41 from the north-south section that is also rated a severe risk of water erosion due to soil type and topography. Appropriate farm techniques such as residue management, conservation tillage, and permanent cover can substantially reduce the risk (Manitoba Sustainable Development 2008). Given the mitigation measures proposed in the various VC assessment sections, water erosion effects were not assessed as being significant for this Project.

Table 7-5: Water erosion risk with the LAA and PFA

Water Erosion Risk	LAA		PFA	
	Area (ha)	Percent	Area (ha)	Percent
Very Low	2252.1	15.4	30.2	16.4
Low	2041.5	14.0	38.7	21.0
Moderate	5084.6	34.8	62.3	33.8
High	1548.2	10.6	7.0	3.8
Severe	3592.6	24.6	46.1	25.0
Water	104.6	0.7	0.3	0.2
Urban, modified or unclassified	0	0	0	0
TOTAL	14622.7	100	184.7	100

Wind erosion

Like water erosion wind erosion removes the fertile topsoil through dislodgement of soil particles by wind action. Susceptibility to wind erosion depends on soil texture and structure with sands potential than clays, and single particle soils greater than crumbly or cloddy soils. Soil particles dislodged by wind move in several different ways including surface creep, saltation (bouncing and dislodging other particles), and suspended in the air.

Wind erosion risk data is less readily available for the RAA. Risk mapping is available for the Assiniboine-Birdtail integrated watershed management plan (Manitoba Sustainable Development 2008) that shows very little high to severe risk areas in the area (Figure 7-1). A pocket of high risk land for wind erosion exists south of Silver Creek where it enters the Assiniboine Valley (Manitoba Sustainable Development 2008). No areas of severe wind erosion occur in the PFA, although some areas of the Spy-Hill-Ellice Community Pasture are susceptible to wind erosion due to soil type and texture. Given the mitigation measures proposed in the various VC assessment sections, wind erosion effects were not assessed as being significant for this Project.

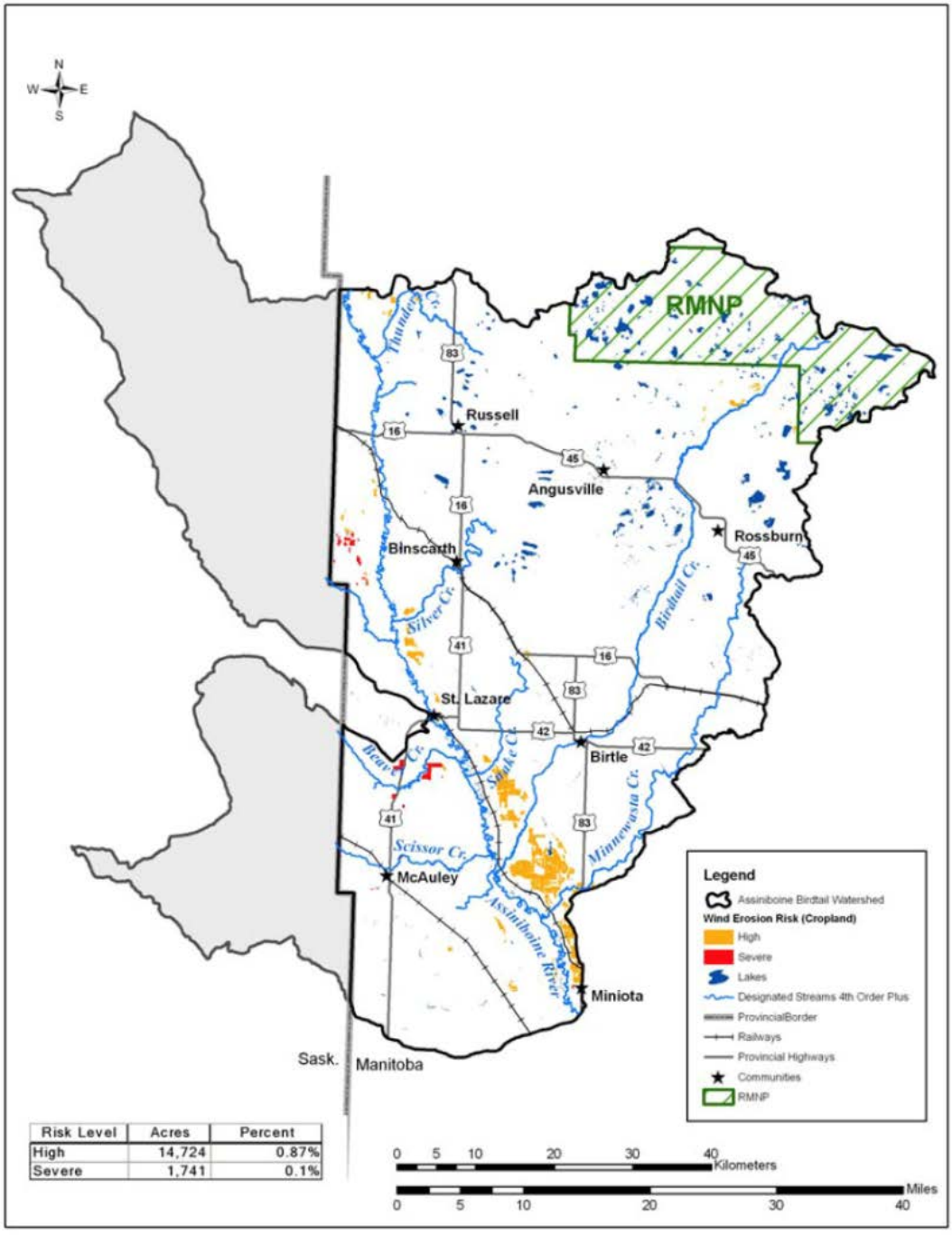


Figure 7-1: Wind erosion risk (MSD 2008)

Soil compaction

Soil compaction is the process of compression reducing space between soil particles normally filled with air or water. The density of the soil increases as a result reducing

water infiltration and impeding seedling emergence, root growth and yield (Manitoba Agriculture 2017e).

Soil compaction in locations of vehicle traffic, material handling and storage, and construction can result in increased run-off, potentially affecting decreased vegetative growth and reduced crop yields. Soil compaction is a function of soil texture and drainage and of importance to transmission line construction. Manitoba Hydro (2015a) developed a matrix to evaluate soil compaction risk using soils data (Table 7-6). The matrix indicates that moderately fine to fine textured soils with imperfect to poor soil drainage are at a high risk of compaction.

Table 7-6: Soil compaction risk matrix

Drainage	Textural Class					
	Very Coarse (S, LS, LFS)	**Moderately Coarse (SL, FSL)**	**Medium (VFSL, L, SiL)**	**Moderately Fine (SCL, CL, SiCL, Si)**	**Fine/Very Fine (SC, SiC, C, HC)**	**Organic**
Rapid	Low	Low	-	-	-	-
Well	Low	Low	Low	Moderate	Moderate	-
Imperfect	Low	Low	Moderate	High	High	-
Poor	Moderate	Moderate	High	High	High	-
Very Poor	-	-	-	-	-	High

NOTES:

S = sand	LS = loamy sand	LFS = loamy fine sand	SL = sandy loamy
FSL = fine sandy loam	VFSL = very fine sandy loam	L = loam	SiL = silt loam
SCL = sandy clay loam	CL = clay loam	SiCL = silty clay loam	Si = silt
SC = sandy clay	SiC = silty clay	C = clay	HC = heavy clay

SOURCE: Matrix developed using professional judgment and review of two compaction systems (Archibald *et al.* 1997; British Columbia Ministry of Forests 1999)

Moving from west to east in the RAA, the community pasture soils are dominantly sand textured (glaciolacustrine/eolian) and are very well drained and generally at a low risk of compaction. However, the Gleysols in the river valleys are highly susceptible to compaction because they have high water tables and are saturated during spring conditions (Table 7-7).

The dominant soil materials found in the RAA consist mainly of loamy textured glacial till (morainal deposits) (Land Resource Unit, 1998a, b, c and d). Soil drainage information (AAFC 1998b) indicates these soil groups to be well drained which would place the

compaction risk at moderate in the matrix. The high soil compaction risk occurs in the humic gleysol soil groups found in wooded area and along the river and stream valleys in the region. The analysis for the Project Footprint shows that only 5.2% (8.9 ha) of the route has soils considered at high risk of soil compaction. On a 40 m ROW width that equates to a route length of approximately 2.2 km on high risk soils. Given the mitigation measures proposed in the various VC assessment sections, soil compaction effects were not assessed as being significant for this Project.

Table 7-7: Soil compaction risk for LAA and Project footprint

Soil Series	Classification	Soil Compaction Risk*	LAA		Project Footprint	
			Area (ha)	Percent (%)	Area (ha)	Percent (%)
Eroded Slopes	Eroded Slopes	Moderate	1,408.7	9.6	13.0	7.0
Dorset	Orthic Black Chernozem	Low	1,356.0	9.3	32.0	17.3
Jaymar	Orthic Black Chernozem	Moderate	2,343.1	16.0	23.4	12.7
Miniota	Orthic Black Chernozem	Low	1,491.1	10.2	21.2	11.5
Newdale	Orthic Black Chernozem	Moderate	6,639.5	45.4	79.0	42.8
Stockton	Orthic Black Chernozem	Low	292.9	2.0	0.6	0.3
Basker	Rego Humic Gleysol	High	236.1	1.6	0.8	0.8
Drokan	Rego Humic Gleysol	High	230.8	1.6	2.1	1.1
Marsden	Rego Humic Gleysol	High	77.3	0.5	-	-
Levine	Gleyed Cumulic Regosol	High	89.5	0.6	6.0	3.3
Shilox	Orthic Regosols	Low	353.2	2.4	6.1	3.3
-	Water	-	104.6	0.7	-	0.2
TOTAL			**14,622.7**	**100**	**184.7**	**100**

Soil contamination

Soil contamination is a potential effect during construction and operation/maintenance activities due to spills from construction and maintenance vehicles/equipment (e.g., fuel, oil, or hydraulic fluid). Soil contamination can also result from the persistence of herbicide residues, subsequent to the application of vegetation management strategies. The primary effect of both forms of contamination is a reduction in soil productivity. Given the mitigation measures proposed in the various VC assessment sections, soil contamination effects were not assessed as being significant for this Project.

7.3.6 Groundwater

7.3.6.1 Summary of current status

As indicated in section 5.3.4, sand and gravel aquifers are commonly found as discrete buried lenses or layers in the overburden, which is typically 20 to 40 m of glacial till, outwash, and lacustrine deposits). Existing groundwater quality is variable with most sources exceeding one or more aesthetic objectives for drinking water.

7.3.6.2 Relevant Project interactions

Potential effects to groundwater can occur during construction as the workforce and equipment mobilize to the site, during the establishment and use of the marshalling yard, and installing the towers and demobilizing from the Project site. Potential effects during operations and maintenance can occur during regular inspections and in managing the vegetation in the ROW.

Groundwater contamination could result from deleterious substance spills or leaks from vehicles or equipment (e.g., fuel, oil, or hydraulic fluid), and from herbicides used for vegetation control during operation. In areas with artesian wells or springs, geotechnical drilling and foundation installation can result in a direct groundwater discharge to the surface and can create the potential for surface and ground water interconnection. Potentially affected VCs include the Grassland, Forest and Wetland Habitat VCs (sections 7.4.3, 7.4.4, and 7.4.5, respectively), the Agriculture VC (section 7.5.3), and the Health VC (section 7.5.5). Given the mitigation measures proposed in the various VC assessment sections, groundwater effects were not assessed as being significant for this Project.

7.4 Ecological effects assessment

7.4.1 Overview

The selection of the Project's four ecological VCs is based on several factors including consideration of input from regulators, the public, Indigenous communities, stakeholders, professional judgement from Manitoba Hydro and information derived from the project-environment interactions table (Table 7-1). Based on this information, the ecological effects assessment is organized around the four basic habitat type VCs: aquatic, grassland, forest and wetland. For each VC, the following information is provided:

- Summary of current status:

    - Habitat;
    - Indicator species (where relevant);
- Relevant Project interactions;
- Project assessment:
    - Predicted changes to VC;
    - Mitigation;
    - Project assessment significance conclusion;
- Sensitivity to cumulative effects;
- Sensitivity to climate change; and
- Follow-up and monitoring.

Within the three assessment areas (Project Footprint, Local, Regional), 14 land use/land cover classes are identified from the Manitoba Land Cover Classification (Table 5-2). These classes include native vegetation of grassland, wetlands, and coniferous, deciduous and mixedwood forests. The water class includes rivers and streams. Agricultural cropland, cultural features and roads are also identified. The land use/land cover was determined (calculated) for classes by assessment area. The proposed Project occurs almost entirely within both the Hamiota and St. Lazare Ecodistricts; the Melville Ecodistrict occupies a minor portion.

Map 5-1 shows the land cover in the RAA.

Land Use/ Land Cover Classes	Project		Local		Regional	
	Area (ha)	%	Area (ha)	%	Area (ha)	%
Agricultural Cropland	69.0	37.3	6,619.1	45.3	36,666.8	37.8
Deciduous Forest	22.8	12.3	1,948.6	13.3	16,244.7	16.8
Water	0.5	0.3	135.7	0.9	1,448.2	1.5
Grassland/Rangeland	61.5	33.3	4,387.0	30.0	32,648.7	33.7
Mixedwood Forest	-	-	-	-	3.0	<0.1
Marsh and Fens	2.5	1.4	299.9	2.1	2,694.3	2.8
Treed and Open Bogs	-	-	-	-	78.3	0.1
Coniferous Forest	-	-	-	-	0.4	<0.1
Open Deciduous	5.9	3.2	443.5	3.0	2,908.5	3.0
Forage Crops	5.9	3.2	502.5	3.4	2,019.7	2.1
Cultural Features	-	-			183.6	0.2
Forest Cutover	-	-	1.8	<0.1	6.5	<0.1
Bare Rock, Gravel and Sand	-	-	4.3	<0.1	35.7	<0.1
Roads and Trails	16.6	9.0	281.0	1.9	1,977.2	2.0

7.4.2 Aquatic habitat

7.4.2.1 Summary of current status

There are eleven stream crossings along the final preferred route. Five of the stream crossings are potentially fish-bearing (Milani 2013) with up to 65 species of fish (Cleator et al. 2010). The five crossings are as follows:

- Assiniboine River;
- Birdtail Creek;
- Snake Creek;
- Armstrong Creek; and
- Snake Creek Tributary.

Based on the engagement processes (described in chapters 3 and 4) as well as past project experience, fish and fisheries in the Regional Assessment Area (RAA) are known to have social, cultural and economic importance. Interaction with the Project is organized around the Aquatic Habitat VC.

The existing land cover within the riparian Project Footprint Area (PFA) is provided in Table 7-8 for each of the five fish-bearing stream crossings. Three of the stream crossings have partially forested riparian areas. These are the crossings where the

highest risk to fish habitat occurs as clearing of the ROW will lead to the largest change from existing conditions.

Table 7-8: Land cover classification within the riparian project footprint

Watercourse Name	Existing Land Cover (%) within the Riparian Project Footprint			
	Agriculture	Wetland	Grassland/ Shrubland	Forested
Assiniboine River	31%	0%	53%	16%
Birdtail Creek	0%	38%	0%	62%
Snake Creek	0%	0%	50%	50%
Armstrong Creek	33%	0%	67%	0%
Snake Creek tributary	100%	0%	0%	0%

The Assiniboine River at the transmission line crossing is at a gentle bend in the river. Within the PFA, the west bank is on the outside bend. The riparian area is primarily agricultural cropland with a thin strip of trees along the river and likely has a low contribution to fish habitat quality. Riparian areas in agricultural lands typically provide little shade and contribute to increased erosion and pesticide runoff into adjacent watercourses. The western bank is unstable as it is on the outside bend, which is typically of meandering prairie rivers. The eastern bank is primarily grasses, shrubs and trees. The reach along the crossing would provide good habitat quality. Instream habitat would be relatively complex as there would be varied water velocities, leading to varied substrates.

Habitat quality within the Local Assessment Area (LAA) is similar to the PFA. The west side of the river is entirely agricultural land use with farming practices occurring almost to the edge of the river, with a small strip of trees right along the west bank. There are a few unconnected oxbows as well. On the east side of the river, the riparian area is natural vegetation consisting of grasses shrubs and trees.

As mentioned in section 5.4.2.3 and Appendix D, the Assiniboine River has a very diverse assemblage of fish and other aquatic species, and there is the potential for priority species such as mapleleaf mussels, chestnut lamprey, silver chub or bigmouth buffalo to be present.

The riparian area along Birdtail Creek within the PFA is primarily forested with a few low lying areas containing wetland vegetation. Wetlands provide moderate contribution to

fish habitat quality, in terms of moderate shade and established root systems which can provide channel stability. The low lying areas could provide additional instream habitat during high flows. The forested areas could provide some shade, but the channel is wide and the banks are shallow. Within the LAA the riparian habitat is entirely natural consisting primarily forested area. As noted in Appendix D, fish species are primarily limited to forage species tolerant of warm shallow ponds such as brook stickleback and fathead minnow.

The Snake Creek crossing, although surrounded by agricultural cropland, has a healthy riparian buffer. Within the PFA and LAA, adjacent to the creek, the riparian area is primarily grasses, shrubs and trees. These areas can contain moderate to high contribution to fish habitat quality. Native upland vegetation has established root systems which can reduce erosion. Shrubland provides moderate shade, and forested and treed areas provide good shade. The trees would also provide nutrient inputs as well as future instream structure. Similar to Birdtail Creek, fish species are primarily limited to forage species tolerant of warm shallow ponds such as brook stickleback and fathead minnow.

The Armstrong Creek crossing is in an agricultural area. Within the PFA there is a small riparian buffer of grasses and shrubs. Within the LAA agricultural land cover extends well within the riparian area. Flows are ephemeral in the creek, likely only providing suitable habitat during spring flows. As noted in Appendix D, the crossing site was dry during the site visit.

The Snake Creek tributary within the PFA is entirely within an agricultural area, primarily annual cropland. The flows are ephemeral, likely only providing habitat in the spring. At the crossing location, habitat quality is poor, as the channel is a swale in an area consisting entirely of annual cropland. This is consistent with habitat quality within the LAA. The channel is a series of low lying areas within annual cropland, likely only providing fish habitat during the spring melt.

Land use in the LAA can be characterized as disturbed because in many areas it is dominated by agriculture. Activities associated with these land uses can increase suspended sediments and sediment in the bedload of adjacent watercourses. With the implementation of mitigation measures, land-based, Project-related construction activities are not expected to increase sedimentation within the watercourses.

Analysis of the potential change in percent coverage of riparian vegetation types is focused on land cover categories in which the Project will have the largest potential impact. Development of the ROW involves the removal of trees (forested areas), whereas grasses and shrubs will not be cleared (Table 7-9). In two of the five watercourse crossings, land cover within the riparian area within the PFA was

predominately agriculture, grassland/ shrubland or wetland. At these crossings, there will be no requirement for clearing within the 30 m riparian buffer and therefore no change from the current land cover.

At crossings where the PFA is moderately to predominantly treed, the expected change in riparian vegetation is determined to be minimal because equivalent riparian vegetation is abundant within the LAA and beyond.

Without mitigation, fish that are part of, or support, a commercial, recreational or Aboriginal fishery, and particularly priority species (chestnut lamprey, mapleleaf mussel), could potentially have life processes affected by increased sedimentation, particularly sensitive early life stages. Mitigation measures are discussed in section 7.4.2.3.

Table 7-9: Change in riparian vegetation cover at watercourse crossings

Site	Watercourse Name	Forested Cover*	
		Acres	%
1	Assiniboine River	0.15	16%
2	Birdtail Creek	0.23	62%
3	Snake Creek	0.45	50%
4	Armstrong Creek	0	0%
5	Unnamed Tributary of Snake Creek	0	0%

*Forested cover within the ROW and within 30 m of the water's edge

7.4.2.2 Relevant Project interactions

While the likelihood is low with this Project, activities such as the removal of riparian vegetation and introduction of sediments from areas of exposed soil have the potential to interact with aquatic habitat, which has the potential to have effects on fish resources. As described in section 2.6.3, the ROW will be cleared to accommodate the Project. The ROW will be cleared of trees and understory to allow for safe and reliable operation of the transmission line. Clearing requirements for the new transmission line rights-of-way will also require selective clearing of danger trees beyond the ROW.

As described in section 2.6.3, access for construction and subsequent line maintenance activities will generally occur along the ROW using existing public access roads or trails wherever possible. This enables maximum use of existing road access and limits the requirement for the development of new temporary trail access. Minor deviations

(bypass trails) from the ROW may be necessary in severe terrain conditions. Some new access may be required in riparian areas, primarily if a temporary stream crossing is required. Water crossings (e.g., snow fills, ice bridges, fording) along temporary access trails and roads, and water crossings at the transmission line ROW may be required for the transport of equipment and workers during ROW clearing and construction activities. New access points could require vegetation clearing and without mitigation may cause rutting along the banks.

Project-related sensory disturbance such as construction noise, the presence of workers and vibrations may result in the temporary displacement of fish if they avoid otherwise suitable habitat during construction and due to inspection patrols and vegetation management during operation. Use of industrial equipment adjacent to waterways could lead to hazardous materials spills and leaks causing hazardous materials to enter adjacent waterways. Machinery can also cause soil compaction, erosion and sedimentation. This can lead to sediment entering adjacent watercourses. The above construction and maintenance activities could lead to a change in water quality.

During the operational phase of the Project, effects relate more to herbicides entering the watercourse from vegetation management activities. As described in section 2.6.3, vegetation management within the ROW is required for public and employee safety, as well as the reliable operation of the line. The ROW will be maintained on an ongoing basis throughout the life cycle of operation. Regular vegetation management is required on an ongoing basis to make sure that regrowth in the cleared ROWs does not interfere with transmission line operations. The above construction and maintenance activities could potentially lead to a loss of riparian vegetation at each of the five stream crossings. Herbicides are one tool used for vegetation management. The use of herbicides, if not applied according to label and pesticide use permit instructions, could lead to release of contaminants to adjacent waterways. As indicated, the presence of the line (and cleared ROW) could lead to increased access leading to increased fishing pressure, direct fish mortality and population changes.

7.4.2.3 Project assessment

Predicted Changes in aquatic habitat

The final preferred route will create five overhead line water crossings of potentially fish-bearing watercourses. Clearing of riparian vegetation, and in particular, tree canopy that overhangs watercourses could reduce cover for fish, reduce shade, which moderates water temperature, and reduce habitat for insects which can be a food source for fish (Government of Manitoba 2015b; Manitoba Riparian Health 2015). Increases in water

temperature can encourage the microbial breakdown of organic matter, leading to a depletion of dissolved oxygen in the watercourse, which is essential for sustaining aquatic life. Removal of overhanging canopy will also limit the long-term input of large woody debris (fallen trees which provide for more complex fish habitat) and leaf litter (a source of nutrients and food for some aquatic invertebrates) into the watercourse.

Of the five watercourses potentially containing fish habitat, three (Assiniboine River, Birdtail Creek, and Snake Creek) have banks with overhanging riparian canopy vegetation. Vegetation removal at watercourse crossing locations can lead to bank instability, bank slumping and exposure of bare soil. This could lead to erosion and subsequent sedimentation into watercourses.

Machinery operating near watercourses can also create ruts and compact soils, especially in saturated, floodplain areas next to watercourses. Compacted soils can channelize water flow effectively, leading to less infiltration and greater surface erosion. Inputs of eroded soil can increase water turbidity, reduce light availability (and aquatic photosynthesis), contribute nutrients, alter benthic invertebrate habitat, and cover fish spawning areas and affect feeding success of fish that rely on clear water to capture prey.

Predicted Changes in indicator species

Indicator species of aquatic habitat were identified to include those with commercial, recreational or Indigenous value, such as walleye and northern pike, species of conservation concerns such as chestnut lamprey and mapleleaf mussel, and invasive and non-native species such as zebra mussels. Without appropriate planning and mitigation and species of conservation concern and traditional use species have the potential to be adversely affected during Project activities and invasive and non-native species have the ability to spread and out-compete other native species as a result of the Project.

Clearing of riparian vegetation can affect fish mortality and health by reducing shade cover and increasing local water temperatures. Increases in water temperature can diminish egg survival in species with lower thermal thresholds, as well as increasing fungal growth on eggs of summer spawning species (Carter 2005). In addition, low order stream communities in deciduous woodlands are energetically dependent upon litter materials contributed by riparian vegetation (Vannote et al. 1980; Benfield and Webster 1985; Malmqvist and Oberle 1995). Changes in litter inputs can have effects on invertebrate abundance, and in turn decrease food availability for fish. The potential effect of tree clearing will decrease with increasing stream size. As stream size increases, the reduced importance of terrestrial organic input coincides with enhanced

importance of allochthonous primary production and organic transport from upstream (Vannote et al. 1980).

The loss of riparian vegetation can also increase erosion and sedimentation, resulting in a change in substrate composition, and altering food supply through turbidity-related reductions in algae and aquatic insect production (Studinski et al. 2012). Increased siltation can also damage spawning grounds for species that require cobble substrate for spawning (Fudge et al. 2008). Increased turbidity can decrease light transmission through the water column, decreasing in-water vegetation growth, which is habitat for young fish.

Herbicide treatment of stumps or above ground foliage in areas close to water could result in accidental (through spills) or unintentional (through aerial drift or runoff) entry into watercourses. Once in a water body, herbicides can reduce photosynthesis or other processes in primary producers (e.g., algae, macrophytes), thereby reducing their biomass and distribution.

Machinery used during construction and operation can cause soil compaction, erosion and sedimentation if done incorrectly in riparian areas. This can lead to erosion and sedimentation in adjacent watercourses. In addition, petroleum products such as gasoline and diesel fuels, oil, lubricants and hydraulic fluids can leak from machinery, be released through maintenance and refuelling activities, and be released through accidental spills. If these situations occur close to a watercourse, these deleterious substances can enter a watercourse and directly or indirectly affect aquatic organisms (including fish).

Effects from deleterious substances entering the watercourse can range from acute and severe (e.g., lethal) to chronic and sub-lethal, depending on the volume, concentration and substance in question. Many hydrocarbon products are also persistent, and will remain in sediments for long periods of time and accumulate in higher trophic levels in the aquatic food web.

Without adequate mitigation high sediment concentrations may cause fish mortality as a result of heavy gill abrasion (Herbert and Merkins 1961; Robertson et al. 2006). At lower suspended sediment concentrations, the effects could include subtle behavioral changes in fish, such as avoidance reactions. These reactions could lead to higher energy expenditures by individual fish and affect territorial responses in some species (Newcombe and Jensen 1996; Robertson et al. 2006). At higher sublethal concentrations, the introduction of fine suspended sediment, such as silts and clays that increase turbidity, could induce effects such as reduced feeding efficiency, sense of smell in fish, decreased visual acuity and predator/prey interactions (Newcombe and Jensen 1996). Silts and clay from erosion can carry contaminants such as pesticides

into watercourses increasing fish exposure and causing harm to fish (increased mortality, reduced physiological function in adult fish and reduced egg survival) (Levasseur et al. 2006).

Increased sedimentation from site preparation and construction activities could also change the availability of invertebrates needed as food sources for fish (Suttle 2004; Ramezani et al. 2014). The reduced food source for fish due to sedimentation can affect fish mortality and health by reducing their growth (Harvey et al. 2009; Sullivan and Watzin 2010; Kemp et al. 2011).

As described in section 5.4.2.2, threats to both species at risk (i.e., chestnut lamprey and mapleleaf mussel) in Manitoba include increased siltation and decreasing water quality. Without adequate mitigation the above changes to fish habitat could lead to these effects. In Manitoba maplealef mussel are threatened by habitat loss and degradation and the effects of invasive species, particularly Zebra mussel (COSEWIC 2016). Habitat changes associated with Zebra mussels and modifications to the banks of the Red and Assiniboine rivers (e.g., rip-rap and dikes) that alter the flow hydrology of these rivers are also threats (COSEWIC 2016b).

Mitigation for potential adverse effects

Selection of the final preferred route took a balanced approach to reduce overlap with areas of steep slope and/or heavily forested habitat. In addition to routing, standard industry practices and avoidance measures, along with Project-specific mitigation as summarized in chapter 10 and described in the Environmental Protection Plan (EnvPP) will be implemented during Project construction and operation. This section highlights the key mitigation measures to be implemented during construction and operation to limit effects to riparian areas on riparian habitat as described in section 7.10.2.3.

Mitigation measures include the following:

- Ensuring that slash piles are located above the ordinary high water mark (OHWM) and are secure;
- Designating of a buffer zone (30 m from OHWM minimum) around all waterbodies, which limits riparian vegetation removal to trees and tall shrubs;
- Marking sensitive areas prior to construction, and clearing;
- Designating machine-free zones (7 m OHWM minimum) in riparian areas;
- Maintaining or promoting the growth of shrub species in riparian areas;
- Keeping root systems intact during tree removal (thereby not disturbing the soil);
- Clearing of tree species in the riparian area, leaving shrub, forbs and grasses to

colonize the riparian area;

- Implementing erosion and sediment control measures where required for sensitive sites;
- Training of work crews in spill prevention;
- Ensuring all petroleum and allied products will be handled in compliance with the requirements of Manitoba Regulation 188/2001;
- Storing petroleum and other products more than 100m from the OWHM of watercourses;
- Ensuring machinery is in good working order and free of leaks;
- Using mats if access is required within the riparian buffer (for temporary crossings) to minimize rutting and compaction;
- Having emergency spill kits on site at all times; and
- Using only certified applicators when herbicides are used.

Project assessment significance conclusion

Existing land use in the LAA can be characterized as disturbed because in many areas it is dominated by agricultural development. Activities associated with this land use can increase suspended sediments and sediment in the bedload of adjacent watercourses.

Fish that are part of, or support, a CRA fishery, and particularly priority species could potentially have life processes affected by increased sedimentation, particularly sensitive early life stages.

With the implementation of mitigation measures, such as leaving a 30 m vegetated buffer, limiting instream work, if required, to outside of sensitive periods (e.g., spring spawning) , land-based, Project-related construction activities are not expected to increase sedimentation within the watercourses.

Analysis of the potential change in percent cover of riparian vegetation types is focused on land cover categories that can have a moderate to high contribution to aquatic habitat quality, and where the change caused by the Project is highest, most notably forested areas (Table 7-9). Forested areas provide shade which moderates water temperature and also provides habitat for insects which can be a food source for fish. In two of five watercourses analyzed, land cover within the riparian area within the Project development area was predominately agriculture or grassland/shrubland. It is expected that changes in riparian vegetation at these crossings would be nil to minimal and limited to the LAA. Therefore, its contribution to fish habitat quality will not be affected.

At crossings where the Project development area was moderately to predominantly treed, the expected change in riparian vegetation is determined to be minimal because: equivalent riparian vegetation was abundant within the LAA and beyond and grasses and shrubs will be maintained which still provide some of the aquatic habitat function of a healthy riparian area.

This assessment considers residual effects on aquatic habitat after mitigation is implemented. There will be no serious harm to fish and fish habitat. Erosion and sedimentation will be mitigated by selective clearing of trees within the ROW; brush and small trees provide root systems that stabilize soils. There is no net change in fish habitat availability because similar habitat is available within and beyond the LAA. For change in aquatic habitat, the residual environmental effects have been characterized as follows:

- Direction: Adverse
- Magnitude: Small
- Geographic extent: Local
- Duration: Long term
- Frequency: Sporadic
- Reversibility: Reversible
- Resiliency: Moderate

In conclusion, the residual effects are assessed as being not significant.

7.4.2.4 Sensitivity to cumulative effects

This section identifies and assesses the cumulative effect of those residual effects likely to overlap in time and space with residual environmental effects of other projects and physical activities. Section 5.2 includes summary of past, current and reasonably foreseeable projects that may overlap with the Project. As indicated, past and existing agricultural activities have had effects to watercourses in the RAA, including three of the five crossing sites. Fish populations in the RAA have adapted over 100 years to the current conditions and given the fact that the transmission lines span the watercourses and mitigation measures have been developed to deal with erosion and other potential deleterious substances, the contribution of Project effects is not expected to cause the fish, including indicator species (e.g. chestnut lamprey), and aquatic habitat in the watercourses to exceed any population sustainability thresholds. As a result, cumulative effects are not expected to change the significance determinations for aquatic habitat.

7.4.2.5 Sensitivity to climate change

According to the climate change information and scenarios presented in the sections 5.2.3 and 7.5, temperature and precipitation are expected to increase in the future. These sections also note that it is difficult to develop any precision on changes at local scale, where factors such as land cover, topography, watercourses and other barriers may have a greater influence on the distribution of a local population, in addition to complexities associated with local food webs. Effects of climate change on aquatic habitat are expected to be a function of this anticipated increase in temperature and associated extreme weather events (e.g., flooding, wildfires). Resulting effects on aquatic habitat in the RAA may include:

- Higher mean monthly temperature could produce increases in maximum water temperatures that could exceed the lethal threshold for some species;
- Increased total precipitation, heavy rain events and flooding could increase erosion from agricultural areas and stream banks resulting in higher sediment loads entering watercourses;
- Change in riparian habitat resulting from wildfires caused by extreme weather events:
- Reduced food availability due to shifts in the seasonal timing of insect emergence associated with warmer temperatures; and
- Shifts in species ranges which could have implications for the aquatic ecosystem.

Given the timelines associated with the projected precipitation and temperature changes, there is uncertainty in predicting how these physical changes may affect fish species and their habitat. Fish species within the RAA will likely be able to overcome these challenges through shifts in spawning windows and species ranges (Chetkiewicz et al. 2012). Subtle changes in flow and temperature will alter thresholds of susceptibility; however, with adaptive management and close regulatory involvement the relative changes in effects of this Project due to climate change are anticipated to be negligible. The Project is not expected to cause a measurable change in any aquatic habitat parameters. The predicted climate change scenarios are therefore not expected to change the significance determinations for aquatic habitat as they are not anticipated to measurably increase the magnitude of effects of the Project on fish habitat availability or fish health and mortality.

7.4.2.6 Follow-up and monitoring

This section describes the monitoring and follow-up programs for aquatic habitat and describes how programs will be implemented, and how information resulting from the programs will be applied. Monitoring programs for aquatic habitat will be implemented as part of the environmental protection program. The environmental protection program includes an environmental monitoring plan (Appendix I) that provides the detailed methods on how predicted changes will be verified and how the effectiveness of mitigation strategies will be evaluated.

Monitoring of aquatic habitat will be focused on the riparian buffer width, vegetative cover, bank stability, erosion and revegetative success. Reports describing the results of follow-up and monitoring activities may reveal the need for adaptive management to address unanticipated environmental effects. As outlined in the environmental monitoring plan unanticipated effects may require the application of additional mitigation or require modifications to existing mitigation measures. Knowledge gained through ongoing monitoring and associated analysis will be used to make recommendations for ongoing improvements to mitigation measures, the monitoring plan, methods, and analysis.

Manitoba Hydro conducts its monitoring programs in an integrated fashion across all current projects, so that knowledge gained from other projects (i.e., Manitoba Minnesota Transmission Project and Bipole III Transmission Project) effects monitoring is available to apply to this Project. The environmental monitoring plan identifies the decision triggers or thresholds for when adaptive management action is required.

7.4.3 Grassland habitat

7.4.3.1 Summary of current status

Habitat

As described in the Biophysical Technical Report (Appendix D) and shown in Map 5-1, two intact native mixed-grass prairies exist in the RAA, which include roughly 23,000 hectares (ha) in the Ellice-Archie (15,260 ha) and Spy Hill-Ellice (8,400 ha) community pastures (Reimer and Hamel 2003). These large prairie landscapes are flat, open grasslands with occasional stands of trembling aspen (Populus tremuloides), and provide grazing and breeding space for livestock.

The Spy Hill-Ellice Community Pasture, where a portion of the PFA is located, provides important habitat for wildlife. Grassland bird species of conservation concern that could be found within this pasture include chestnut-collared longspur (*Calcarius ornatus*),

Sprague's pipit (*Anthus spragueii*), short-eared owl (*Asio flammeus*), and potentially loggerhead shrike (*Lanius ludovicianus excubitorides*), all of whose populations are in decline (ECCC 2017a) for reasons that include habitat loss (NABCIC 2012) and fragmentation (Sliwinski and Koper 2012). The community pasture also provides habitat for mule deer (*Odocoileus hemionus*) and American badger (*Taxidae taxus taxus*), two priority mammal species.

Within the grassland sites sampled in the Spy Hill-Ellice Community Pasture, commonly occurring grasses were blue grama (*Bouteloua gracilis*), speargrasses (*Hesperostipa curtiseta* and *H. spartea*), slender wheat grass (*Elymus trachycaulus*), June grass (*Koeleria macrantha*), Hooker's oat grass (*Avenula hookeri*), sand grass (*Calamovilfa longifolia*), and plains rough fescue (*Festuca hallii*). Common forbs were prairie crocus (*Anemone patens*), pasture sage (*Artemisia frigida*), prairie clover (*Dalea purpurea*), great-flowered gaillardia (*Gaillardia aristata*), three-flowered avens (*Geum triflorum*), hoary puccoon (*Lithospermum canescens*), and rose (*Rosa* spp.). Plant litter cover was moderate (67.9%), while bare soil cover was very low (1.3%). Widespread in grassland sites, a non-vascular ground cover occurred as a tightly meshed community of mosses, lichens, and fungi, accounting for an average of 20.6% ground cover across sites. In some places, this appeared as a continuous mat or crust from which the vascular plants grow, resulting in very little bare ground observed in plots.

Within the community pasture there is a mosaic of vegetation associations dependent on conditions at each site. The flat open sandy sites were generally made up of western porcupine (*Hesperostipa curtiseta*) and blue grama grasses, with areas of slender wheatgrass or sand dropseed (*Sporobolus cryptandrus*), while a ridge top area is dominated by speargrasses and plains rough fescue, with patches of little bluestem (*Schizachyrium scoparium*). Transitional sites (i.e., previously cleared of trees) were intermediate between forest and grassland sites, sharing species in common with both. Grassland sites were classed into six vegetation associations, based on dominant vegetation composition.

Traditionally important plant species in grasslands were identified from values and interest workshops with Canupawakpa Dakota Nation (Manitoba Hydro 2017b), Gambler First Nation (Manitoba Hydro 2017h), and Waywayseecappo First Nation (Manitoba Hydro 2017j). Plant and tree species currently used in the RAA are also identified in the Metis land use and occupancy study (MNP 2017).

Members of Gambler First Nation identified that the pasture is full of wildflowers that are not found elsewhere (Manitoba Hydro 2017h). Areas with tiger lilies (*Lilium philadelphicum*) and crocuses (*Anemone patens*) are visited.

A workshop in Waywayseecappo First Nation (Manitoba Hydro 2017j) discussed specific plant species that have been and continue to be considered important by members of the community. Important plants cited for the community include sweetgrass (*Anthoxanthum* sp.), sage (*Artemisia* spp.). Tea is also part of an important cultural harvesting activity.

The Metis land use and occupancy study (MNP 2017) identify traditionally important species from both previous data collection and Project specific use and occupancy sites. Species are noted for their activity type (i.e., subsistence, medicinal, cultural, and economic), seasons gathered or harvested and general location of activity. Plants identified for berry gathering include pin cherry, raspberry and strawberry, while plants used for medicinal or general gathering include common sweet clover (*Melilotus* spp.), dandelion (*Taraxacum officinale*), prairie turnip (*Brassica napus*), rat root (*Acorus americanus*), seneca root (*Polygala senega*), stinging nettle (*Urtica dioica*), thistle (*Cirsium* spp.), wild mint (*Mentha arvensis*), wild onion (*Allium* spp.), wild rose (*Rosa* spp.), lamb's quarter (*Chenopodium album*), bulrush (*Schoenoplectus* spp.), cattail (*Typha* spp.), purple coneflower (*Echinacea angustifolia*) and hazelnut (*Corylus* spp.)

Grasslands were also assessed from private land roadside assessments, where most were converted to pasture, currently cropped, or used as hay storage. The quality of pastures at these sites was unequal to sites within the community pasture, and appeared to be dominated by non-native species.

Grassland birds generally require large tracts of undisturbed habitat (NABCIC 2012). These birds tend to avoid edges where grassland meets other types of vegetation, even if similar in structure to the adjacent grassland (Sliwinski and Koper 2012). Because much of North America's native grasslands have been converted to agriculture or other developments, grassland bird species rely on well-managed pastures for habitat (NABCIC 2012). The Ellice-Archie and Spy Hill-Ellice community pastures comprise one of the largest intact grasslands in Manitoba (Hamel and Reimer 2004), and are important for the grassland bird community.

Intact habitat is defined as patches larger than 200 ha in size (Environment Canada 2013). Under Land Use/Cover Classifications, grassland/rangeland represent 34% (32,648.7 ha) of the RAA, 30% (4,387.0 ha) of the LAA, and 33% (61.5 ha) of the PFA. While the Spy Hill-Ellice Community Pasture comprises a relatively small proportion of the grassland/rangeland habitat in the RAA (16%) and LAA (33%), most of the intact grassland habitat in each assessment area is within the Spy Hill-Ellice Community Pasture (Table 5-2)(Table 7-10). There are currently 22 patches of intact grassland habitat in the RAA that range in size from 202 to 4,550 ha.

Indicator species

Indicator species of grassland habitat were identified to include the following:

- Vegetation species of conservation concern;
- Invasive and non-native vegetation species;
- Traditional use plant species; and
- Chestnut-collared longspur.

Species of conservation concern and traditional use species have the potential to be adversely affected during Project activities. Invasive and non-native species have the ability to spread and out-compete other native plants as a result of the Project.

Eighteen species of conservation concern (rare and uncommon plants) were recorded during surveys in the grassland sites, in the Spy Hill-Ellice Community Pasture. However, no species listed by the federal *Species at Risk Act*, *The Endangered Species and Ecosystems Act* of Manitoba or listed by the Committee on the Status of Endangered Wildlife in Canada were observed in grassland habitat.

Within the grassland sites in the Spy Hill-Ellice Community Pasture, only two non-native species were recorded. Common dandelion (*Taraxacum officinale*) was recorded in a single transect, and goat's beard (*Tragopogon* spp.) was recorded in three rare plant surveys as incidentals. Of the traditional use plant species identified, 15 were recorded in community pasture surveys with many of these species observed in grassland sites.

The chestnut-collared longspur was selected as an indicator species for grassland habitat due to its conservation status and because it represents potential Project effects on wildlife species that require grassland habitat. As identified in surveys, it is also more abundant in the region than most other grassland bird species of conservation concern. Grassland bird populations are experiencing large declines, mainly due to the loss of native prairie habitat to agriculture (NABCIC 2012, ECCC 2017a). Well-managed pasturelands are important for these species, as livestock grazing can maintain suitable grassland habitat (NABCIC 2012, ECCC 2017b). The chestnut-collared longspur inhabits and breeds in recently mowed or grazed short- or mixed-grass prairie (Species at Risk Public Registry 2017, ECCCb 2017) and is at the edge of its range in the RAA (K. De Smet pers. comm.). This species is listed as Threatened by the federal *Species at Risk Act* (SARA) and as Endangered by *The Endangered Species and Ecosystems Act* of Manitoba. A draft *Recovery Strategy for the Chestnut-collared Longspur* was recently released by Environment and Climate Change Canada. Critical habitat has not yet been identified in Manitoba.

7.4.3.2 Relevant project interactions

As outlined in Table 7-1, the Project is predicted to interact with the grassland habitat ecological environment during the Project construction activities of mobilization, workforce presence, access, foundations, structures and conductors, and demobilization. The Project is predicted to interact with the grassland habitat ecological environment during operation and maintenance including physical presence, inspection patrols, and vegetation management.

A loss of grassland habitat is anticipated at tower foundations. In addition to direct habitat effects, Project-related sensory disturbance such as construction noise, the presence of workers, vibrations, and exhaust and other odours may result in the temporary displacement of grassland birds, amphibians, reptiles, and mammals if they avoid otherwise suitable habitat during construction and due to inspection patrols and vegetation management during operation.

Wildlife mortality could increase due to collisions with construction vehicles, particularly during the mobilization and demobilization stages. There could be an increase in mortality for birds during operation due to nest predation and nest parasitism. The physical presence of the transmission line may have a minor effect on movements of individuals near and across the right-of-way during operation. Mortality of grassland birds and small mammals could increase because transmission towers could create nesting and perching areas from which birds of prey can hunt. There is a small possibility of grassland bird mortality from collisions with transmission lines.

No additional effects of the establishment and use of marshalling yards, accommodations and borrow sources or of modifications at Birtle South Station on wildlife are anticipated in grassland habitat during construction. Grassland habitat indicators (i.e. grassland birds, vegetation species of conservation concern, invasive and non-native vegetation species, and traditional use plant species) can be used to assess habitat change as a result of Project activities.

7.4.3.3 Project assessment

Predicted changes in grassland habitat

Potential effects on grassland habitat from the development of transmission lines and associated Project components have been reported on by Manitoba Hydro for the Bipole III Transmission Project (Manitoba Hydro 2011a) and the Manitoba-Minnesota Transmission Project (Manitoba Hydro 2015a), as well as by SaskPower (2009), Minnesota Department of Commerce Office of Energy Security and USDA Rural Development Rural Utilities Service (2010), and Bonneville Power Administration

(2010). Effects include disturbance or loss of grassland habitat, loss of grassland species of conservation concern, ground compaction, and spread of weed species.

The proposed Birtle Transmission Project has the potential to result in disturbance of grassland habitat and reduce floristic diversity within the PFA geographical extent due to construction, and operation and maintenance activities. Soil and vegetation disturbance may result from construction activities such as mobilization, access, foundations, and demobilization; and during operation and maintenance including inspection patrols, and vegetation management. The Project will traverse approximately 61.5 ha of grassland/rangeland area (Table 5-2); with 25.2 ha occurring in the community pasture (Table 7-10). Project activities in grassland communities may damage the herb stratum in areas, and soil disturbance and plant root damage may occur. Foundations and structures are anticipated to remove minimal areas of grassland habitat. Rutting and compaction from construction activities (e.g. travel, mobilization, rig matting) can result in reduced vegetation growth. In the community pasture, a non-vascular community of lichen/moss/fungi is present as a ground layer beneath vascular vegetation, throughout the grasslands. This cover would likely be sensitive to ground disturbance, and may not readily recolonize any resulting bare ground, should disturbance occur. Recent environmental monitoring of prairie vegetation identified a decrease in total species cover after initial transmission construction activities (Bipole III Transmission Project 2016).

The proposed Project has the potential to cause other adverse effects to grassland habitat in the PFA from construction and maintenance activities including the potential loss of vegetation species of conservation concern and traditional use plants. Environmental assessments on other transmission projects have identified that construction and maintenance activities can result in adverse effects to species of conservation concern (e.g. Manitoba Hydro 2011a, 2013 and 2015; SaskPower 2009).

Individual plants of a species or the habitat they occupy can be altered by transmission line project activities where conditions are left unfavourable for plant growth (Public Service Commission of Wisconsin 2009). Traditional use plant species may also be affected during construction and maintenance activities. Indigenous communities use a variety of grassland plant species that were identified from Indigenous engagement and land use studies. Locally valued species that may be adversely affected from project activities include various plants gathered for cultural and medicinal purposes.

The proposed Project has the potential to introduce and spread invasive and non-native species to grassland habitat. Construction equipment and granular material used for construction can be a source of non-native and invasive plant species which can become problematic for the native plant species in the area for the duration of the

Project. Many non-native species thrive in disturbed habitat (Kershaw 2003), and some species compete exceptionally well with desirable or native plants (Royer and Dickinson 1999). A number of non-native and invasive species have the potential to be introduced during Project activities, as these plants often colonize disturbed ground. The introduction and spread of non-native and invasive species from construction and maintenance activities associated with transmission projects have also been reported on by SaskPower (2009), Minnesota Department of Commerce Office of Energy Security and USDA Rural Development Rural Utilities Service (2010) and US Department of Energy (2015). The potential spread of non-native or invasive plant species in the Project area could result in a measurable magnitude that extends from construction through to the operation and maintenance phase of the Project.

A reduction in growth of grassland plants may occur from increased dust levels during regular use of access roads for construction activities and vehicle use during maintenance activities. Dust can cause increased stress on vegetation resulting from increased solar heat absorption and decreased transpiration rates (Succarieh 1992) and reduce vegetation growth. There is also the potential for the loss or impairment of vegetation from accidental releases of fuels or hazardous substances, or from herbicide application during maintenance activities. Herbicides not only inhibit the growth of undesirable species but can also negatively affect desirable species by causing stress and possible mortality of vegetation that may be considered important for wildlife, traditional use, or have botanical value. The accidental release of fuels and hazardous substances has the potential to occur during construction activities and into the operation and maintenance phase of the Project.

Vegetation height is an important characteristic of habitat selected by grassland bird species, as it determines the composition of species in the bird community. Effects of grassland habitat loss or alteration on grassland birds vary by species and will depend mainly on the height of vegetation on the right-of-way. Grassland vegetation height is largely controlled by rates of grazing pressures or other disturbances such as fire. Habitat alteration could benefit species such as song sparrow (*Melospiza melodia*) that select edge habitat and chestnut-sided warbler (*Setophaga pensylvanica*), which prefers the shrubby, early successional habitat that often regenerates on transmission line rights-of-way. Habitat generalists like chipping sparrow (*Spizella passerina*) would likely be less affected than grassland habitat specialists that include Baird's sparrow (*Ammodramus bairdii*), chestnut-collared longspur, and Sprague's pipit (*Anthus spragueii*) (Unruh 2015), which require large, intact grassland habitat, and tend to avoid forest edges (Sliwinski and Koper 2012).

As outlined in Table 5-2 there are 61.5 ha of grassland/rangeland habitat in the PFA, the area subject to direct disturbance as a result of the Project. Less than 1% (0.2%) of

the 32,648.7 ha of grassland/rangeland habitat in the RAA and 1.4% of the 4,387.0 ha grassland/rangeland habitat in the LAA will be affected. There will be permanent loss of grassland/rangeland habitat at the tower foundations, but the remainder of the area is expected to remain as grassland habitat. The final preferred route will cross one patch of intact grassland habitat in the Spy Hill-Ellice Community Pasture. In all, the PFA will traverse 25.2 ha of grassland/rangeland in the pasture, affecting 0.5% of the pasture in the RAA and 1.8% of the pasture in the LAA (Table 7-10).

Predicted changes in indicator species

Changes to grassland habitat may occur as a result of the Project that could be detected through indicator species (i.e., grassland birds, vegetation species of conservation concern, invasive and non-native vegetation species, and traditional use plant species).

Eighteen species of conservation concern (rare and uncommon plants) were recorded during surveys in grassland habitat, with one nationally rare species (sand millet - *Dichanthelium wilcoxianum*) observed in the community pasture. Several traditional plant species were identified, including species recorded in the community pasture surveys (e.g., roses, sages, strawberry, etc.). There is the potential for species of conservation concern and traditional use plants to be adversely affected or lost from the proposed Project as a result of vegetation disturbance or removal, and rutting and compaction from construction activities; increased dust levels during construction and maintenance activities; accidental releases of fuels or hazardous substances during construction and maintenance activities; and vegetation management during maintenance activities (i.e. herbicide use). Although few non-native species were observed during the community pasture grassland surveys (e.g., common dandelion and goat’s beard), there is the potential for the introduction and spread of non-native and invasive species in the PFA from construction and maintenance activities, including activities of equipment mobilization, access and inspection patrols. Any soil disturbance as a result of the Project (e.g., rutting from heavy equipment or installation of foundations) has the potential to occupy non-native or invasive species, which can become problematic for the native plant species in the grasslands.

A few chestnut-collared longspurs were found in and near the PFA, and in areas that will be unaffected by the Project. There will be a long-term, continuous, and permanent loss of habitat at tower foundations in grasslands; however, no effect on the remaining habitat in the Spy Hill-Ellice Community Pasture is anticipated. While grassland birds including chestnut-collared longspur tend to avoid the edges created where grasslands transition to other habitat such as forest or agriculture (Sliwinski and Koper 2012), the final preferred route traverses a small tract of forest separating two intact grassland

patches, and minimal to no additional edge effects are anticipated. Short-term disturbance of grassland habitat may occur during construction due to access development and construction traffic on the right-of-way, but affected areas will likely regenerate into modified grassland (i.e., potentially altered from its original state but still a functioning type of grassland habitat) during operation, based on livestock grazing management activities.

In addition to the direct loss of habitat, potential Project effects on chestnut-collared longspurs include sensory disturbance that results in the displacement of some individuals. There is some uncertainty concerning how sensory disturbance affects grassland bird populations (K. De Smet pers. comm.). Some may avoid areas with human disturbances, of which chestnut-collared longspurs are moderately tolerant (Hamilton et al. 2011). Noise disturbance during construction could result in birds avoiding otherwise suitable habitat, and the presence of machinery and construction workers could bring about changes in their daily movements. Noise from helicopters used during tower construction and for maintenance activities during operation could cause temporary disturbances to birds in the vicinity, particularly during sensitive periods like the breeding bird season. The effects of sensory disturbance will likely be adverse but small magnitude, local, short-term, and infrequent.

Predation is a substantial source of mortality and reproductive failure in grassland bird species (Unruh 2015). During operation, transmission towers could provide nesting habitat or perches for birds of prey, potentially resulting in increased mortality of grassland birds such as chestnut-collared longspurs (K. De Smet pers. comm.). Additionally, brood parasitism by brown-headed cowbirds is a potential source of reduced reproductive success for grassland birds (e.g., Shaffer et al. 2003; Rasmussen and Sealey 2006; Ludlow et al. 2014; K. De Smet pers. comm.). Project effects that benefit brown-headed cowbirds, which occupy a range of habitats including grasslands and forest edges in fragmented habitat (Donovan et al. 1997), could result in reduced nesting success for other songbirds including chestnut-collared longspur. Brown-headed cowbirds are common in the region. Their movements and relative abundance are frequently associated with livestock and ungulates that disturb insect prey on the ground where they forage.

Other sources of potential chestnut-collared longspur mortality include collisions with vehicles, to which songbirds appear to be particularly susceptible (Ashley and Robinson 1996; Bishop and Brogan 2013). During construction, the risk of bird mortality due to such collisions could increase because of increased construction traffic. Effects would likely be adverse, small magnitude, local, short-term, and sporadic.

Because the chestnut-collared longspur is a species of conservation concern whose populations are in decline, its resiliency is low. However, adverse Project effects on the local population will likely be small, particularly since very little habitat will be permanently lost. Effects of sensory disturbance and the risk of increased mortality will be short-term and small. According to Environment and Climate Change Canada, threats to chestnut-collared longspurs from utility and service lines are described as low in impact, small in scope, slight in severity, and continuous (ECCC 2017b).

Another grassland bird species, sharp-tailed grouse (*Tympanuchus phasianellus*) requires grasslands with nearby shrub and forest habitat (Baydack 1988) and may also be affected by the presence of a transmission line in the RAA. Of the 28 leks (grassy breeding areas) identified in the Spy Hill-Ellice Community Pasture, 13 were within 1 (km) of the final preferred route. A lek was also observed on the final preferred route near Birtle South Station. Like other grassland birds, grouse could be affected by habitat loss or alteration and sensory disturbance due to construction and maintenance activities. Transmission towers near leks could provide perches for birds of prey, potentially increasing sharp-tailed grouse mortality. The combined effects of sensory disturbance and increased mortality will likely be adverse, small to moderate in magnitude, local, and long-term.

Because less than 1% of the grassland habitat in the RAA and just over 1% of the grassland habitat in the LAA will be affected by the Project, effects on grassland habitat and indicator species are expected to be small, and not measurably change availability of plants or wildlife.

Mitigation measures

Selection of the final preferred route took a balanced approach to reduce overlap with grassland habitat. Particular efforts were made within the Spy Hill-Ellice Community Pasture to select a route that avoided grassland areas in favour of forested or shrubby habitat. Routing also favoured the edge of grassland areas, and avoided open areas. In addition, clearing and construction activities in Spy Hill-Ellice Community Pasture will be scheduled during frozen ground conditions while vegetation is dormant and migratory birds are not present.

Continued rangeland management practices through livestock grazing in previously forested areas could create modified grassland habitats in the future. This conversion from forest to modified grassland habitat has been observed during field surveys in other recently cleared areas within the Spy Hill-Ellice Community Pasture (Biophysical Technical Report Appendix D).

Standard industry practices and avoidance measures, along with Project-specific mitigation as described in the Environmental Protection Plan (EnvPP) will be implemented during Project construction and operation. This section highlights the key mitigation measures to be implemented during construction and operation to limit effects on grassland habitat as described in section 7.4.3.3. Mitigation measures include the following:

- Wildlife features (i.e., mineral licks) will be identified in mapsheets and flagged prior to clearing.
- Environmentally sensitive sites, features and areas will be identified and mapped before clearing.
- To reduce the potential for bird collisions with wires following wire installation, bird diverters will be placed at designated environmentally sensitive sites;
- Hunting and harvesting of wildlife or possession of firearms by Project staff will not be permitted while working on Project sites.
- Plant SAR and critical habitat will be protected in accordance with provincial and federal legislation and provincial and federal guidelines. A 10 m buffer will be applied to mapped SOCC occurrences within the PFA. Setbacks and buffers along the ROW will be clearly identified by signage or flagging prior to construction, and signage or flagging will be maintained during construction to alert crews to the presence of the setback or buffer.
- Final tower siting will avoid confirmed locations of plant SOCC, where possible.
- If avoidance of listed rare plant species is not possible, Manitoba Sustainable Development will be contacted to determine the most appropriate mitigation action. This could include harvesting seed from the PFA, salvaging and transplanting portions of sod, collecting cuttings or transplanting whole plants.
- Additional surveys will be conducted in the PFA prior to construction to identify new occurrences of rare plants. If previously unidentified plant SAR or SOCC are found on the ROW prior to or during construction, the occurrences will be flagged and mitigation measures applied.
- Methods such as hand cutting, mechanical cutting or winter shearing will be used to clear the transmission line ROW and other sites. If herbicides are required to control vegetation growth, such as noxious/invasive weeds, all applicable permits and provincial regulations (*The Noxious Weeds Act*) will be followed.
- Manitoba Hydro employees and the contractors will follow the Project Biosecurity Management Plan to prevent the spread of invasive weeds.

- Contractor specific Erosion Protection and Sediment Control Plans will be developed prior to construction and updated annually.
- For clearly identified plant harvesting areas, Manitoba Hydro may use a variety of measures, including flagging of area, selective clearing methods, construction matting, non-chemical vegetation management - specific measures are assigned on a site by site basis.
- All equipment must arrive at the ROW or Project site clean and free of soil or vegetation debris.
- Equipment will be cleaned before moving from locations with identified invasive weed infestation.
- Vehicle, equipment and machinery maintenance and repairs will be carried out in designated areas located at least 100 m from the ordinary high water mark of a waterbody, riparian area or wetland.
- Vehicle, equipment and machinery operators will perform a daily inspection for fuel, oil and fluid leaks and will immediately shutdown and repair any leaks found.
- Rehabilitation plans will include objectives for restoration of natural conditions, erosion protection, sediment control, non-native and invasive plant species management, as required.
- Construction activities will be restricted to identified roads, trails and cleared construction areas in accordance with the Access Management Plan.
- Only water and approved dust suppression products will be used to control dust on access roads, where required. Oil or petroleum products will not be used.
- Clearing and construction activities in the Spy Hill-Ellice Community Pasture will be carried out during frozen ground conditions to limit affects to vegetation and avoid sensitive timing windows for wildlife.
- Rehabilitation in the Spy Hill-Ellice Community Pasture will include objectives for restoration to pre-existing conditions and the use of native seed mixes in disturbed areas, if required.
- Tower foundations that limit disturbance of soil will be utilized within grassland habitat ESS sites within the Spy Hill-Ellice Community Pasture.
- Perch deterrents will be installed on transmission line infrastructure in Spy Hill-Ellice Community Pasture within grassland ESS sites where feasible as identified through the environmental monitoring program, and in consultation with Manitoba Sustainable Development.

- Marshalling yards and worker accommodations will not be developed in Spy Hill-Ellice Community Pasture.
- Marshalling yards, borrow sites and worker accommodations will not be developed in grassland habitat ESS sites.

Project assessment significance conclusion

This section summarizes the Project effects analysis for grassland habitat. The information below characterizes the environmental effects of the Project on grassland habitat, including the indicator species. Changes in grassland habitat characteristics in the RAA and LAA pre- and post-Project are outlined in Table 7-10.

Table 7-10: Change in grassland habitat characteristics in the RAA and LAA

	Grassland/Rangeland	
	Spy Hill-Ellice Pasture	**Other Areas**
RAA		
Amount of habitat pre-construction (ha)	5,221.7	27,427.0
Amount of habitat post-construction (ha)	5,196.5	27,390.7
Change from pre-construction levels (ha)	25.2	36.3
Percent change post-construction	-0.5	-0.1
LAA		
Amount of habitat pre-construction (ha)	1,432.6	2,954.4
Amount of habitat post-construction (ha)	1,407.4	2,918.1
Change from pre-construction levels (ha)	25.2	36.3
Percent change post-construction	-1.8	-1.2

Given the application of the above-described mitigation measures the effects of the Project in terms of grassland habitat are summarized as follows:

- Direction: Adverse
- Magnitude: Small to Moderate
- Geographic extent: Local Assessment Area
- Duration: Medium Term
- Frequency: Infrequent
- Reversibility: Permanent
- Resiliency: Moderate

In summary, the Project will have adverse, small to moderate magnitude effects on grassland habitat. Overall, the Project's effects to grassland habitat will be small, and not expected to measurably affect the long-term persistence or viability of grassland habitat in the RAA. Grassland habitat will be moderately resilient to Project effects with the implementation of mitigation measures. The residual effects are assessed as being not significant.

7.4.3.4 Sensitivity to cumulative effects

This section identifies and assesses the cumulative effect of those residual effects likely to overlap in time and space with residual environmental effects of other projects and physical activities. Section 5.2 includes a summary of past, current and reasonably foreseeable projects that may overlap with the Project. Past agriculture, residential and commercial resource development has contributed to the cumulative loss of grassland habitat in the RAA, and has led to changes in the distribution and abundance of many wildlife species. The majority of the remaining grassland habitat occurs in the western region of the RAA, within the community pastures. With the exception of some grassland birds, the populations of many species of wildlife inhabiting the RAA appear relatively stable despite cumulative effects on habitat availability. The cumulative effect on grassland habitat is adverse as some habitat in the RAA will be altered as a result of the Project and reasonably foreseeable future projects; however, the magnitude of this effect is low due to the location of most reasonably foreseeable projects on previously modified habitat. Considerations during the routing process provided mitigation by limiting the extent of grassland habitats traversed by the Project. Uncertainly lies in the future expansion or increase in mining development for oil, gas, and potash in the RAA, especially with respect to grassland areas. Most of the privately owned land in the RAA that has the potential to support grassland habitat has been converted to agricultural development. Most of this conversion occurred within the past century, but many of the remaining areas of grassland habitat are vulnerable to agricultural conversion and intensification.

To date, the cumulative loss of grassland habitat in the RAA has contributed to reduced abundance of species at risk, most notably the grassland birds. Although these species are experiencing population declines, most continue to persist in the RAA where suitable habitat remains.

These residual cumulative effects will be continuous and permanent yet reversible upon the removal of infrastructure and rehabilitation of affected areas. The ecological context for the RAA is disturbed, but grassland habitat can be resilient if an appropriate grazing regime is maintained in large open areas. The majority of lands in the RAA have already

been substantially disturbed by human development and human development is still present.

In summary this Project, in combination with other future projects, will have contributions to cumulative effects on grassland habitat. Project routing took a balanced approach to reduce potential change in habitat availability. There is uncertainty about future projects in grassland habitat. If they do proceed, they will require continued management and Project specific mitigation. Post-Project monitoring of this proposed Project will help in verifying predicted changes and mitigation effectiveness.

7.4.3.5 Sensitivity to climate change

According to the climate change information and scenarios presented in sections 5.2.3 and 7.3.3, temperature and precipitation are expected to increase in the future. These sections also note that it is difficult to develop any precision on changes at a local scale, where factors such as land cover, topography, watercourses and other barriers may have a greater influence on the distribution of a local population, in addition to complexities associated with local food webs.

A shorter winter and longer growing season could result in an expansion in distribution of vegetation species less tolerant of cooler conditions, and alter bird habitat. An earlier spring and later fall may alter the seasonal movements of wildlife and the timing of activities such as migration.

Effects of climate change on grassland habitat are expected to be a function of this anticipated increase in temperature and associated extreme weather events (e.g., flooding, wildfires). Resulting effects to grassland habitat from climate change in the RAA may include the following:

- Change in habitat composition resulting from extreme weather events such as wildfire, drought, or forest encroachment;
- Reduced food availability (e.g., shifts in the seasonal timing of insect emergence, change in food availability due to warmer temperatures); and
- Shifts in species ranges

Given the timelines associated with the predicted precipitation and temperature changes, grassland habitats will likely be able to overcome these challenges through shifts in ranges and the narrowing of the timing imbalance between wildlife breeding seasons (e.g., timing of egg laying, insect emergence, nesting) that is already being observed (Both et al. 2006).

The predicted climate change scenarios are not expected to change the significance determinations for grassland habitat, as they are not anticipated to measurably increase the magnitude of effects of the Project. However this information does reinforce the importance of implementing a monitoring program, and employing adaptive management, as described below.

7.4.3.6 Follow-up and monitoring

This section provides an overview of the monitoring and follow-up programs for grassland habitat and describes how programs will be implemented, and how information resulting from the programs will be applied. Further information can be found in Section 10.3 and Appendix I.

Monitoring programs for grassland habitat will be implemented as part of the Environmental Protection Program (EPP). The EPP is a framework for implementation, management, monitoring and evaluation of protection activities in keeping with environmental effects identified in environmental assessments, regulatory requirements and public expectation. The EPP prescribes measures and practices to avoid and reduce adverse environmental effects on wildlife and wildlife habitat (e.g., wildlife reduced risk work windows, setbacks and buffers for wildlife and sensitive wildlife habitat).

The EPP includes an environmental monitoring plan that provides the detailed methods on how predicted changes will be verified and how the effectiveness of mitigation strategies will be evaluated. Monitoring of grassland habitat will be focused in the Spy Hill-Ellice Community Pasture, and will be concentrated on grassland bird habitat, vegetation species of conservation concern, invasive and non-native vegetation species, and traditional use plant species. The environmental monitoring plan will also identify reporting commitments and schedule.

Reports describing the results of follow-up and monitoring activities for grassland habitat may reveal the need for adaptive management to address unanticipated environmental effects. As outlined in the environmental monitoring plan unanticipated effects may require the application of additional mitigation or require modifications to existing mitigation measures. Knowledge gained through ongoing monitoring and associated analysis will be used to make recommendations for ongoing improvements to mitigation measures, the monitoring plan, methods, and analysis. Manitoba Hydro conducts its monitoring programs in an integrated fashion across all current projects, so that knowledge gained from other projects (i.e., Manitoba Minnesota Transmission Project and Bipole III Transmission Project) effects monitoring is available to apply to this

Project. The environmental monitoring plan will identify the decision triggers or thresholds for when adaptive management action is required for grassland habitat.

The approach and methods used to monitor grassland habitat are consistent with many of those used by Manitoba Hydro on other projects (e.g., Bipole III Transmission Project) as well as past projects (e.g., Wuskwatim Transmission Project, Manitoba Minnesota Transmission Project). The results of past monitoring efforts and Project baseline studies together influenced the development of a Project-specific monitoring program.

7.4.4 Forest habitat

7.4.4.1 Summary of current status

Habitat

As described in the Biophysical Technical Report (Appendix D) and shown in Map 5-1, upland deciduous and mixedwood forests consisting of trembling aspen and balsam poplar (*Populus balsamifera*) occur on moist sites, while bur oak (*Quercus macrocarpa*) is common on drier sites (Smith et al. 1998). Upland forest, including riparian/river bottom forest, represents 20% (19,156.6 ha) of the RAA (deciduous, mixed and coniferous), 16% (2,392.1 ha) of the LAA (deciduous) and 16% (28.7 ha) of the PFA (deciduous) (Table 5-2)(Table 7-11). The RAA is highly fragmented, particularly east of the Assiniboine River, and is dominated by agricultural lands and residential areas. As shown in Map 5-2, there are approximately 834 km of linear features including roads, railways, and transmission lines within, for a density of 0.66 km/km². Linear feature density west of the Assiniboine River is 0.28 km/km² and east of the river is 0.84 km/km²

Upland forests assessed along the final preferred route were classed as trembling aspen hardwood communities, based on vegetation composition and structure. In the Spy Hill-Ellice Community Pasture, one stand was open trembling aspen with a presence of bur oak, while other sites were sparsely treed trembling aspen stands. In sites sampled, the tallest aspen were 7, 11 and 14 m in height, with a diameter at breast height of 10.9, 28.9 and 26.5 cm, respectively. Trembling aspen was aged at 72 years in one stand.

Tall shrubs included Saskatoon (*Amelanchier alnifolia)*, pin cherry (*Prunus pensylvanica*), American hazel (*Corylus americana*), snowberry (*Symphoricarpos albus*) and rose. The understory was composed of typical forest forbs such as two-leaved Solomon's-seal (*Maianthemum canadense*), wild peavine (*Lathyrus venosus*) and veiny meadow-rue (*Thalictrum venulosum*). Forested sites were characterized by lower diversity of grasses, with white-grained mountain-rice grass and purple oat grass

(*Schizachne purpurascens)* dominating. Forested sites had a distinctively high mean litter cover (94.8%), presence of woody debris (2.5%), and very little bare ground (0.5%) or moss (0.3%) covering.

In the vicinity of the Spy Hill-Ellice Community Pasture, a hardwood stand was visited during a reconnaissance survey in 2016. At this location, the tree canopy was composed dominantly of trembling aspen with a well-developed tall shrub stratum is composed of Saskatoon (*Amelanchier alnifolia*), downy arrow-wood (*Viburnum rafinesquianum*), chokecherry (*Prunus virginiana*), beaked hazel (*Corylus cornuta*), balsam poplar (*Populus balsamifera*) and willow species (*Salix* spp.). The herb and low shrub stratum was dominated by wild red raspberry (*Rubus idaeus*), prickly rose (*Rosa acicularis*), smooth wild strawberry (*Fragaria virginiana*), meadow-rue (*Thalictrum sp.*) and bluegrass (*Poa sp*.).

Riparian and river bottom forest supported Manitoba maple (*Acer negundo*), green ash (*Fraxinus pennsylvanica*), bur oak, aspen and balsam poplar (*Populus balsamifera*). The forest along the Assiniboine River supported trembling aspen with sub-dominant balsam poplar, and a rich tall shrub layer and herb understory, surrounded by crop land on the river terrace. Tall shrubs included red-osier dogwood (*Cornus sericea*), chokecherry (*Prunus virginiana*) and highbush cranberry (V*iburnum opulus*). Small wet pools dominated by sedge and willows had formed in places. Near the Birdtail Creek, occurred a forested pasture of Manitoba maple, balsam poplar and bur oak, with a heavy tall shrub component, made up of hazelnut (*Corylus americana* and *C. cornuta*), red-osier dogwood, Saskatoon, willow (e.g. *Salix exigua, S. bebbiana*) and rose, with an understory of grasses.

Forest-dwelling bird species of conservation concern that could occur in the RAA include Canada warbler (*Cardellina canadensis*), olive-sided flycatcher (*Contopus cooperi*), and red-headed woodpecker (*Melanerpes erythrocephalus*). All of these populations decreased in the Prairie Pothole Region of Manitoba from 2005 to 2015 (ECCC 2017a). Chimney swift (*Chaetura pelagica*), common nighthawk (*Chordeiles minor*), and eastern whip-poor will *(Antrostomus vociferus*) populations are declining more rapidly than other bird groups, mainly due to habitat loss and to pesticides' effects on the abundance of insects that compose the bulk of their diet (NABCIC 2012). All but red-headed woodpecker and chimney swift were observed in the region during field studies.

Indicator species

Indicator species of forest habitat were identified to include the following:

- Vegetation species of conservation concern;

- Invasive and non-native vegetation species;
- Traditional use plant species; and
- Moose.

Vegetation species of conservation concern and traditional use species have the potential to be adversely affected during Project activities. Invasive and non-native species have the ability to spread and out-compete other native plants as a result of the Project.

Four uncommon species were observed in forested sites in the community pasture, including beautiful sunflower (*Helianthus pauciflorus ssp. subrhomboideus,* S3S4); low sedge (*Carex duriuscula*, S3S4); western porcupine grass (Hesperostipa curtiseta, S3) and little bluestem (*Schizachyrium scoparium*, S3S4). Western jewelweed (*Impatiens noli-tangere,* S1) and yellow twayblade (*Liparis loeselii,* S3S4) were observed in forest habitat near the Assiniboine River. No species listed by the *Species at Risk Act, The Endangered Species and Ecosystems Act,* or listed by the Committee on the Status of Endangered Wildlife in Canada were observed in forest habitat.

Within the upland forest sites in the community pasture, three non-native or invasive species were recorded and included common dandelion (*Taraxacum officinale*), sweetclover (*Melilotus spp*.) and goat's beard (*Tragopogon spp.*). Roadside of private lands, other invasive species were observed including invasive smooth brome (*Bromus inermis*), along the ditch. At the river's edge of the Birdtail Creek, invasive species included reed canary grass (*Phalaris arundinacea*), smooth brome and Canada thistle (*Cirsium arvense*).

Several traditional use plant species were observed in upland forest habitat. Species included trees of trembling aspen and bur oak. Shrubs included Saskatoon (*Amelanchier alnifolia*), pin cherry (*Prunus pensylvanica*), chokecherry (*Prunus virginiana*), raspberry (*Rubus idaeus*), willows (*Salix* spp.), cranberries (*Viburnum spp.*), hazelnut (*Corylus spp*.) and rose species (*Rosa spp.)* (Manitoba Hydro 2017b, 2017h, 2017j, MNP 2017).

Moose (*Alces alces*) habitat typically consists of a mixture of early-succession forest interspersed with waterbodies and late-succession forest (Bowyer et al. 2003). This habitat is found within the aspen parkland and boreal forest regions of Manitoba and is strongly influenced by forest fires. In central and southern Manitoba, low moose numbers have resulted in closures of licensed and rights-based hunting in some game hunting areas (GHAs). In 2017, 15 GHAs remained closed to all licensed and most rights-based moose hunting to assist with the recovery of the local populations (Manitoba Sustainable Development 2017c). While the moose population in Manitoba is

generally decreasing, the population in the RAA is considered stable (K. Rebizant pers. comm.). Moose density in the RAA is greater than in some regions of the province, but is lower than in high-density areas such as Duck Mountain, Riding Mountain, and Porcupine Hills (K. Rebizant pers. comm.). There is no licensed moose hunting in GHA 22, which overlaps the RAA, but it is not closed to rights-based hunting and is an important area for ungulate harvest by Indigenous resource users (Manitoba Hydro 2017b, 2017h, 2017j, MNP 2017). Moose were selected as the indicator species for forest habitat because they represent potential Project effects on wildlife species that require forest habitat, and because their importance to resource users represents potential effects of increased access to the area on ungulate mortality. More information on Traditional Land and Resource Use can be found in section 7.5.10.

7.4.4.2 Relevant project interactions

As outlined in Table 7-1 the Project is predicted to interact with the forest habitat ecological environment during the Project construction activities of mobilization, workforce presence, access, clearing, foundations, structures and conductors, and demobilization. The Project is predicted to interact with the forest habitat ecological environment during operation and maintenance Project activities of physical presence, inspection patrols, and vegetation management.

A loss of forest habitat is anticipated due to ROW clearing. In addition to direct habitat effects, Project-related sensory disturbance such as construction noise, the presence of workers, vibrations, and exhaust and other odours may result in the temporary displacement of forest mammals and birds if they avoid otherwise suitable habitat during construction and due to inspection patrols and vegetation management during operation. Sensory disturbance could affect wildlife in forest habitat during all but one construction stage; no effects are anticipated due to the use of local accommodations by the workforce.

Wildlife mortality could increase due to collisions with construction vehicles, particularly during the mobilization and demobilization stages. No additional effects of the establishment and use of marshalling yards and borrow sources are anticipated in forest habitat during construction.

The physical presence of the transmission line may have a minor effect on movements of wildlife near and across the right-of-way during operation. Increased access to the area by predators such as gray wolf (*Canis lupus)* and by resource users could result in increased mortality of prey and harvested species. No additional effects of equipment maintenance at Birtle South Station on forest habitat are anticipated during operation.

Forest habitat indicators (i.e. moose, vegetation species of conservation concern, invasive and non-native vegetation species, and traditional use plant species) will be used to assess habitat change as a result of Project activities

7.4.4.3 Project assessment

Predicted changes in forest habitat

Potential effects on forest vegetation from transmission clearing and construction have been reported on by Manitoba Hydro (e.g., 2011, 2013 and 2015), as described below. The removal and long-term loss of forest cover as a result of ROW clearing is an effect of transmission line development (Manitoba Hydro and Nisichawayasihk Cree Nation 2003). Potential effects on vegetation have been identified for the proposed Manitoba-Minnesota Transmission Project (Manitoba Hydro 2015a) to include a change in vegetation landscape intactness and change in vegetation structure. Effects on vegetation have also been reported on for the Bipole III Transmission Project (Manitoba Hydro 2011a) to include loss of native forest vegetation, fragmentation, reduced vegetation diversity, potential effects to riparian areas, and increased risk of wildfire. The Tyndall 115 kV Transmission Line and DSC Project (Manitoba Hydro 2013b) reported effects on vegetation to include tree and shrub clearing.

The proposed Birtle Transmission Project will result in the removal of approximately 28.7 ha of deciduous forest vegetation (including treed riparian) in the PFA due to clearing during construction (Table 5-2). Construction will result in fragmentation of treed vegetation communities and a reduction in vegetation diversity on the ROW. A consequence of fragmentation is the isolation of smaller vegetation communities that may result in reduced pollen quality and quantity. Recent environmental monitoring of terrestrial vegetation confirmed the loss of native forest vegetation and a temporary reduction in vegetation diversity on the ROW (Bipole III Transmission Project 2015 and 2016a).

The modification of vegetation composition and structure adjacent to the disturbance zone will occur due to clearing from construction. Changes to adjacent forest vegetation from transmission clearing have been reported in other studies and projects (Jackson et al. 1994; Manitoba Hydro 2011a). Increased solar radiation exposure and a change in microclimate along these edges may cause changes in understory plant species composition and structure (Ecological Land Surveys Ltd. 1999). Species that prefer shaded and moist conditions may decrease in abundance while xerophytic species (plants that grow on dry sites) may increase. Edge effects or long-term disturbance has the potential to gradually damage important habitat and threaten the long-term survival of plants in these areas (Henderson 2009). Windfall (blow-down) may also result along

newly created forest edges due to trees being susceptible to increased wind exposure (Ecological Land Surveys Ltd. 2003; British Columbia Transportation Corporation 2010).

Rutting and erosion from construction activities can result in increased run-off and reduced vegetation growth. These effects could occur within the PFA when vehicles and equipment mobilize to sites for construction activities related to clearing, foundation and structure installation, movement of borrow source material, and demobilization of equipment. During operations and maintenance, the potential for rutting and erosion will be less frequent, possibly occurring during inspection patrols and vegetation maintenance.

Other potential effects from the removal of forest habitat during construction includes disturbance to understory vegetation, and the potential loss of species of conservation concern and traditional use plants. The Project has the potential to introduce and spread invasive and non-native species to forest habitat during construction and maintenance activities, including Project activities of ground disturbance, equipment movement between sites, use of borrow source material, and inspection patrols. There is also the potential for the loss or impairment of vegetation from accidental releases of fuels or hazardous substances, or from herbicides application during maintenance activities. The accidental release of fuels and hazardous substances in the PFA could extend through the duration of construction and into the operation and maintenance phase of the Project.

As outlined in Table 5-2, there are 28.7 ha of forested habitat in the PFA, the area subject to direct disturbance as a result of the Project. Less than 1% of the 19,156.6 ha of forest habitat in the RAA and 1.2% of the 2,392.1 ha will be affected. There will be permanent loss of forest habitat in the PFA, but the cleared area is expected to remain as natural habitat as type of grassland or shrubland. The final preferred route avoids bisecting grassland habitat in the Spy Hill-Ellice Community Pasture and was routed to traverse forested areas. As with other areas in the Spy Hill-Ellice Community Pasture that have been recently cleared of forested habitat, it is expected that the cleared forested habitat will be managed to support a modified shrubby or grassland habitat through livestock grazing (Appendix D).

Predicted changes in indicator species

Changes to forest habitat may occur as a result of the Project that could be detected through indicator species (i.e., moose, vegetation species of conservation concern, invasive and non-native vegetation species, and traditional use plant species). Four species of conservation concern (uncommon plants) were recorded during surveys in forest habitat in the community pasture, while two species (very rare to uncommon plants) were observed in forest habitat on private land. Several traditional plant species

were identified from the Project, including species recorded in upland forest habitat (e.g., Saskatoon, pin cherry, chokecherry, cranberries etc.). There is the potential for species of conservation concern and traditional use plants (various trees shrubs and herbs) to be affected or lost from the proposed Project as a result of vegetation clearing and disturbance during construction and maintenance activities, accidental releases of fuels or hazardous substances during construction and maintenance activities, and vegetation management during maintenance activities (i.e., herbicide use). Few non-native and invasive species were observed within upland forest sites during surveys (i.e., sweetclover, common dandelion and goat's beard); however there is the potential for the introduction and spread of non-native and invasive species in the PFA from construction and maintenance activities, including activities of equipment mobilization, access, foundations, and inspection patrols. Any soil disturbance as a result of the Project (e.g., rutting from heavy equipment or installation of foundations) has the potential to spread non-native or invasive species, which can hinder the growth of native plant species in forest habitat.

Regeneration of shrubby grassland vegetation on the ROW during operation will likely result in suitable conditions for moose (Bartzke et al. 2014), and a minor effect of forest habitat alteration on the species, and all ungulates, is anticipated.

Habitat connectivity will be reduced as forest patches are fragmented into smaller areas by the ROW. A transmission line is unlikely to deter moose movements (Bartzke et al. 2015), but increased access to moose habitat by resource users could be created in forested areas, potentially resulting in increased moose mortality (K. Rebizant per comm.). The majority of the region is already readily accessible as there is an existing network of roads and trails plus large grasslands that are easily traversed. However, immediately west of the Assiniboine River, approximately 1000 m of the final preferred route will pass through a relatively open forest area. This section of the ROW will require the removal of some trees that may expose some wildlife to a minor increase in visibility and possible increased hunting pressure and predation by large predators such as gray wolf and black bear (*Ursus americanus*). Other ungulate species may become exposed to predators such as coyotes (*Canis latrans*). The 46 km-long final preferred route will create 23.9 km of ROW that parallel other linear features, and 22.1 km of new ROW in the RAA. The final preferred route will increase the density of linear features from 0.66 km/km^2 to 0.68 km/km^2, or by approximately 3.5%. As moose numbers in the region are stable, increased mortality could adversely affect the population (K. Rebizant per comm.). Because of the extent of existing access trails within the LAA, effects would likely be local, and the access created by the ROW will be managed.

Moose can be attracted to food sources on transmission lines (K. Rebizant pers. comm.). Meningeal worm (*Parelapostrongylus tenuis*), a parasite tolerated by white-

tailed deer but fatal in other ungulates (Anderson 1972), is a threat to moose populations. If white-tailed deer are also attracted to rights-of-way, the risk of transmission to moose could increase and negatively affect local populations (K. Rebizant pers. comm.).

Moose mortality could also increase due to increased vehicle traffic in the region during the construction phase. The amount of construction-related traffic, including workers and equipment, will increase temporarily and could result in a greater risk of collisions with wildlife; however, moose-vehicle collisions have never been reported during construction of recent transmission projects in Manitoba. While the risk of moose-vehicle collisions may increase, it will likely remain small. The effect of the removal of individuals from the population would likely also be small.

Project-related sensory disturbance may result in the temporary displacement of some individuals if they avoid otherwise suitable habitat during construction and due to maintenance activities during operation, particularly during the sensitive calving and calf-rearing period. However, such activity may not have a particularly strong influence on habitat selection by moose, as suggested by their presence at or near roads and large construction sites in northern Manitoba (Wildlife Resource Consulting Services MB Inc. and Armstrong 2011; Wildlife Resource Consulting Services MB Inc. 2016, 2017a). While a few individuals may be temporarily displaced, no population-level effects are anticipated.

Moose are generally a resilient species, but populations in easily-accessible southern Manitoba are lower than ideal (Manitoba Sustainable Development, no date). A potential reduction in their numbers in the area and beyond could result in small, local to regional, long-term, and continuous Project-related effects on the local population.

Because less than 1% of the forested habitat in the RAA and just over 1% of the forested habitat in the LAA will be affected by the Project, effects on forested habitat and indicator species are expected to be small and not have a substantial effect on plant and wildlife availability for resource users.

Mitigation measures

Selection of the final preferred route took a balanced approach to reduce overlap with natural habitats, including forest habitat. Other standard industry practices and avoidance measures, along with Project-specific mitigation as described in the Environmental Protection Plan (EPP) will be implemented during Project construction and operation. This section highlights the key mitigation measures to be implemented during construction and operation to limit effects on forested habitat as described in section 7.4.4.3. Mitigation measures include the following:

- Important wildlife features (i.e. mineral licks, stick nests) will be identified in mapsheets and flagged prior to clearing.
- Trees containing large nests of sticks and areas where active animal dens or burrows are encountered within the ROW will be left undisturbed until unoccupied.
- Artificial structures for nesting may be provided if unoccupied nests must be removed.
- Clearing activities will not be carried out during reduced risk timing windows for wildlife species without additional mitigation, such as bird nest sweeps.
- To reduce the potential for collisions with wires following wire installation, bird diverters will be placed at designated environmentally sensitive sites.
- Hunting and harvesting of wildlife or possession of firearms by Project staff will not be permitted while working on Project sites.
- Plant SAR and critical habitat will be protected in accordance with provincial and federal legislation and provincial and federal guidelines. A 10 m buffer will be applied to mapped SOCC occurrences within the PFA. Setbacks and buffers along the ROW will be clearly identified by signage or flagging prior to construction, and signage or flagging will be maintained during construction to alert crews to the presence of the setback or buffer.
- Final tower siting will avoid confirmed locations of SOCC, where possible.
- If avoidance of listed rare plant species is not possible, Manitoba Sustainable Development will be contacted to determine the most appropriate mitigation action.
- Additional surveys will be conducted in the PFA prior to construction to identify new occurrences of rare plants. If previously unidentified plant SAR or SOCC are found on the ROW prior to or during construction, the occurrences will be flagged and mitigation measures applied.
- Environmentally sensitive sites, features and areas will be identified and mapped before clearing.
- Natural low-growing shrub and grass vegetated buffer areas of 30 m, or greater, will be delineated around wetlands and riparian areas and be maintained to the extent possible.
- Windrows of grubbed materials will be piled at least 15 m from standing timber.

- Trees will not be felled into waterbodies.
- Danger trees will be flagged or marked for removal using methods that do not damage soils and adjacent vegetation.
- Contractor specific Erosion Protection and Sediment Control Plans will be developed prior to construction and updated annually.
- All equipment must arrive at the ROW or Project site clean and free of soil or vegetation debris.
- Equipment will be cleaned before moving from locations with identified invasive weed infestation.
- Manitoba Hydro employees and the contractors will follow the Project Biosecurity Management Plan to prevent the spread of invasive weeds.
- Vehicle, equipment and machinery maintenance and repairs will be carried out in designated areas located at least 100 m from the ordinary high water mark of a waterbody, riparian area or wetland.
- Vehicle, equipment and machinery operators will perform a daily inspection for fuel, oil and fluid leaks and will immediately shutdown and repair any leaks found.
- Rehabilitation plans will include objectives for restoration of natural conditions, erosion protection, sediment control, non-native and invasive plant species management, as required.
- Weed control along access roads and trails, at temporary construction camps, marshalling yards and borrow sites will be conducted in accordance with the Rehabilitation and Weed Management Plan.
- Methods such as hand cutting, mechanical cutting or winter shearing will be used to clear the transmission line ROW and other sites. If herbicides are required to control vegetation growth, such as noxious/invasive weeds during construction, all applicable permits and provincial regulations (The Noxious Weeds Act) will be followed.
- Construction activities will be restricted to identified roads, trails and cleared construction areas in accordance with the Access Management Plan.
- Only water and approved dust suppression products will be used to control dust on access roads, where required. Oil or petroleum products will not be used.
- Necessary work permit(s) will be obtained, as required under The Crown Lands Act.

- The new access point required to access the Spy Hill-Ellice Community Pasture from the east will be decommissioned in collaboration with the private landowner and the Spy Hill-Ellice Community pasture manager to prevent vehicle access, in accordance with the Access Management Plan.
- Clearing and construction activities in the Spy Hill-Ellice Community Pasture will be carried out during frozen ground conditions to limit affects to vegetation and avoid sensitive timing window for wildlife.
- Marshaling yards and worker accommodations will not be developed in Spy Hill-Ellice Community Pasture.
- If required, marshaling yards and worker accommodations will not be developed in forested habitat sites.
- Borrow material will be sourced from the cleared ROW or nearby existing quarry sites, if required.

Project assessment significant conclusion

This section summarizes the Project effects analysis for forest habitat. The information below characterizes the environmental effects of the Project on forest habitat, including the indicator species. Changes in habitat characteristics in the RAA and LAA pre- and post-Project are outlined in Table 7-11.

Table 7-11 Change in forest habitat characteristics in the RAA and LAA

	Forest
RAA	
Amount of habitat pre-construction (ha)	19,156.6
Amount of habitat post-construction (ha)	19,127.9
Change from pre-construction levels (ha)	-28.7
Percent change post-construction	-0.1
LAA	
Amount of habitat pre-construction (ha)	2,392.1
Amount of habitat post-construction (ha)	2,363.4
Change from pre-construction levels (ha)	-28.7
Percent change post-construction	-1.2

Given the application of the above-described mitigation measures the effects of the Project in terms of forest habitat are summarized as follows:

- Direction: Adverse
- Magnitude: Small to moderate

- Geographic extent: Local Assessment Area
- Duration: Medium Term
- Frequency: Infrequent
- Reversibility: Permanent
- Resiliency: Moderate

In summary, the Project will have adverse, low in magnitude effect on forest habitat. Overall, the Project's effects to forested habitat will be small, and not expected to measurably affect the long-term persistence or viability of forest habitat in the RAA. The residual effects are assessed as being not significant.

7.4.4.4 Sensitivity to cumulative effects

This section identifies and assesses the cumulative effect of those residual effects likely to overlap in time and space with residual environmental effects of other projects and physical activities. Section 5.2 includes summaries of past, current and reasonably foreseeable projects that may overlap with the Project. Past agriculture, residential and commercial resource development has contributed to the cumulative loss of forest habitat in the RAA and has led to changes in the distribution and abundance of many wildlife species. The majority of forest habitat occurs along the Assiniboine River and its tributaries. The populations of many species of wildlife inhabiting the RAA are considered stable despite cumulative effects on habitat availability. The cumulative effect to forested habitats is adverse as some habitat in the RAA will be altered as a result of the Project and reasonably foreseeable future projects; however, the magnitude of this effect is low due to the location of most of the projects on previously modified habitat. Considerations during the routing process provided mitigation by limiting the extent of natural habitats traversed by the Project. Uncertainly lies in the future expansion or increase in mining development for oil, gas, and potash in the RAA, especially with respect to forested areas. Much of the privately owned land in the RAA that has the potential to support forest habitat has been converted to agricultural development. Most of this conversion occurred within the past century, but many of the remaining areas of forested habitat are vulnerable to agricultural conversion or removal for mining and oil and gas development.

Residual cumulative effects will be continuous and permanent yet reversible upon the removal of infrastructure and rehabilitation of affected areas. The ecological context for the RAA is disturbed, as the majority of lands have already been substantially disturbed by human development and human development is still present.

7.4.4.5 Sensitivity to climate change

According to the climate change information and scenarios presented in the sections 5.2.3 and 7.3.3, temperature and precipitation are expected to increase in the future. These sections also note that it is difficult to develop any precision on changes at a local scale, where factors such as land cover, topography, watercourses and other barriers may have a greater influence on the distribution of a local population, in addition to complexities associated with local food webs.

A shorter winter and longer growing season could result in an expansion in distribution of vegetation species less tolerant of cooler conditions, and alter ungulate habitat. An earlier spring and later fall may alter the seasonal movements of wildlife and the timing of activities such as calving.

Effects of climate change on forested habitat are expected to be a function of anticipated increases in temperature and associated extreme weather events (e.g. flooding, wildfires). Resulting effects to forest habitat from climate change in the RAA may include:

- Change in habitat composition resulting from extreme weather events such as wildfire, or flooding;
- Reduced food availability (e.g., shifts in the seasonal timing of insect emergence, change in food availability due to warmer temperatures); and
- Shifts in species ranges.

Given the timelines associated with the predicted precipitation and temperature changes, forested habitats will likely be able to overcome these challenges through shifts in ranges and the narrowing of the timing imbalance between wildlife breeding seasons (e.g., timing of egg laying, insect emergence, nesting) that is already being observed (Both et al. 2006).

The predicted climate change scenarios would not change the significance determinations for forested habitat, as they are not anticipated to measurably increase the magnitude of effects of the Project. However this information does reinforce the importance of implementing a monitoring program, and employing adaptive management.

7.4.4.6 Follow-up and monitoring

This section provides an overview of the monitoring and follow-up programs for forested habitat and describes how programs will be implemented, and how information resulting

from the programs will be applied. Further information can be found in Section 10.3 and Appendix I.

Monitoring programs for forested habitat will be implemented as part of the Environmental Protection Program (EPP). The EPP is a framework for implementation, management, monitoring and evaluation of protection activities in keeping with environmental effects identified in environmental assessments, regulatory requirements and public expectation. The EPP prescribes measures and practices to avoid and reduce adverse environmental effects on wildlife and wildlife habitat (e.g., wildlife reduced risk work windows, setbacks and buffers for wildlife and sensitive wildlife habitat).

The EPP includes an environmental monitoring plan that provides the detailed methods on how predicted changes will be verified and how the effectiveness of mitigation strategies will be evaluated. Monitoring of forest habitat will be directed to the Spy Hill-Ellice Community Pasture, and will be focused on ungulates, vegetation species of conservation concern, invasive and non-native vegetation species, and traditional use plant species. The environmental monitoring plan also identifies reporting commitments and schedule.

Reports describing the results of follow-up and monitoring activities for forested habitat may reveal the need for adaptive management to address unanticipated environmental effects. Unanticipated effects may require the application of additional mitigation or require modifications to existing mitigation measures. Knowledge gained through ongoing monitoring and associated analysis will be used to make recommendations for ongoing improvements to mitigation measures, the monitoring plan, methods, and analysis. Manitoba Hydro conducts its monitoring programs in an integrated fashion across all current projects, this ensures knowledge gained from other project (i.e. Manitoba Minnesota Transmission Project and Bipole III Transmission Project) effects monitoring is available and applicable to this Project. The environmental monitoring plan will identify the decision triggers or thresholds for when adaptive management action is required for forested habitat.

The approach and methods used to monitor forested habitat are consistent with many of those used by Manitoba Hydro on other projects (e.g. Bipole III Transmission Project) as well as past projects (e.g., Wuskwatim Transmission Project, Manitoba Minnesota Transmission Project). The results of past monitoring efforts and Project baseline studies together influenced the development of Project-specific monitoring programs.

7.4.5 Wetland habitat

7.4.5.1 Summary of current status

Habitat

As described in the Biophysical Technical Report (Appendix D) and shown in Map 5-1, wetlands in the RAA commonly occur as ponds and sloughs, also known as prairie potholes. Some wetlands were small, dry cattail (*Typha* sp.) depressions while others had open water with willows (*Salix* spp.), cattails and graminoids. Other wetlands occurred along an aspen (*Populus tremuloides*) forest fringe with cattails or were part of a treed willow stand. Wetlands were typically surrounded by crop or pasture land. Other wetland types in the region include bogs and fens. Vegetation in bogs largely consists of peat mosses and ericaceous shrubs.

Wetland functions include filtration and improving water quality, regulation of water levels, and providing habitat for aquatic and semi-aquatic species. Wetlands form important habitat for amphibians, waterfowl, some furbearers, and moose. These habitats are known to support species of conservation concern and traditional use plants. Two wetland bird species of conservation concern, horned grebe (*Podiceps auritus*) and yellow rail (*Coturnicops noveboracensis*), could occur in the RAA. As outlined in Table 5-2, wetlands represent 2.9% (2,772.6 ha) of the RAA (marsh and fens, treed and open bogs), 2.1% (299.9 ha) of the LAA (marsh and fens), and 1.4% (2.5 ha) of the PFA (marsh and fens).

Indicator species

Indicator species of wetland habitat were identified to include the following:

- Vegetation species of conservation concern;
- Invasive and non-native vegetation species;
- Traditional use plant species, and
- Waterfowl.

Species of conservation concern and traditional use species have the potential to be adversely affected during Project activities. Invasive and non-native species may have the ability to spread and out-compete other native plants as a result of the Project.

Yellow twayblade (*Liparis loeselii,* S3S4) was observed in the vicinity of a fresh water spring, restricted to single individual occurrence. No other rare to uncommon plant species of conservation concern listed by the Manitoba Conservation Data Centre were observed in wetlands. No species listed by the federal *Species at Risk Act*, *The*

Endangered Species and Ecosystems Act or listed by the Committee on the Status of Endangered Wildlife in Canada were observed in wetland habitat.

Non-native and invasive species were observed during roadside surveys of privately owned lands. Species observed (but not limited to wetland surveys) included creeping bent grass (*Agrostis stolonifera*), smooth brome (*Bromus inermis*), Canada thistle (*Cirsium arvense*), lesser duckweed (*Lemna minor*), black medic (*Medicago lupulina*), reed canary grass (*Phalaris arundinacea*), common dandelion (*Taraxacum officinale*) and white clover (*Trifolium repens*).

Of the traditional plant species identified from the Project, several species recorded are typical of wetland habitat and included willows (*Salix* spp.), stinging nettle (*Urtica dioica*), bulrush (*Schoenoplectus tabernaemontani*), Weke (*Acorus americanus*) and cattail (*Typha* sp.) (Manitoba Hydro 2017b, 2017h, 2017j, MNP 2017).

Waterfowl include ducks, geese, mergansers, and swans, most of which require wetlands or other water bodies for breeding. Wetland degradation has been a threat to many bird species in the Prairie Pothole Region (Environment Canada 2013b), which includes the RAA. However, the populations of many species of waterfowl are currently stable or increasing, due primarily to wetland conservation efforts (Environment Canada 2013b). Waterfowl occur in relatively large numbers throughout the RAA, including the Assiniboine and Qu'Appelle rivers during the spring and fall migration periods. Their greatest densities are in marsh habitat. Waterfowl were selected as the indicator species for wetland habitat because they represent potential Project effects on species that require it. Many waterfowl species are harvested by resource users, and individuals are vulnerable to collisions with transmission wires, particularly near wetlands and other water bodies. As such, this group also represents potential Project effects on bird mortality during operation.

7.4.5.2 Relevant project interactions

As outlined in Table 7-1, the Project is predicted to interact with the wetland habitat ecological environment during construction activities of mobilization, workforce presence, access, foundations, structures and conductors, and demobilization. The Project is predicted to interact with the wetland habitat ecological environment during operation and maintenance Project activities of physical presence, inspection patrols, and vegetation management.

While there are 2.5 ha of wetlands in the PFA, the area subject to direct disturbance from the Project, no loss of wetland habitat is anticipated as the transmission line spans water bodies. Indirect effects could include soil compaction and rutting during mobilization, demobilization, and access development. Project-related sensory

disturbance such as construction noise, the presence of workers, vibrations, exhaust and other odours may result in the temporary displacement of wetland birds and mammals if they avoid otherwise suitable habitat during construction and due to inspection patrols during operation. Sensory disturbance could affect wildlife during all but one construction stage; no effects are anticipated due to the use of local accommodations by the workforce. No additional effects of the establishment and use of marshalling yards and borrow sources or of modifications at Birtle South Station on wildlife are anticipated in wetlands during construction.

The physical presence of the transmission line may have a minor effect on movements of individuals near and across the ROW during operation. Bird mortality could increase due to collisions with transmission wires and because increased access could increase the number of birds harvested by resource users. No additional effects of equipment maintenance on wetland habitat at Birtle South Station are anticipated during operation.

7.4.5.3 Project assessment

Predicted changes to wetland habitat

Potential effects on wetland habitat from the development of transmission lines has been reported on by Manitoba Hydro (2011a and 2015), SaskPower (2009), Minnesota Department of Commerce Office of Energy Security and USDA Rural Development Rural Utilities Service (2010) and US Department of Energy (2015). Effects identified include wetland loss, soil rutting and compaction, change in vegetation structure, fragmentation of wetland vegetation, use of herbicides, loss of traditional use plants, introduction of sediments from areas of exposed soil, and spread of invasive plant species.

The Project has the potential to result in disturbance of wetland habitat within the PFA due to construction, and operation and maintenance activities. Soil and vegetation disturbance such as rutting, compaction, and trampling of vegetation and reduced species diversity may result from construction activities of mobilization, access, foundations, and demobilization; and during operation and maintenance including vegetation management. Installation of foundations and tower structures are not anticipated to remove wetland habitat. The Project will traverse approximately 2.5 ha of marsh and fen wetlands (Table 5-2)(Table 7-12). Wetlands are highly connected systems that transport water and nutrients across the landscape. Water balances that have been altered in wetlands may result in increased drainage (i.e., drier moisture regime) or flooding that could affect species composition and abundance (Ecological Land Surveys Ltd. 1999). Transmission line construction is unlikely to impede water flow resulting in long-term ecological changes.

The proposed Project has the potential to cause other adverse effects to wetland habitat in the PFA from construction and maintenance activities including the potential loss of species of conservation concern and traditional use plants. The Project has the potential to introduce and spread invasive and non-native species to wetland habitat during construction and maintenance activities, including activities from mobilization, access, foundations, and inspection patrols. There is also the potential for the loss or impairment of vegetation from accidental releases of fuels or hazardous substances. The accidental release of fuels and hazardous substances could occur in the Project assessment area during construction and into the operation phase of the Project.

Predicted changes to wetland indicator species

Changes to wetland habitat may occur as a result of the Project that could be detected through indicator species (i.e., vegetation species of conservation concern, invasive and non-native vegetation species, traditional use plant species, and waterfowl,).

One species of conservation concern (uncommon plant) was recorded during surveys in the vicinity of a fresh water spring. Traditional plant species were identified from the Project, including species recorded in wetland habitat (e.g., willows, cattail, bulrush etc.). There is the potential for species of conservation concern and traditional use plants (various shrubs and herbs) to be affected or lost from the proposed Project as a result of vegetation disturbance or removal, rutting and soil compaction from construction and maintenance activities; and accidental releases of fuels or hazardous substances during construction and maintenance activities. There is the potential for the introduction and spread of non-native and invasive species in wetland habitat of the PFA (e.g., reed canary grass) from construction and maintenance activities, including activities of equipment mobilization, access and foundations. Any soil disturbance as a result of the Project (e.g., rutting from heavy equipment or installation of foundations) has the potential to occupy non-native or invasive species, which can become problematic for the native plant species in wetland habitat.

During operation, waterfowl mortality could increase due to collisions with transmission wires. Large, heavy-bodied birds with limited manoeuvrability are at most risk of collisions with transmission lines (e.g., Bevanger 1998; Avian Power Line Interaction Committee [APLIC] 2012); waterfowl are particularly susceptible (Rioux et al. 2013). Some behaviours are also associated with increased collision risk. Examples include flocking and spending substantial amounts of time in flight (APLIC 2012), as with Canada geese (*Branta canadensis*) during the spring and fall migrations.

The largest concentrations of waterfowl in the RAA occur during the fall migration. Waterfowl density is greatest in marsh habitat during the spring and fall migrations, with smaller groups of ducks and geese distributed along the Assiniboine and Qu'Appelle

rivers and larger creeks, particularly in fall. Wetlands located northeast of PTH 41 and PR 475 tend to concentrate large numbers of waterfowl in fall. Groups of waterfowl were observed where the final preferred route crosses the Assiniboine River during both migration periods and the risk of collisions with transmission lines will likely be greatest at this location. The final preferred route also crosses Birdtail and Armstrong creeks, where smaller groups of waterfowl have concentrated in spring.

Recent monitoring of bird mortality at transmission lines in northern Manitoba has been conducted. Bird collision mortality for the Wuskwatim outlet transmission lines was estimated at 43.1 birds/km during the breeding bird season and 21.55 birds/km during the fall migration period (Wildlife Resource Consulting Services MB Inc. 2017b). Bird collision mortality for the Keeyask Transmission Project was estimated at 10.8 birds/km in the late breeding season and 10.3 birds/km during the fall migration period (Wildlife Resource Consulting Services MB Inc. 2017c). The estimated average number of birds killed per kilometre of transmission line per year in Canada is 25.6 (Rioux et al. 2013). The general increase in waterfowl populations in Canada suggests that collision mortality is not likely limiting population growth (Rioux et al. 2013). As most waterfowl populations are generally resilient, a small, long-term, continuous effect is anticipated, which will be limited to the PFA.

Because less than 1% of the wetland habitat in the RAA and less than 1% of the wetland habitat in the LAA will be affected by the Project, effects on wetland habitat and indicator species are expected to be small and will not have a substantial effect on plant and wildlife.

Mitigation measures

Selection of the final preferred route took a balanced approach to reduce overlap with natural habitats, including wetland habitat. Other standard industry practices and avoidance measures, along with Project-specific mitigation as described in the Environmental Protection Plan (EPP) will be implemented during Project construction and operation. This section highlights the key mitigation measures to be implemented during construction and operation to limit effects on wetland habitat as described in section 7.4.5.3. Mitigation measures include the following:

- Wildlife features (i.e. mineral licks, stick nests) will be identified in mapsheets and flagged prior to clearing.
- Trees containing large nests of sticks and areas where active animal dens or burrows are encountered within the ROW will be left undisturbed until unoccupied.
- Artificial structures for nesting may be provided if unoccupied stick nests must be

removed.

- Environmentally sensitive sites, features and areas will be identified and mapped before clearing.
- Construction activities will be restricted to identified roads, trails and cleared construction areas in accordance with the Access Management Plan.
- To reduce the potential for collisions with wires following wire installation, bird diverters will be placed at designated environmentally sensitive sites.
- Hunting and harvesting of wildlife or possession of firearms by Project staff will not be permitted while working on Project sites.
- Plant SAR and critical habitat will be protected in accordance with provincial and federal legislation and provincial and federal guidelines. A 10 m buffer will be applied to mapped SOCC occurrences within the PFA. Setbacks and buffers along the ROW will be clearly identified by signage or flagging prior to construction, and signage or flagging will be maintained during construction to alert crews to the presence of the setback or buffer.
- Final tower siting will avoid confirmed locations of plant SOCC, where possible.
- If avoidance of listed rare plant species is not possible, Manitoba Sustainable Development will be contacted to determine the most appropriate mitigation action. This could include harvesting seed from the PFA, salvaging and transplanting portions of sod, collecting cuttings or transplanting whole plants.
- Additional surveys will be conducted in the ROW prior to construction to identify new occurrences of rare plants. If previously unidentified plant SAR or SOCC are found on the ROW prior to or during construction, the occurrences will be flagged and mitigation measures applied.
- Clearing activities will not be carried out during reduced risk timing windows for wildlife species without additional mitigation, such as bird nest sweeps.
- Natural low growing shrub and grass vegetated buffer areas of 30 m will be delineated around wetlands and riparian areas and be maintained to the extent possible.
- Only water and approved dust suppression products will be used to control dust on access roads, where required. Oil or petroleum products will not be used.
- Methods such as hand cutting, mechanical cutting or winter shearing will be used to clear the transmission line ROW and other sites.

- Contractor specific Erosion Protection and Sediment Control Plans will be developed prior to construction and updated annually.
- All equipment must arrive at the ROW or Project site clean and free of soil or vegetation debris.
- Equipment will be cleaned before moving from locations with identified invasive weed infestation.
- Manitoba Hydro employees and the contractors will follow the Project Biosecurity Management Plan to prevent the spread of invasive weeds.
- Vehicle, equipment and machinery maintenance and repairs will be carried out in designated areas located at least 100 m from the ordinary high water mark of a waterbody, riparian area or wetland.
- Vehicle, equipment and machinery operators will perform a daily inspection for fuel, oil and fluid leaks and will immediately shutdown and repair any leaks found.
- Rehabilitation plans will include objectives for restoration of natural conditions, erosion protection, sediment control, non-native and invasive plant species management, as required.
- Trees will not be felled into waterbodies. Danger trees will be flagged or marked for removal using methods that do not damage soils and adjacent vegetation.
- If required, marshalling yards and worker accommodations will not be developed in wetland habitat sites.

Project assessment significance conclusion

This section summarizes the Project effects analysis for wetland habitat. The information below characterizes the environmental effects of the Project on wetland habitat, including indicator species. Changes in wetland habitat characteristics in the RAA and LAA pre and post Project are outlined in Table 7-12.

Table 7-12: Change in wetland habitat characteristics in the RAA and LAA

	Wetland
RAA	
Amount of habitat pre-construction (ha)	2,772.6
Amount of habitat post-construction (ha)	2,770.1
Change from pre-construction levels (ha)	-2.5
Percent change post-construction	-0.1
LAA	
Amount of habitat pre-construction (ha)	299.9
Amount of habitat post-construction (ha)	297.4

Change from pre-construction levels (ha)	-2.5
Percent change post-construction	-0.8

Given the application of the above-described mitigation measures the effects of the Project in terms wetland habitat are summarized as follows:

- Direction: Adverse
- Magnitude: Small
- Geographic extent: Project Footprint Area
- Duration: Medium Term
- Frequency: Infrequent
- Reversibility: Permanent
- Resiliency: High

In summary, the Project will have adverse, low in magnitude effects on wetland habitat. Overall, the Project's effects to wetland habitat will be small, and not expected to measurably affect the long-term persistence or viability of wetland habitat in the RAA. The residual effects are assessed as being not significant.

7.4.5.4 Sensitivity to cumulative effects

This section identifies and assesses the cumulative effect of those residual effects likely to overlap in time and space with residual environmental effects of other projects and physical activities. Section 5.2 includes a summary of historic, current and reasonably foreseeable projects that may overlap with the Project. Past agriculture, residential and commercial resource development has contributed to the cumulative loss of wetland habitat in the RAA, and has led to changes in the distribution and abundance of many wildlife species. The majority of wetland habitat occurs along the Assiniboine River, its tributaries, and the shallow prairie ponds and sloughs, also known as prairie potholes found in the privately owned agricultural land in the eastern part of the RAA. The populations of many species of wildlife inhabiting the RAA are considered stable despite cumulative effects on habitat availability. The cumulative effect of wetland habitat effects is adverse as some habitat in the RAA will be altered as a result of reasonably foreseeable future projects; including ongoing wetland drainage to support agricultural development. However, the magnitude of this effect is low due to the location of most projects on previously modified habitat and routing mitigation.

Residual cumulative effects will be continuous and permanent yet reversible upon the removal of infrastructure and rehabilitation of affected areas. The ecological context for

the RAA is disturbed, as the majority of lands have been substantially previously disturbed by human development and human development is still present.

7.4.5.5 Sensitivity to climate change

According to the climate change information and scenarios presented in the sections 5.2.3 and 7.3.3, temperature and precipitation are expected to increase in the future. These sections also note that it is difficult to develop any precision on changes at a local scale, where factors such as land cover, topography, watercourses and other barriers may have a greater influence on the distribution of local populations in addition to complexities associated with local food webs.

A shorter winter and longer growing season could result in an expansion in distribution of vegetation species less tolerant of cooler conditions, and alter wetland habitat. An earlier spring and later fall may alter seasonal movements and the timing of activities such as break-up, freeze-up, waterfowl migration.

Effects of climate change on wetland habitat are expected to be a function of this anticipated increase in temperature and associated extreme weather events (e.g., flooding, wildfires). Resulting effects to wetland habitat in the RAA may include the following:

- Change in habitat composition resulting from extreme weather events such as wildfires, or flooding;
- Reduced food availability (e.g., shifts in the seasonal timing of insect emergence, change in food availability due to warmer temperatures); and
- Shifts in species ranges.

Given the timelines associated with the predicted precipitation and temperature changes, wetland habitats will likely be able to overcome these challenges through shifts in and the narrowing of the timing imbalance between wildlife breeding seasons (e.g., timing of egg laying, breeding, insect emergence, nesting) that is already being observed (Both et al. 2006).

The predicted climate change scenarios are not expected to change the significance determinations for wetland habitat, as they are not anticipated to measurably increase the magnitude of effects of the Project. However this information does reinforce the importance of employing adaptive management, as discussed below.

7.4.5.6 Follow-up and monitoring

Due to limited Project interactions and well-established wetland protections and mitigation measures, wetland habitat specific monitoring is not proposed for the Project. If significant wetland damage is observed, remediation efforts will be implemented and a monitoring plan developed to address concerns at each specific site.

Protections for wetland habitat will be implemented as part of the Environmental Protection Program (EPP). The Environmental Protection Program is a framework for implementation, management, monitoring and evaluation of protection activities in keeping with environmental effects identified in environmental assessments, regulatory requirements and public expectation. The EPP prescribes measures and practices to avoid and reduce adverse environmental effects on wetlands habitat (e.g., wildlife reduced risk work windows, setbacks and buffers for sensitive habitat).

7.5 Socioeconomic effects assessment

7.5.1 Overview

The selection of the Project's socioeconomic valued components is based on several factors, including consideration of input from regulators, the public, Indigenous communities, stakeholders, professional judgement from Manitoba Hydro and information derived from the project-environment interactions table (Table 7-1). Based on this information, the socioeconomic effects assessment is organized around the following VCs:

- Infrastructure and services;
- Employment and economy;
- Property and residential development;
- Agriculture;
- Other commercial resource use
- Recreation and tourism;
- Health;
- Traditional Indigenous land use; and
- Heritage.

For most VCs, the Regional Assessment Area (RAA) extends beyond the route planning area described in section 7.2.2, and includes the local, regional municipality areas. For each VC, the following information is provided:

- Summary of current status:
- Relevant Project interactions;
- Project assessment:
    - Predicted changes to VC;
    - Mitigation;
    - Project assessment significance conclusion;
- Sensitivity to cumulative effects;
- Sensitivity to climate change; and
- Ongoing communication and coordination.

7.5.2 Infrastructure and services

7.5.2.1 Summary of current status

Overview

The infrastructure and services section provides an overview and assessment of the effects of the Project on provincial, municipal and privately operated infrastructure and services in the vicinity of the Project. This includes the following indicators of change:

- Temporary accommodations;
- Emergency services;
- Municipal services;
- Transportation and utility infrastructure; and
- Transmission lines and associated facilities.

Infrastructure and services (see Map 5-2) was selected as a VC in recognition of its importance to residents and communities. Potential effects to infrastructure and services include effects from increased traffic on transportation infrastructure (including damage or disruption), increased pressure on utilities and/or emergency services, and the potential for interference with communication and transmission signals.

Temporary accommodations

Temporary accommodations in the RAA include hotels/motels, resorts, campgrounds, and bed and breakfasts. Larger communities outside the RAA that can provide temporary accommodations to workers include Brandon and Virden. There is a total of 15 hotels/motels, bed and breakfasts and campgrounds in the RAA.

Emergency services

Emergency services in the RAA include policing, fire services and ambulance services. The RCMP is the primary provider of policing services in the region. There are three detachments that serve the area from Russell, Hamiota and Virden. Firefighting services in the RAA are provided by a combination of professional and volunteer firefighters based out of various fire departments. Fire departments serving the RAA typically have less than 25 members. Ambulance stations exist at the Birtle, Russell, Hamiota and Virden Health Centres. All ambulances in rural Manitoba are dispatched through one location in Brandon (outside the RAA). If a resident calls 911 or if BRHC requests an ambulance, it is dispatched through Brandon. The ambulance service uses geolocation so ambulances are always out on the road and moving around the region.

Municipal services

Key municipal services in the RAA include water and wastewater treatment and solid waste disposal. A number of centers and rural areas in the RAA are served by public drinking water and wastewater utilities (Table 5-10). Drinking water in and around the RAA is primarily supplied by groundwater well sources. The St. Lazare Water and Wastewater Utility is the only utility supplied by surface water and has recently undergone upgrades to meet potable water needs of existing residents. Residents not served by a municipal utility typically obtain water through private wells.

Wastewater facilities operated by municipal utilities typically consist of wastewater treatment lagoons. The Village of St. Lazare’s wastewater treatment lagoon is an unlicensed facility and will need to be replaced in order to accommodate new development in the community that requires full services.

Disposal sites, landfills and eco-depots operate throughout the region, collecting household, yard and hazardous wastes. Household hazardous waste collection eco-depots have been established for a variety of wastes throughout the region under Green Manitoba’s Recycling Programs initiative, including for the collection of tires, pesticide containers, oil and antifreeze and e-waste. There are a total of eight waste disposal facilities in the region.

Transportation and utility infrastructure

Roads

The lands traversed by the Project can be accessed by Provincial Trunk Highways (PTH), Provincial Roads (PR) and mile or half mile roads. Key highways and roads are listed in Table 5-12 and include PTH 16, PTH 41 and PR 568.

Other transportation

There are three rail lines that run through the region that are owned and operated by Canadian Pacific Railway and Canadian National Railway (Table 5-13). There is also one rail spur operated by Agricore. The rail lines include a combination of both freight and passengers. The nearest airport to the region is the Brandon Municipal Airport (YBR). There are no aerodromes or airstrips located directly in the vicinity of the Project.

Utility infrastructure

There are two pipelines in the RAA; the Minell Pipeline that runs in a north-south direction through the RMs of Ellice Archie and Russell Binscarth and the TransCanada Pipeline which runs in an east west direction through the RMs of Ellice Archie and Prairie View

Communication facilities

Communication facilities/towers, including microwave and cellular towers can be found across western Manitoba. These are maintained by telephone communication companies, broadcast companies and radio stations and corporations, the Government of Canada, Provincial and municipal governments and utility companies. There are 29 communication towers located in the RAA.

Transmission lines and associated facilities

There are two transmission lines in the RAA that are above 66 kV: a 230kV transmission line (B70H) emanating from Birtle South Station and proceeding southward for 57 km to Virden West Station and Birtle South to Raven Lake (B69R), and a 230kV transmission line emanating from Birtle South Station and proceeding eastward for 32 km to Raven Lake Station, south of Shoal Lake, Manitoba. Upgrades to the 230 kV Birtle South Station are part of the Project.

7.5.2.2 Relevant Project interactions

Increased demands placed on infrastructure and services (e.g., roads, accommodations and hospitals) will occur largely during the construction phase when Project activities

and the construction workforce is at its largest (i.e., workforce presence - movement of people and materials). It is not anticipated that there will be any measurable interactions during the operations phase, or with the termination at Birtle South Station. Potential for interference with radio and communication devices could occur only during the operations phase of the Project due to the physical presence and operation of the transmission line.

7.5.2.3 Project assessment

Temporary accommodations

Predicted changes to temporary accommodations

The Project will contribute to a minor temporary increase in the local population due to the presence of workers during Project construction. This could change the availability of accommodations in the RAA for local residents on a temporary basis (i.e., several months during two winters). The additional workers in the area will provide economic opportunities for those businesses that can provide lodging to workers during construction of the Project.

The construction workforce will peak during tower installation at approximately 50-60 workers. Possible overlap in construction activities could also result in a larger number of workers in the RAA. As noted in section 2.6.3.3 it is anticipated that workers will be housed in suitable accommodations available in local communities where feasible and practical. In the event that accommodations are not available, a mobile construction camp will be established. Camp size could be in the range of 50 to as many as 75 workers, but will vary according to the activity, contract size and labour force requirements. The short-term construction activities and small scale of the Project and workforce should not have a material impact on accommodation availability.

Mitigation for temporary accommodations

Mitigation measures include the following:

- In the event that there is no vacancy at accommodation facilities in the area, a mobile work camp will be established.

Emergency services

Predicted changes to emergency services

Given the relatively modest amount of workers required for construction during any phase (50-60 workers maximum) and short-term duration of construction (primarily 3-4 months during two winters) excluding works at Birtle South Station, it is anticipated that

there will be limited additional demand for emergency services during the construction phase. Existing emergency services should be able to accommodate the small and temporary day-time increase in workers in the area. For example, hospital/ambulance usage due to accidents was calculated based on the Project workforce estimates and the likely number of injuries that would occur over the construction phase using Safe Work Manitoba 2000-2012 data (estimated as 7.9 injuries per 100 full time workers) (Safe Work Manitoba 2015). Based on this information, the number of injuries estimated for peak, average monthly and total injuries are as follows for the Project:

- 1.5 injuries at peak month;
- 0.5 average monthly injuries during construction; and
- 10.4 total injuries for Project construction.

A total of 10.4 injuries over a 20-month period of construction should not impact the ability of the local hospitals/ambulance to provide services for the workforce. It is not anticipated that firefighting and policing will be affected by the Project.

Mitigation for emergency services

This section highlights the key mitigation measures to be implemented during construction to limit effects on emergency services. Mitigation measures include the following:

- Manitoba Hydro and its contractors will meet the requirements of the *Manitoba Workplace Safety and Health Act*. Manitoba Hydro or relevant contractors will provide first aid supplies and facilities, and trained first aid personnel to deal with minor injuries. In the case of major injuries, medical aid will be summoned and/or evacuation via land or air ambulance to medical facilities will be undertaken;
- The contractor will be responsible for developing and implementing an Emergency Response Plan (ERP), including measures to address onsite first aid, fire-fighting and security procedures.
- Project personnel will be made aware of the ERP and designated staff will receive ERP training. Among other elements, the plan will address handling and storage of materials, driving safety, animal encounters, emergency response communications, spill response, personnel injury response and vehicle accidents. The plan will describe response measures for major medical emergencies and include procedures for emergency response coordination with local emergency response personnel and local medical facilities; and
- Emergency service providers will be notified of construction activities and timing.

Municipal services

Predicted changes to municipal services

A variety of sources and types of waste during the construction process will contribute to the waste stream of the Project. The following table highlights the waste that is typically generated by transmission projects. It is anticipated that drinking water infrastructure and wastewater treatment infrastructure will not be affected by the Project.

Table 7-13: Typical construction materials generated by transmission line projects

Category	Items
Hazardous waste	Motor oils, fuels, solvents, coolants, pesticides, other
Construction materials	Wood, aluminum, copper, steel, cardboard, plastic
Food services	Beverage containers (aluminum, plastic and glass), cardboard, boxboard, plastics, newsprint, office paper
Domestic solid waste	Organic material, non-recyclable waste
E-waste	Computers, circuitry, batteries
Construction equipment	Rubber tires, lead-acid batteries, hydraulic fluid, oil filters

To manage and reduce the amount of materials flowing from the construction of the Project, Manitoba Hydro will require Waste and Recycling Management (W&R) plans from construction contractors in an effort to reduce the volume of materials going to landfill and facilitate reuse and recycling. Where applicable, W&R Plans will also address wastes developed in the operation of work camps.

Overall, the small scale of the Project should not result in a substantive waste stream. Licensed waste disposal sites in the region with available capacity will only be used for all waste disposal and all necessary approvals will be obtained. The effect on the capacity of waste disposal is small in magnitude.

Mitigation for municipal services

Mitigation measures will include the following:

- Waste and Recycling Management Plans will be developed for the Project; and
- All waste generated by the Project will be disposed of at licensed facilities with capacity.

Transportation and utility infrastructure

Predicted changes to roads

The route crosses PTH 16 and PTH 41 and parallels PR 568 for 13 km in length (see Map 5-2). During the construction phase of the Project, materials, equipment and workers will be transported to and from the site using different types of vehicles. Vehicles used in construction will include excavators, loaders, dozers, graders, backhoes, cranes, semi-trailers, dump trucks, tracked vehicles, pick-up trucks, drill rigs and all-terrain and support vehicles. There will be increased traffic which could lead to concerns regarding localized congestion, safety concerns and a need for permits. Efforts will be made to utilize transportation routes that can accommodate the increase in traffic to transport materials and equipment to address concerns of congestion and safety.

The small scale of the Project and short-term duration are not anticipated to have any measurable impacts on roadways in the area. Utilizing roadways with increased capacity should result in no impact on traffic congestion on major roadways due to the roadways currently operating under capacity based on Manitoba Infrastructure design standards (Manitoba Department of Highways and Transportation 1998).

In addition to traffic volumes, another concern related to roads includes the impact on the quality of roadways from the transportation of large equipment and station components. All materials transported by truck on provincial highways are subject to provincial weight restrictions. The primary routes to transport heavy machinery and station equipment are designed to allow for heavy loaded vehicles which will minimize impacts to roadways. During the course of the Project, if Manitoba Hydro or its contractors need to operate overloaded vehicles on provincial highways, all necessary permits (e.g., overweight permits) will be acquired and any restrictions (e.g., Spring Road Restrictions) will be adhered to.

Mitigation for roads

This section highlights the key mitigation measures to be implemented during construction to limit effects on roads. Mitigation measures include the following:

- Construction methods and timing will be designed to minimize traffic disruption to the extent possible;
- If Manitoba Hydro or its contractors need to operate overloaded vehicles on provincial highways, all necessary permits (e.g., overweight permits) will be acquired and any restrictions (e.g., Spring Road Restrictions) will be adhered to; and

- All necessary safety signs and offsets will conform to MI standards.

Predicted changes to other transportation (rail, airports/aerodromes)

As the nearest rail line is located 2.7 kilometers away from the final preferred route there will be no possible induction effects due to the distance from the transmission line (induction discussed further under Predicted changes to utility infrastructure (oil and gas pipelines). Furthermore, no materials or workers are expected to utilize rail for the Project and, therefore, no effects are anticipated regarding rail capacity.

Regarding use of air travel for materials and workers, it is anticipated that all materials and workers will utilize ground transportation; therefore, no effects are anticipated regarding air travel capacity.

Mitigation for other transportation

As no effects are anticipated, no mitigation is required.

Predicted changes to utility infrastructure

Transmission lines and/or oil and gas pipelines traversing or paralleling (usually within 100m of other transmission lines, oil and gas pipelines, and rail lines) can interfere with the operation of the infrastructure due to induced Alternating Current (AC) voltage. A transmission line generates electric and magnetic fields, which can interact with objects around them. If these objects happen to be metallic, a small voltage called an induced voltage can appear on them. When a long-term induced voltage exists on a pipeline, for example, it can be a safety issue for operations personnel and can also result in pipe corrosion.

As shown in Map 5-6, regarding the final preferred route, one oil and gas pipeline is traversed in the RM of Ellice-Archie at NE-4-18-28W. No transmission lines or rail lines are traversed or paralleled by the route and, therefore, will not be affected. The standard practice of Manitoba Hydro is at the detailed design stage to contact the owner of the infrastructure and determine with Manitoba Hydro what mitigation measures would be required to ensure safe operation of their infrastructure. In addition to the above, for pipelines, Manitoba Hydro adheres to various regulatory standards to address induction issues. It is expected that any potential interference would be completely mitigated at all crossings with the proposed mitigation measures through following the relevant standards.

Mitigation for utility infrastructure

This section highlights the key mitigation measures to be implemented during construction to limit effects on utility infrastructure. Mitigation measures include the following:

- Manitoba Hydro will meet CAN/CSA-c22.3 No. 6-13 Principles and Practices of Electrical Coordination between pipelines and electrical supply lines; and
- Manitoba Hydro will also apply its internal natural gas standards: 625.01 Construction of steel pipe parallel to Electric Transmission lines and 721.05 Maintenance of Steel Pipe Parallel to Electric Transmission Lines.

Predicted changes to communication facilities and devices

In terms of communication facilities, during the engagement processes for transmission projects there is often concern expressed regarding potential interference of radio frequency devices from transmission lines and stations (e.g., TV antenna and satellite dishes, radio, cellular phones). For this Project there are no communication facilities in the Project Footprint. The closest communication tower is approximately 6.6 km away in NE-4-18-28-W in the Rural Municipality of Ellice-Archie (Map 5-2).

Electrical interference from a proposed transmission line on radio, television and/or communications equipment is not normally a problem because most transmission lines and stations transmit radio noise below the operating range of most Radio Frequency devices. The most common cause of such interference occurs when loose electrical hardware causes unintended arcing. These situations are managed through proper construction and routine maintenance (e.g., tightening of hardware components). Maximum radio interference levels are specified by Industry Canada (Industry Canada 2001). Manitoba Hydro will meet the necessary regulatory requirements and will attempt to resolve any radio or television interference problems traceable to the transmission line; however, proximity to such receptors were considered during routing (e.g., homes, commercial buildings and communication facilities) and, therefore, no effects are anticipated during the operation and maintenance phase.

Mitigation for *communication facilities and devices*

This section highlights the mitigation measures to be implemented to limit effects on communication facilities and Radio Frequency devices. Mitigation measures include the following:

- Manitoba Hydro will meet the requirements of The Radio Communications Act (R.S., 1985, c. R-2 [as amended to 2007-07-09]; Manitoba Hydro will meet the

Radio Communication Regulations (SOR/96-484, Registration 5 November 1996 [as amended to 2011-02-17]);

- Manitoba Hydro also meets the requirements of the Industry Canada's Interference- Causing Equipment Standard - ICES-004 Issue 3 December, 2001 – Alternating Current High Voltage Power Systems; and
- Manitoba Hydro will attempt to resolve any radio or television interference problems traceable to the new station.

Predicted changes to transmission lines and associated facilities

As no transmission lines are traversed or paralleled by the Project, no induction effects are anticipated or issues associated with radio interference. All design clearances will be adhered to.

Project assessment significance conclusion

Potential effects to infrastructure and services include effects from increased traffic on transportation and utility infrastructure (including damage or disruption), increased pressure on emergency services, and the potential for interference with communication and transmission signals.

Although effects will occur at a regional scale, the small scale of the Project and short-term duration of construction should not impact transportation infrastructure or emergency services/utilities in the RAA with the implementation of the above mitigation measures. Regarding possible interference with communication and transmission signals, the effects will be small in magnitude since most transmission lines transmit their radio noise below the operating range of most Radio Frequency devices. No adverse effects are expected regarding induction with the implementation of mitigation measures.

Given the application of the above-described mitigation measures the effects of the Project in terms of infrastructure and services are summarized as follows:

- Direction: Adverse
- Magnitude: Small
- Geographic extent: Regional
- Duration: Short-term
- Frequency: Sporadic/intermittent
- Reversibility: Reversible

- Resiliency: High

In summary, the Project will have adverse, small magnitude effects that are reversible. The residual effects are assessed as being not significant.

7.5.2.4 Sensitivity to cumulative effects

Overview

This section identifies and assesses the cumulative effect of those residual effects likely to overlap in time and space with residual environmental effects of other projects and physical activities. Section 5.2 includes a summary of historic, current and reasonably foreseeable projects that may overlap with the Project.

As described in section 5.2.3, future plans for the RAA include several transportation and water treatment and supply infrastructure projects in the Russell area, water treatment and supply infrastructure in the Birtle area, and ongoing residential development in these larger urban communities, as well as some of the smaller settlements in the RAA such as St. Lazare. Mining and oil and gas exploration and development are also expected to continue in the RAA including the Spy Hill-Ellice Community Pasture.

In many cases past and present physical activities and infrastructure are captured in the existing conditions for infrastructure and services and provide the basis for the assessment of Project residual effects. It is not anticipated that these activities or uses will result in additional effects on infrastructure and services in the future that are not already present. Furthermore, based on available information, projects that would have potential cumulative effects are not expected to be in the vicinity of the infrastructure in the foreseeable future.

The following infrastructure and services components that are not carried forward for the cumulative effects assessment regarding services capacity, induction or electrical interference as there are no predicted material Project-based effects:

- Rail;
- Aerodromes;
- Utility infrastructure - communication facilities; and
- Transmission lines and associated facilities.

Temporary accommodations

The workforces for the various projects in the RAA have the potential to create cumulative demand for temporary accommodations during their respective construction

phases if workers stay in the same communities at the same time. It is anticipated that some of the projects may use camps, to some degree, to house their temporary workforces, alleviating the demand on temporary accommodations. There are very few accommodations directly in the RAA, but Brandon has extensive temporary accommodations and is expected to accommodate the cumulative demand (i.e., more than 1,400 rooms in Brandon). The use of camps by other projects will substantially alleviate demands on temporary accommodations. The geographic extent of cumulative effects will be spread throughout the RAA and beyond, and will effectively occur continuously throughout the time of overlap.

It is also anticipated that each of the Project proponents will also engage and share Project information with local governments, service providers, and/or businesses so they are aware of the anticipated demands, allowing them to identify potential service gaps or issues. Residual adverse cumulative effects will be distributed throughout the RAA as well as outside the RAA, which will reduce the effects on temporary accommodation.

Emergency services

As described previously, current emergency and protection services should be sufficient to meet current demands and there should be available capacity to provide services to a greater population if needed. Communication with fire departments, hospitals and police/RCMP detachments by Project proponents ahead of time will help them plan for potential increases in demand for their services. Overall, the cumulative demand for emergency and protection services are anticipated to be of small magnitude; resulting in no measurable effect on the quality of service provision.

Municipal services

Existing water, wastewater, and solid waste infrastructures can also meet the current demands with available capacity to meet additional demands, except in St. Lazare. Cumulative demand for water, wastewater and solid waste infrastructures is not anticipated to exceed the available capacities of these infrastructures or affect the quality of service provided. As noted, only licensed waste disposal sites and facilities in the region with available capacity will be used for all waste disposal streams and all necessary approvals will be obtained. It is expected that other Project proponents will also follow this same course of action. Therefore, residual cumulative effects will also be of small magnitude.

Transportation and utility infrastructure

Roads

Transportation activities for projects carried out at the same time as the Project construction process would have the potential to create cumulative road traffic during their respective construction phases because the same road network is likely to be used. It is anticipated that other projects will also engage and share Project information with government agencies and infrastructure operators (e.g., Manitoba Infrastructure, municipal governments, etc.) so they are aware of the anticipated demands, allowing them to identify potential service gaps or issues as well to inquire about permitting requirements.

All roads in the RAA currently operate below design capacity indicating that the network has capacity to accommodate additional traffic volumes associated with reasonably foreseeable projects. This cumulative road traffic volume is unlikely to decrease the level of service of the roadways.

Overall, the cumulative change in road traffic will be of small magnitude and reversible after the projects' construction phases. Residual cumulative effects will be distributed throughout the RAA, which will reduce the effects on roads or highways.

Oil and gas pipelines

In the event a proposed oil or gas pipeline crosses underneath or parallels the Project infrastructure there is the potential for induction effects to occur. Manitoba Hydro's standard practice would be to discuss what mitigation measures would be required with the owner of the infrastructure to ensure safe operation of their pipelines. Given this, no adverse effects are anticipated.

Overall, cumulative effects from past and present projects are largely captured in the existing conditions and there is limited overlap spatially and temporally with future projects. Existing accommodations and community infrastructure and services are sufficient to meet the current demands and there is available capacity to handle increased demand and growth in the region. There is low potential for induction and radio frequency interference with future projects. Therefore, effects on infrastructure and services are not predicted to alter the Project significance conclusions.

7.5.2.5 Sensitivity to climate change

According to the climate change information and scenarios presented in the section 5.2.3 and 7.5, temperature and precipitation are expected to increase in the future. Climate change is not expected to have a material impact on infrastructure and services

and, therefore, not anticipated to result in a change to the determination of significance for residual or cumulative effects.

7.5.2.6 On-going communication and coordination

No monitoring or follow-up is required. All project-based effects are of small magnitude and will not have a measurable effect on the current baseline condition. However, Manitoba Hydro throughout the construction phase of the project will continue to share information with directly affected and interested communities, stakeholders and individual property owners.

7.5.3 Employment and economy

7.5.3.1 Summary of current status

Employment and economy is a valued component because of its importance to local and provincial residents, business owners, communities and governments. Interest in employment and business opportunities related to the Project and past projects has been expressed through the engagement processes. Project construction could generate employment opportunities for the local and regional labour force. Direct employment opportunities for the Project will include management and supervisory roles, inspection services, equipment operators, trades, and semi-skilled and unskilled labour. As noted in Table 5-15 there is limited labour force availability in the RAA due to a low unemployment rate; however, communities outside the RAA may be able to capitalize on any available opportunities.

7.5.3.2 Relevant Project interactions

During construction direct Project employment will be generated through the hiring of workers by either Manitoba Hydro or its contractors for construction activities for the transmission line excluding workforce presence and accommodations. Other direct employment could be generated by providers of equipment used in construction, while indirect employment could be generated within industries supplying intermediate components as well as services. The construction work at Birtle South Station is minimal and, therefore, is not considered in the assessment. During the operations and maintenance phases of the Project there will be no employment opportunities since the existing Manitoba Hydro workforce will be used to patrol the transmission line and maintain the Birtle South Station.

7.5.3.3 Project assessment

Predicted changes to employment and economy

As the majority of Project activities have a labour component, the Project will have an effect on employment and economy. Overall, Project clearing and construction activities could generate small, positive economic effects through increased local and regional employment, procurement and service provision. It is expected that local labour will be used for clearing activities to the extent possible based on labour availability, while an outside labour force will be used for construction of the transmission line. The Project will seek to hire locally and procure from local businesses; however, due to the nature of labour and equipment needed to construct the Project, most procurement will occur outside the RAA, and to an extent, outside the province. As indicated in Table 2-1, the workforce will peak during the tower installation stage at approximately 50-60 workers.

Transmission line and facility construction typically requires skilled and unskilled labour for short-term (3-4 month) employment. Construction employment will require various levels of education and training including trades certification or applicable construction experience for some positions. Employment opportunities typically associated with transmission line construction include the following:

- Management and supervisory personnel (e.g., supervisor, foreperson);
- Equipment operators (e.g., heavy equipment, bulldozers, cranes);
- Trades and apprentices (e.g., mechanics, technicians); and
- Semi-skilled and unskilled labour (e.g., labourer, mechanic's helper).

There may also be opportunities for indirect benefits to communities in the vicinity of the Project through the provision of goods and services to the construction workforce (e.g., fuel, food, accommodation). Due to the small size of the workforce and short-term duration of construction activities these positive effects are considered small in magnitude.

Mitigation Measures

No mitigation is planned as Project effects are anticipated to be positive.

Project Assessment Significance Conclusion

Potential effects to employment and economy include Project employment opportunities and indirect benefits to communities in the vicinity of the Project through the provision of goods and services to the construction workforce. Although effects will occur at a regional scale, the small scale of the Project and short-term duration of construction will

result in small positive effects. The positive effects of the Project in terms of Employment and Economy are summarized as follows:

- Direction: Positive
- Magnitude: Small
- Geographic extent: Regional
- Duration: Short-term
- Frequency: Regular
- Reversibility: Reversible
- Resiliency: High

In summary, the Project will have beneficial effects that are assessed as being not significant.

7.5.3.4 Sensitivity to cumulative effects

This section identifies and assesses the cumulative effect of those residual effects likely to overlap in time and space with residual environmental effects of other projects and physical activities. Section 5.2 includes a summary of historic, current and reasonably foreseeable projects that may overlap with the Project.

Projects and activities that overlap spatially and temporally with the Project could result in cumulative effects, both positive and negative, on employment and economy. The effects for linear developments for employment and economy will be greater during construction than operation. Effects will be more limited throughout the operation and maintenance phase (e.g., employment, purchase of goods and services).

As described in section 5.2.3, future plans for the RAA include several transportation and water treatment and supply infrastructure projects in the Russell area, water treatment and supply infrastructure in the Birtle area, and ongoing residential development in these larger urban communities, as well as some of the smaller settlements in the RAA such as St. Lazare. Mining and oil and gas development are also expected to continue in the RAA including the Spy Hill-Ellice Community Pasture.

Reasonably foreseeable projects occurring in the RAA are anticipated to involve the hiring of labour and purchase of goods and services in the RAA to the extent feasible and elsewhere in Manitoba. These projects are anticipated to generate government revenue during construction contributing to Manitoba’s GDP. There are a number of reasons that the potential for adverse cumulative effects on employment and economy may be limited. Given the relatively low numbers of workers required for the Project,

contractors will likely have a large labour pool to draw on and will not need to compete for labour in Manitoba in order to complete their projects. Furthermore, existing low unemployment rates in the RAA should not change labour availability from the existing conditions. In addition, it is not anticipated that other projects will cause shortages of goods or services in Manitoba given the relatively low numbers of workers required and that some materials and workers are anticipated to be sourced from outside the RAA. Therefore, the Project is not anticipated to drain local resources of goods and services.

Overall, reasonably foreseeable projects in the province will generate cumulative positive direct, indirect economic effects through employment, procurement and contribution to the provincial GDP.

7.5.3.5 Sensitivity to climate change

According to the climate change information and scenarios presented in section 5.2.3 and 7.5, temperature and precipitation are expected to increase in the future, although there is some uncertainty in extrapolating model outputs to the local level. Given the timelines associated with the projected precipitation and temperature changes and limited pathways of effect for this VC, it is not anticipated to result in a change to the determination of significance for residual or cumulative effects.

7.5.3.6 On-going communication and coordination

No monitoring or follow-up is required, as effects are anticipated to be positive. However, Manitoba Hydro throughout the construction phase of the project will continue to share information with directly affected and interested communities, stakeholders and individual property owners.

7.5.4 Property and residential development

7.5.4.1 Summary of current status

Property and residential development was selected as a valued component (VC) because of regulatory considerations and its importance to communities and property owners. Components of property and residential development are protected or otherwise regulated under various legislation, including, but not limited to, *The Crown Lands Act* (C.C.S.M. c. C340), as well as development plans and zoning bylaws of the municipalities that the transmission line will traverse. Indicator topics are development potential, property values and aesthetics.

The transmission line will be developed in an area where residential developments and commercial (e.g., mining, agriculture) and non-commercial (e.g., sport hunting and fishing) land use occurs. Through the public engagement process for the Project, key issues/perspectives heard from the public included a desire to consider proximity to homes while routing the transmission line, impact of transmission lines on property values, incompatible land uses associated with presence of the transmission line and future development potential and aesthetic concerns. The above issues are used as the indicators of changes to measure the effects on Property and Residential Development. Issues surrounding concerns about health (nuisance based effects - e.g., noise, dust and EMF) due to proximity of residential developments to the transmission line are addressed under the Health VC (section 7.5.8).

The key driver that facilitates the above effects is proximity to homes from the infrastructure. In the RAA there are a total of 2,320 occupied private dwellings. In the LAA there are 48 occupied homes, while there are no homes in the Project Footprint.

7.5.4.2 Relevant Project interactions

Property and residential issues typically occur only during the operation and maintenance phase due to the physical presence of the infrastructure. There are minimal interactions between property and residential development during the construction phase other than needing to relocate structures in the ROW or with the Birtle South Station due to transmission line termination and minor upgrades. Issues associated with construction such as noise and air emissions are addressed under the Health VC (section 7.5.8). .

The route selection process for the Project took into consideration proximity to homes, buildings, special features (e.g., schools, daycares, churches) and residential developments. The final preferred route avoids areas of high residential densities (e.g., towns, etc.) and considers proximity to homes, including areas designated for future urban and rural residential development. The result is that few homes are in close proximity to the transmission line, which mitigates some of the effects.

The final preferred route primarily crosses through agricultural land that for the most part is privately owned (Map 5-3). There are a total of 68 parcels that are traversed by the Project (56 private, 10 crown, 2 Manitoba Hydro). The total length of the route is approximately 46 km; 39.5 kilometers is situated on private property while the remaining 6.5 km is located on crown land at the northerly part of the route. There are no homes located in the ROW; the nearest home is approximately 86 m south of the edge of the ROW (NW-18-16-26W), which is screened by vegetation and is approximately 855 m directly west of Birtle South Station. There are also a total of seven occupied homes

100 – 500 m from the edge of the ROW. The total number of occupied homes in the LAA is 48.

Regarding residential development, the route intersects one quarter-section parcel that has four subdivision applications that are now closed (NE-26-17-28W) in the Rural Municipality of Ellice-Archie. There are a total of four quarter-sections in the LAA with three open and one closed subdivision application that are not affected by the route.

For other structures in the vicinity of the route there is a total of 248 buildings and structures in the LAA. There are three grain silos that are directly in the Project Footprint in Prairie View (SW-22-16-27W) that will need to be removed or relocated prior to construction. There is a total of 10 buildings and structures from the edge of the ROW to 100 m (six agriculture buildings, two outbuildings, one unobservable, and one unclassified building).

Special features such as schools, daycares and churches were also considered in the route selection process. None of the above is located in the Project Footprint or LAA of the Project.

There is a total of 10 crown land parcels traversed by the route at the northerly part of the route. All but one parcel is located in the community pasture. Total length of the line in crown land is 6.5 km. The crown land in the community pasture is coded as Community Pasture (CP) with the one parcel outside of the community pasture that has multiple codes including C/J/T/F2/7A.

A review of crown land encumbrance data obtained from the Provincial Crown Lands and Property Agency identified crown land encumbrances in the vicinity of and/or affected by the final preferred route including a pipeline pumping station, mining or quarry allocations, and agricultural operations.

7.5.4.3 Project assessment

Development potential of lands

Predicted changes to development potential of lands

While the route selection process considered landowners that were in the process of developing their property at the time of route selection via the subdivision application process, the physical presence of the transmission line after construction will affect the ability (depending on use) of those residents in the future to develop their property if there is an incompatible land use. Furthermore, those individuals who are utilizing crown lands traversed by the Project may also be affected by the presence of the transmission line if uses are incompatible. For private property owners, the key method

to mitigate the effects is the implementation of Manitoba Hydro's Landowner Compensation Policy, described in section 2.4.

Mitigation for development potential of lands

This section highlights the key mitigation measures to be implemented during construction and operation to limit effects on development potential of lands. Mitigation measures include the following:

- Manitoba Hydro will implement its Landowner compensation policy for directly affected property owners.
- Manitoba Hydro throughout the construction phase of the project will continue to share information with directly affected and interested communities, stakeholders and individual property owners. One mechanism that will be employed is the Landowner Owner Liaison Program where each affected property owner has a dedicated Manitoba Hydro Staff member to facilitate discussion and address issues as they arise during the property acquisition process and through construction.
- Subject to detailed engineering analysis, tower location (tower spotting) has been identified as a potential mitigative measure to reduce adverse effects on sensitive land uses in proximity to the ROW. Location preferences identified in the course of the land acquisition process (including more detailed pre-construction evaluation of the selected rights-of-way) will be included in the engineering analysis and, where technically and economically feasible, incorporated in the structure placement decision. Manitoba Hydro Property Department staff and/or landowner liaisons will discuss site-specific circumstances or tower placement preferences with landowners. Tower spotting will take into consideration line of sight from sensitive receptors.
- Construction personnel will ensure that activities and equipment do not impact upon neighbouring properties, structures or operations. In the unlikely event that physical damages are incurred by a landowner, damages are subject to compensation through Manitoba Hydro's existing compensation policies.

Property values

Predicted changes to property values

The presence of a transmission line may affect property and residential development. The final preferred route does not result in the need to relocate residences, but has some potential to affect residential development, including areas designated for future urban and rural residential development as noted earlier. For the most part, the final

preferred route was selected to avoid displacing or passing within close proximity to rural residences. Areas of rural residential development were also a consideration in routing.

The literature is inconclusive whether transmission lines affect property values. Some studies show a small, negative effect on property values immediately after construction that diminish over time and distance (Cowger *et. al.* 1996; Jackson and Pitts 2010; Headwaters Economics 2012). In a review of transmission line effects on housing prices, Bottemiller and Wolverton (2013) found a small, negative effect occurring when ROWs abut single-family homes. Effects on property values were more substantive for higher priced homes and negligible for average priced homes.

While transmission line easements were found to have a consistent, small negative effect on the value of adjacent affected properties, the statistical significance of this finding has varied (Elliot Grover & Co. Ltd. 2008). Effects on property value varied depending on the location and visibility of transmission towers to properties (Colwell 1990, Cowger *et al.* 1996, Bottemiller *et al.* 2000, Elliot Grover & Co. Ltd. 2008, Chalmers and Voorvart 2009, Jackson and Pitts 2010). Other studies have found no evidence that proximity to, or visibility of, high voltage transmission lines affect property values (Elliot Grover & Co. Ltd. 2008).

The findings of an econometric analysis conducted for Manitoba Hydro by Prairie Research Associates (PRA) on the effect of transmission lines on residential property values were consistent with the existing literature. PRA found mixed evidence that transmission lines affect property values. Evidence that pointed to a negative effect suggests that any effect is small and diminishes rapidly as distance to the transmission line increases (PRA 2017).

Mitigation for property values

This section highlights the key mitigation measures to be implemented during the Project operations phase to limit potential effects on property values. Mitigation measures include the following:

- A dedicated Manitoba Hydro Landowner Liaison will be assigned to each private landowner and will work to understand and facilitate mitigation where possible for concerns related to the transmission line and its potential effect on property value, residential development and land use.
- Manitoba Hydro will implement its Landowner compensation policy for directly affected property owners.
- Subject to detailed engineering analysis, tower location (tower spotting) has been identified as a potential mitigative measure to reduce adverse effects on sensitive

land uses in proximity to the ROW. Location preferences identified in the course of the land acquisition process (including more detailed pre-construction evaluation of the selected rights-of-way) will be included in the engineering analysis and, where technically and economically feasible, incorporated in the structure placement decision. Manitoba Hydro landowner Liaisons and/or Property staff will discuss site-specific circumstances or tower placement preferences with landowners. Tower spotting will be used to ensure that towers will not be located in direct line of sight to the extent possible of any sensitive receptors.

Aesthetics

Predicted changes to aesthetics

The aesthetics of the Project in the LAA vary with the topography and vegetation of the natural landscape, as well as the degree of human activity associated with settlement patterns and with consumptive and non-consumptive land/resource uses beyond communities. Depending on the degree of human modification, the quality and enjoyment of the visual landscape can be affected; however, the degree of disturbance varies depending on the viewshed being observed. For example, agricultural land, while largely homogenous in nature, provides views of open spaces and visually appealing rural landscapes characteristic of open prairie landscapes (Benson 2008; Fleischer and Tsur 2000) and can therefore in fact improve scenic quality.

The presence of a transmission line can influence the visual landscape in urban and rural settings. Aesthetics do, to a certain extent, differ according to a person's values and perspectives. An individual's response to visual changes in the landscape and the level of the concern or sensitivity related to a particular viewscape is a function of the type of views involved, as well as the distance, perspective and duration of the view (MMTP 2015) . The potential effect on aesthetics depends on:

- The physical relationship of the viewer to the transmission line (distance and site line);
- The activity of the viewer (e.g., living in the area, driving through or sightseeing); and
- The contrast between the transmission line and the surrounding environment.

The route selection process for the Project considered site-specific receptors that could have aesthetic concerns. Receptors considered included, for example, proximity to:

- Occupied homes and communities;
- Campgrounds and picnic areas;

- Wilderness/heritage provincial parks;
- Recreation centres (e.g., golf, skiing); and
- National, provincial and municipal heritage sites.

Other methods used by Manitoba Hydro to address aesthetic concerns include paralleling existing infrastructure and roadways in order to concentrate the extent of the effect. For example, the route parallels PR 568 for a total of 13 km.

Through the engagement process recreation areas and viewsheds were identified by community members as being an important consideration. In addition to the above, to gain an appreciation for recreational sites in the area, Manitoba Hydro met with representatives from the Valley Recreation District. The final preferred route avoids a number of important locations where residents recreate. The route is approximately 7.3 km north of recreation facilities associated with Hooper's Lake which is a destination for a variety of outdoor recreation activities. The route is approximately 6.6 km west of the nearest campground in the RM of Ellice-Archie. In addition to the above, the route selected is approximately 1.5 km south of the Wady Loop that is maintained by the Birtle Ski Club.

Regarding residential receptors, as noted earlier, there are no homes located in the ROW. The nearest home is approximately 86 m south of the edge of the ROW (NW-18-16-26W) and approximately 855 m directly west of Birtle South Station. The view of the Project from this home is screened by vegetation. There are also a total of seven occupied homes 100 – 500 m from the edge of the ROW which would potentially be able to see the infrastructure depending on vegetative screening and the orientation of residences.

Mitigation

This section highlights the key mitigation measures to be implemented during operations to limit effects on aesthetics. Mitigation measures include the following:

- A dedicated Manitoba Hydro Landowner Liaison will be assigned to each private landowner crossed by the transmission line who will work to understand and facilitate mitigation where possible for concerns related to the transmission line and its potential effect on aesthetics.
- Manitoba Hydro will implement its Landowner compensation policy for directly affected property owners.
- Subject to detailed engineering analysis, tower location (tower spotting) has been identified as a potential mitigative measure to reduce adverse effects on sensitive land uses in proximity to the ROW. Location preferences identified in the course

of the land acquisition process (including more detailed pre-construction evaluation of the selected rights-of-way) will be included in the engineering analysis and, where technically and economically feasible, incorporated in the structure placement decision. Manitoba Hydro Liaisons and/or Property Department staff will discuss site-specific circumstances or tower placement preferences with landowners. Tower spotting will be used to ensure that towers will not be located in direct line of sight to the extent possible of any sensitive receptors.

- Natural low growing shrub and grass vegetated buffer areas of 30 m will be delineated around wetlands and riparian areas and be maintained to the extent possible. In addition to protecting watercourses, the shrubbery will act as a vegetative screening to assist in managing aesthetics effects**.**

Project assessment significance conclusion

Potential effects to property and residential development include effects on residential development potential, property values and aesthetics. Although effects will occur largely at a Project Footprint scale over the long term, overall impairment to property and residential development should be small in magnitude.

Given the application of the above-described mitigation measures the effects of the Project in terms of property and residential development are summarized as follows:

- Direction: Adverse
- Magnitude: Small
- Geographic extent: Project Footprint
- Duration: long-term
- Frequency: Regular/continuous
- Reversibility: Permanent
- Resiliency: High

In summary, the Project will have adverse, small in magnitude effects. The residual effects are assessed as being not significant.

7.5.4.4 Sensitivity to cumulative effects

This section identifies and assesses the cumulative effect of those residual effects likely to overlap in time and space with residual environmental effects of other projects and

physical activities. Section 5.2 includes a summary of historic, current and reasonably foreseeable projects that may overlap with the Project.

Projects and activities that overlap spatially and temporally with the Project could result in cumulative effects on property and residential development. The effects for property and residential development will be greater during operations phase of the Project due to the presence of the infrastructure.

As described in section 5.2.3, future plans for the RAA include several transportation and water treatment and supply infrastructure projects in the Russell area, water treatment and supply infrastructure in the Birtle area, and ongoing residential development in these larger urban communities, as well as some of the smaller settlements in the RAA such as St. Lazare. Mining and oil and gas exploration and development are also expected to continue in the RAA including the Spy Hill-Ellice Community Pasture.

Future projects in the RAA have the potential to interact cumulatively with the Project if their plans include the development of facilities in areas of existing residences or residential development, resulting in effects related to development potential, property values and aesthetics. The nature and extent of cumulative effects will likely differ depending on the Project. For example, pipelines have little visible infrastructure and thus could be expected to have less effects on land and resource values related to aesthetics than transmission lines. Any additional above-ground development will be a net addition to the landscape and depending on proximity, location and receptor could have an effect on visual quality.

Further development on the landscape could also reduce residential development potential due to fragmentation of lots and/or property. Multiple projects in a geographic area could result in less interest in wanting to purchase a lot or build a residence near the Projects thus lowering the development potential of land or land nearby. However, additional Projects in the area could result in additional amenities which could draw people to the area. The cumulative effects in these areas may extend for a longer period or be of greater magnitude than with just the Project alone due to multiple projects being present. However, the projects will affect a very small proportion of the developable land within the RAA and will not substantially alter overall land development patterns.

Potential effects associated with a change in property (i.e., property value) are primarily related to the operation and maintenance phase from the presence of infrastructure. Based on literature review and the PRA study, the potential effects on property value are anticipated to be small magnitude as a result of the Project in combination with other projects.

The Project's contribution to cumulative environmental effects is not anticipated to result in a change that widely disrupts continued residential land and property use, potential development or aesthetics overall within the RAA.

7.5.4.5 Sensitivity to climate change

According to the climate change information and scenarios presented in sections 5.2.3 and 7.5, temperature and precipitation are expected to increase in the future. These sections also note that it is difficult to develop any precision on changes at local scale, where factors such as land cover, topography, watercourses and other barriers may have a greater influence on local conditions.

Concerns in urban centres associated with climate change relate to extreme weather events, flooding, drought, heat stress, disease and changes in green space. Urban centres are more able to undertake climate adaptation. Rural communities are more sensitive to climate change given their dependence on natural resource sectors (i.e., agricultural communities, recreation/tourism communities). Communities that depend on these industries could face challenges. However, as changes in climate are not anticipated to have a material impact on property and residential development effects related to development potential, property values and aesthetics the determination of significance for residual or cumulative effects is not expected to change.

7.5.4.6 On-going communication and co-ordination

No monitoring or follow-up is required. All Project-based effects are predicted to be small in magnitude and will not have a material effect on the current baseline condition. However, Manitoba Hydro throughout the construction phase of the Project will continue to share information with directly affected and interested communities, stakeholders and individual property owners. One mechanism that will be employed is the Landowner Owner Liaison Program where each affected property owner has a dedicated Manitoba Hydro Staff member to facilitate discussion and address issues as they arise during the property acquisition process and through construction.

7.5.5 Agriculture

7.5.5.1 Summary of current status

Agriculture was chosen as a Valued Component for the environmental assessment of the Project because of its value to landowners and its importance to the economy of the area. Effects on agriculture from transmission line development are well known and have the potential to change the land use under and around a transmission line and

cause economic as well as other impacts to farming and crop production. Due to its importance to the region agriculture is addressed separately, although it is part of commercial resource use. A summary of the most germane information is provided below to facilitate the assessment. Additional information is located in the existing environment section 5.5.6.

Agricultural land cover and capability

Agricultural land cover

Cropland (annual cereal, oil seed and other specialty crops) accounts for between 34 – 50% of the land area and is the dominant agricultural land use in all the RMs in the region (see Map 5-4). Rangeland and grassland is the next most common agricultural land use ranging from 25-36%. The RM of Ellice-Archie has the highest occurrence of this classification at 36%. This can be attributed to the Spy Hill Community Pasture and the Ellice-Archie Community Pasture being located in the northern extent of the RM. Less than four percent of the total municipal area in each RM in the area is occupied by forage cropland cover.

Agricultural capability

The agricultural capability for soils in the RMs in the region relates to the land and crop uses and provides an overview of value to agricultural production, in terms of crops and livestock. As shown in Map 5-5, none of the RMs contained Class 1 (highly productive) lands, which are generally not widespread on the landscape in Manitoba. The RM of Prairie View has 75% of its soil classed as Class 2-3. These are highly productive soils with few limitations, and indicate the excellent crop growing land in the municipality (mostly Newdale clay loam) and are mainly farmed for grains and oilseed. The RM of Ellice-Archie has 30.7% of the land classed as 4-6 with limitations on crops and has the highest percentage of this class of land of the three RMs in the region. The highly productive Class 2 and 3 soils predominantly occur between Birtle and the Assiniboine River Valley. In the river and stream valleys lower Class 6 soils occur due to the steep slopes.

Farm types and infrastructure

Farm types

Farming and ranching are the predominant land uses in the RAA with more farms overall in grain and oilseeds than livestock. There are 434 farms in the RAA; approximately 50-60% of them are involved in crop production while 40-50% are

involved in livestock. Oilseed and grain production make up the majority of the farms in crop, while cattle ranching is the predominant livestock activity.

Buildings and structures

Buildings were inventoried and recorded from surveys conducted in 2016. Seven sites with structures and one site with a farm dugout within 300 m of the Project were identified (Table 5-22).

Crop production

Crop type

The most frequently grown crops in the RAA are wheat, canola and alfalfa. The top three crops were the same for all three RMs in the RAA.

Crop yield and value

The top three crops in value in the RMs are Argentine canola, red spring wheat, and soybeans. The RM of Prairie View (made up of the former RMs of Birtle and Miniota) has the highest crop value and the most cropland both in percent of RM and in total hectares. Analysis of the data indicates the high value of crop production in the RAA and the intensity of annual crop farming.

Aerial application

Management considerations maps produced for individual RMs in the RAA (AAFC 1998 a-e) provide an inventory of landscapes of soil texture and drainage, among other variables. The inventory for the five RMs (pre-amalgamation) in the RAA shows that there is very little soil-landscape area for fine textured soil and combinations of fine texture with wetness or topography. Only the RM of Miniota had an occurrence of fine texture soil and that was 367 ha or 0.4% of the RM (AAFC 1998d). Further investigation of soil drainage from the AAFC reports shows the very low incidence and area of poor to very poor drained soils which would make them susceptible to limitations on ground application of pesticides (Table 5-23). As such, aerial application of crop protection chemicals is likely limited in the RAA.

Irrigation

According to the Manitoba Irrigation Survey completed for the province of Manitoba by Gaia Consulting Limited (2007), no lands in the RAA were under irrigation at that time. Irrigation suitability data for some of the RMs in the RAA show fairly low risk and large areas that could be suitable for irrigation (AAFC 1998 a-e). The majority of irrigated acres in Manitoba are for potatoes (Gaia 2007); however, there were no potato

acreages recorded in census data for the region. Market forces and availability and quality of water may be factors in limited to no irrigation in the region.

Organic farming

Organic farming does occur to a limited degree in the RAA. A Manitoba Hydro inventory (Manitoba Hydro 2017f) of organic farms identified one organic farm in the area.

Introduction of invasive species (Biosecurity)

The spread of disease, invasive species and pests is a concern for crop and livestock producers in the RAA. Soil-borne crop diseases such as clubroot, sclerotina stem rot and *verticillium* are of major concern for canola producers. Distribution and quantification mapping is not available for all crop disease but is reported on regularly in Insect and Disease Updates and weekly crop reports published by Manitoba Agriculture (2017c,d).

Clubroot is a disease that affects brassica crops including canola. It is caused by a fungus-like organism called Plasmodiophora brassicae. Manitoba Agriculture has published a distribution map of P. brassicae based on observed symptoms and soil test results. The RAA is in a relatively low to intermediate risk area with the RMs of Prairie View and Russell-Binscarth in a zone recording 1,001-10,000 spores/gram of soil well below a threshold where field symptoms have been observed in fields. The RM of Ellice-Archie shows an even lower level of spores in soil and consequently, risk.

Livestock operations

Livestock information in the RAA was obtained from Statistics Canada Census of Agriculture (Statistics Canada 2011a; Table 5-24). Livestock farming is a substantial activity in the RAA, accounting for between 39 – 51% of farms in the Census. The predominant livestock production in the RAA is cattle ranching and farming, accounting for 30-35 % of all farms in the 2016 census and greater than 70% of all livestock farms in the region. There were only two dairy farms recorded in the 2011 census (RM of Miniota) and again in the 2016 census (RM of Prairie View).

Hog production, and poultry and egg production are rare in the RAA. There were only three hog production farms and two poultry and egg farms recorded in 2016, and only three apiculture operations recorded.

Horse and other equine production was the only other category of livestock production that occurred in the RAA with some frequency. In total, 22 of these operations were recorded in the RAA in the 2011 census.

7.5.5.2 Relevant Project interactions

During all activities of construction the Project has the ability to have temporary effects on agricultural activities. The operation and maintenance phases of the transmission line component of the Project will also have reoccurring effects due to the physical presence of the structures on agricultural activities and these will occur throughout the life of the Project. The upgrades at Birtle South Station do not have any impact on agricultural activities due to all activities taking place within the fenced area. Project interactions are organized around the following indicator topics that are linked to the information presented in the previous section. The following indicator topics are discussed for the remainder of the section:

- Agricultural land cover and capability:
    - Erosion and soil compaction;
    - Permanent land loss; and
    - Land value.
- Farm types and infrastructure:
    - Change in buildings and structures.
- Crop production:
    - Introduction of invasive species (biosecurity);
    - Interference with agricultural activities:
        - Irrigation; and
        - Aerial spraying.
- Livestock operations:
    - Grazing;
    - Electric and Management Fields;
    - Stray voltage; and
    - GPS interference.

It is important to note that many of the above topics were identified through the public engagement process for the Project (chapter 3). Many landowners expressed concern about the location of transmission line infrastructure. Landowners indicated the difficulty in manoeuvring large farm implements around structures resulting in loss of cropped area and overlapping application of farm inputs. Another major concern was the placement of the transmission line. Many thought it should parallel road ROWs or the half-mile line, and the least preferred alignment was diagonal crossings of cropland. The following is a summary of issues and concerns brought forward by the farm community and other stakeholders:

- Diagonal crossing of farmland causes nuisance and difficulty in farming around structures and is the least preferred alignment of a transmission line;

- Loss of farm land to the transmission line ROW is a concern;
- Working around structures will be difficult with limited mobility of large farm equipment resulting in increases in production costs and value loss;
- Aerial crop spraying becomes limited near transmission lines;
- Concerns about effects on livestock from EMF or stray voltage in dairy barns;
- Safety – clearances of farm equipment in the vicinity of the transmission line;
- Biosecurity risks for transfer of disease, pest, and invasives between fields during construction and maintenance;
- Liability concerns associated with the potential to damage hydro equipment with farm machinery; and
- Farmland value – concerns about the potential for decreased land values due to presence of the transmission line.

During Round two of the engagement process a preferred route was presented. Landowner Information Centres (LICs) were intended to gather input from landowners who would likely be directly affected by the Project. A total of 38 landowners attended the LIC meetings and 23 filled out questionnaires.

The majority of respondents (20 out of 23) indicated annual cropping as part of their farm operation. Pasture/grazing was indicated by eight respondents as part of their land use and six indicated cattle or cow/calf operations. Other land uses included one each of irrigation, an orchard, horses, and chicken/turkey in landowner's responses. High use of GPS navigation system was noted with 17 of 23 reporting use of this technology. Ten landowners reported use of aerial application in their farm management and an additional 10 indicated they spread manure on their land mostly solid, with four using draglines. The issues most frequently reported in relation to a nearby transmission line were interference with farm practices (18), followed by property value (17) and then loss of agricultural land (16) and GPS interference at 15 respondents. Concern over diagonal crossing of cropland was only indicated as an issue by 6 out of 23 respondents who filled out the questionnaire.

7.5.5.3 Project assessment

Agricultural land cover and capability

Predicted changes due to erosion and soil compaction

Water erosion of soil involves the detachment of soil particles and transport during runoff events. Construction activities can expose soils to increased risk of erosion by water. Water erosion risk depends on ground cover, surface texture, organic matter content and permeability. Water erosion can affect fields as rills and gullies causing site specific damage not only as soil loss but also as physical cuts that can affect equipment manoeuvrability.

Water erosion can reduce soil productivity by removal of the surface fertile soil layer containing organic matter and other nutrients. Soil loss leads to reduced productivity and crop loss diminishing the capability for agriculture. Natural restoration of topsoil loss can take centuries to replace, depending on the location, climate and the severity of loss. Prevention of water erosion in high risk areas is important during construction to maintain productivity of the land.

As indicated in section 7.3.5.2, 18-20 percent of the RMs of Ellice-Archie and Prairie View have high to severe water erosion risk. In the RM of Russell-Binscarth almost half (47.8%) of the land area is classified as high-to severe risk of water erosion. Most of the severe risk areas are in the Assiniboine River and tributary stream valleys of the RAA.

Water erosion risk is either high or severe for almost 30% of the Project Footprint and of that 25% is at severe risk. There is also a wide area in the north portion of the RAA on both sides of PTH 41 that is classed as severe risk due to rolling topography and slopes of 5-9%. The Project Footprint passes through a portion of this zone east of PTH 41 and south of PR 475 for approximately 5 km of transmission line route (Figure 7-1).

Appropriate farm techniques such as residue management, conservation tillage, and permanent cover can substantially reduce the risk (Manitoba Sustainable Development 2008).

As indicated in section 7.3.5.2 wind erosion, similar to water erosion, removes the fertile topsoil through dislodgement of soil particles by wind action. Susceptibility to wind erosion depends on soil texture and structure with sands potential than clays, and single particle soils greater than crumbly or cloddy soils. Soil particles dislodged by wind move in several different ways including surface creep, saltation (bouncing and dislodging other particles), and suspended in the air. If soil loss is more than 5 tons/acre/year (0.75 mm) it is likely to have some impact on productivity, increasing with the depth of loss (Manitoba Agriculture 2017). Since wind erosion risk is evaluated under bare-ground

condition, some protection during construction is essential to prevent soil loss and potential productivity impacts.

A pocket of high risk land for wind erosion exists south of Silver Creek where it enters the Assiniboine Valley (Manitoba Sustainable Development 2008). The route passes through some of this agricultural capability Class 4 soil area composed of sand and gravel deposits that are susceptible to wind erosion and require protection under bare soil conditions. While there are some areas considered high risk there are no areas considered at severe risk of wind erosion in the Project Footprint.

Shelterbelts planted along field edges to reduce wind erosion provide protection but require a long time to grow and replace. While avoidance is the best approach to preserve this natural infrastructure, where removal is required, restoration of wind protection values should be considered for permanent mitigation. An examination of aerial imagery was conducted to identify any shelterbelts affected by the Project Footprint. Approximately 455 m are potentially affected by construction of the transmission line. The effect on wind erosion risk due to shelterbelt removal is likely negligible for places where the shelterbelt is perpendicular to the line. For those locations, only 10 -20 m of the end of the shelter belt row would be removed for construction (Table 7-14).

Table 7-14: Shelterbelts affected by the Project Footprint.

Location	Length (m)	Orientation	Orientation to T-Line
Property line between NE and SE 26-17-28 W	10	East-west	Perpendicular
Property line between SE 25-16-28 W and SW 30-16-27 W	335	North-south	Parallel
SW 21-16-27 W	100	East-west	Parallel
Property Line between SW 21-16-27 W and SE 21-16-27 W	20	East-west	Perpendicular
Total	455		

Source: Manitoba Hydro 2017e.

Soil compaction is discussed in section 7.3.5.2. It was determined that a high soil compaction risk occurs in the wooded area and along the river and stream valleys in the RAA. The analysis for the Project Footprint shows that only 5.2% (8.9 ha) of the route has soils considered at high risk of soil compaction. On a 40 m ROW width that equates to a route length of approximately 2.2 km on high risk soils. Heavy equipment and materials will be transported on the Project Footprint for construction of the transmission line that will have potential to compact soils at high risk, especially under wet non-frozen conditions.

Mitigation for erosion and soil compaction

Mitigation for erosion and soil compaction includes the following:

- Effects of soil compaction and rutting will be mitigated by managing equipment traffic routes and activities for access route and bypass trail development, temporary sites' setup, clearing of the transmission ROW, installation of the transmission structures, and station site preparation.
- In accordance with the Access Management Plan, the Contractor will be restricted to established roads and trails and cleared construction areas.
- During construction phase measures will be considered to prevent water erosion and sediment runoff from bare ground including construction on frozen ground construction mats, and or use of erosion control materials.
- The transmission line will be constructed in agricultural areas when soils are not saturated to limit compaction, rutting and admixing, particularly in areas of high compaction risk. If this is not possible, other mitigation or rehabilitation measures will be conducted.
- If working on saturated soils during non-frozen ground conditions, equipment and techniques that distribute ground pressure (e.g., swamp mats, geofabric and padding and corduroy) will be used to avoid compaction and admixing.
- Contractor-specific Erosion Protection and Sediment Control Plans will be prepared by the Contractor, accepted by Manitoba Hydro prior to construction and updated annually.
- Where shelterbelts are parallel to the transmission line and for longer distances, determination on the need to remove should be given first consideration. Where that is not possible in order to allow safe construction and operation, compensation will be provided.
- Manitoba Hydro (Landowner Liaison) will contact directly affected landowners to discuss how to reduce effects on their agriculture activities.

Predicted changes due to permanent land loss

Tower footprints will cause permanent loss of land for crop production. These pockets of inaccessible land in fields can create changes in crop and farm management. Crop loss results from the presence of the unseeded area. In addition, the need for equipment to manoeuvre around tower or pole structures can lead to overlap in seed, fertilizer, and pesticide applications on the land adjacent to structures. This over application can reduce productivity, as well as increase the risk of soil compaction. Other effects of farming around structures include additional time, manual weed control and increasing input costs.

Analysis was conducted to quantify land loss, value of crop losses, and additional cost for crop production due to the presence of towers for the Project using a model developed by the Prairie Agricultural Machinery Institute (2015). The PAMI 2015 study was commissioned by Manitoba Hydro to provide an updated understanding of the cost of farming around different types of towers due to evolving farming practices and equipment.

The parameters that informed the PAMI (2015) study were similar to the towers and alignments of the Project and are therefore reasonably transposable. The parameters are highlighted in the table below.

Table 7-15: Comparison of parameters between the Project and the PAMI (2015) study

Item	BTP	PAMI
Span - Lattice Steel	460 m	400 m
Span – Steel H-frame	260 m	250 m
Footprint – Lattice Steel	9 x 9m	9 x 9 m
Footprint Steel H-frame	6 x 1 m	5.5 x 1m
Footprint 1 m Buffered Lattice Steel	11 x 11 m	11 x 11 m
Footprint 1m buffered – Steel H-frame	7.5 x 3 m	7.5 x 3 m
Structures per quarter section (0.5 mile) – Lattice Steel	1.75	2.01
Structures per quarter section (0.5 mile) – Steel H-Frame	3.09	3.22

Structures per quarter – diagonal 45° – Lattice Steel	2.48	2.85
Structures per quarter – diagonal 45° – Steel H-Frame	4.38	4.55
ROW – Lattice Steel	60 m*	80 m

* ROW for lattice steel towers in BTP are set infield at 40 m so effective ROW is 70 m. Footprint loss does not change in physical terms but only in percentage of ROW area.

The results of the analysis show that the total cost or value lost per quarter section for the Project varies widely depending on the field placement of structures (see Table 7-16 below). The analysis considered the largest equipment types identified in the PAMI (2015) study - 60' wide implement for seeding and fertilizing and 120' sprayer for pesticide application. As illustrated in Table 7-16, diagonal crossing of land had the highest estimated lost value per quarter section at $682 per quarter section. There is 3 km of diagonal routing across agricultural fields (this was a consideration in the transmission line routing process). Total value loss estimated for lattice steel towers located along the half-mile (9.82 km) was $2,323.The estimated lost value for the total route length on cropland (37.32km) was $6,008. Considering 37.3km of the route crosses agricultural cropland the value lost predicted by this model is relatively small in magnitude, due largely to the more favorable field alignments used.

Table 7-16: Estimated Project lost value based on tower location

Structure	Placement	ROW Width (m)	Per Quarter Section ($)	Length (km)	Total Lost Value ($)
H-Frame	Adjacent to road ROW	23.75	62.30	24.4	1,890
H-Frame	Diagonal Crossing	40	682.52	3.0	1,795
Lattice Steel Tower	40 m offset from half mile line	60*	190.26	9.82***	2,323

Total	37.32	$6,008
* ROW for lattice steel towers in BTP are set infield at 40m so effective ROW is 70m.		

Landowner Compensation for Structure Payments

The analysis included a comparison of the PAMI (2015) estimates for the cost of farming around towers and land lost from the tower itself, to the Manitoba Hydro Landowner Compensation provided on a per-quarter section basis.

Using the 2015 PAMI study (Manitoba Hydro 2015a) estimated costs per quarter section for canola production for H-frame ROW adjacent to road was $56-62 per quarter section. These impact costs will occur every year annual crops are grown on the ROW but will vary with the crop, production costs and yields.

Using comparable tower types and alignment assumptions, the estimated compensation (structure payment)that covers the cost of lost or reduced production due tower presence using the Manitoba Hydro Compensation Manual, is $167.88 per structure (adjusted for inflation to 2017).

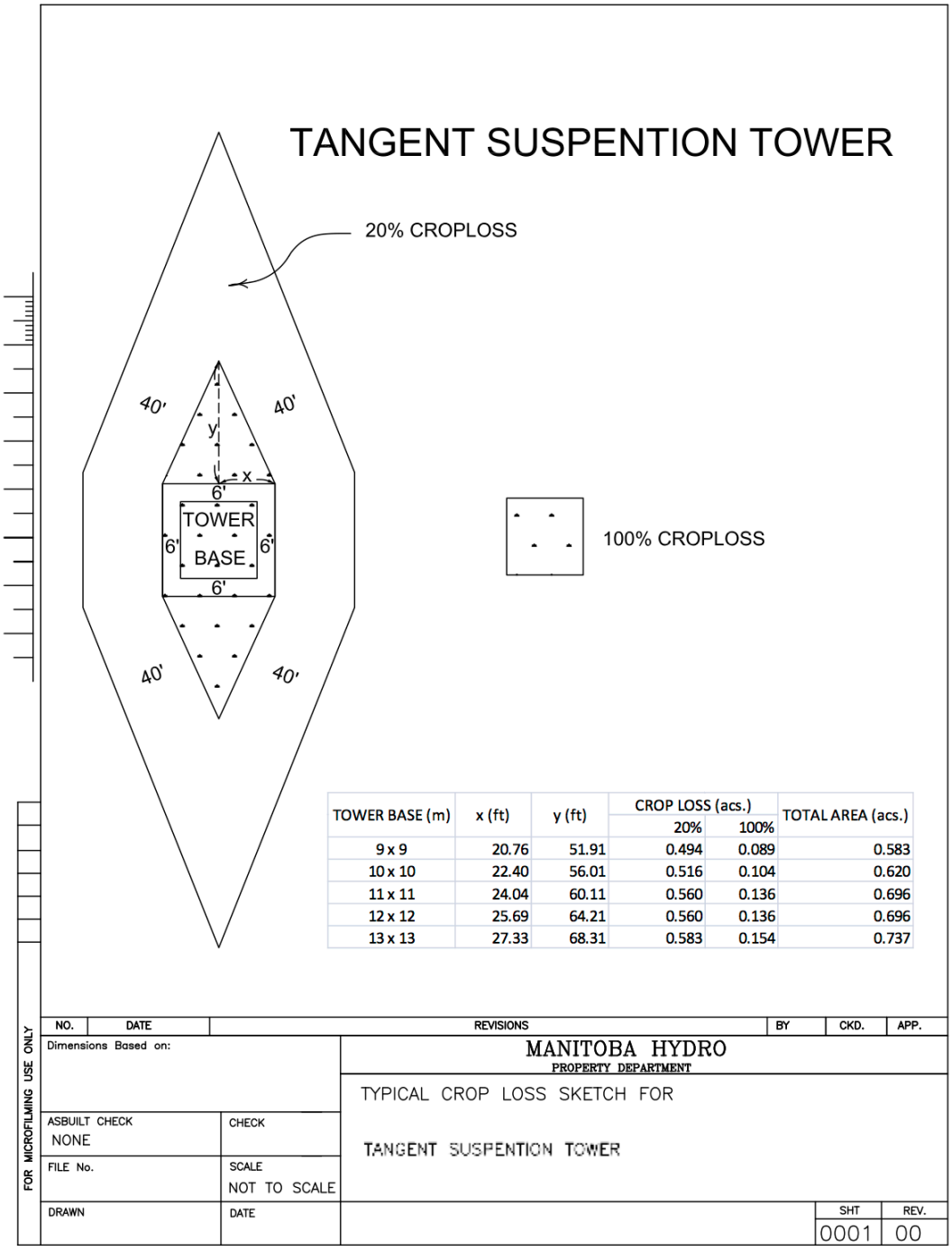
Considering most quarters sections with a similar alignment will receive approximately two towers (in some cases more) – the estimated compensation for this scenario ($335 per quarter section) is generous compared to the estimated lost value of $56-62 per quarter section.

Manitoba Hydro typically provides tower payments as a lump sum that takes into consideration a longer term interest rate than if annual payments were made. When Manitoba Hydro has offered annual payments to landowners on past projects (Bipole III), they have been rejected in favor of one time payments.

Figure 7-2 shows the structure placement diagrams and area of compensation based on 100% loss plus an adjacent area where there is 20% crop loss (Manitoba Hydro 2012). Weed control, costs for double seeding and extra time are also included in the compensation calculation.

Estimated compensation under the Manitoba Hydro Landowner Compensation Program (see section 2.4) for tower payments are higher that the estimated cost of farming around structures on cropland (using the PAMI (2015) approach). Manitoba Hydro calculates a one-time amount for payment to producers based on the annual costs. One-time payments are substantially higher than the annual to account for multiple years of effect by the project. The analysis and comparison shows the compensation

amount offered by Manitoba Hydro far exceeds the estimated annual cost calculated using the PAMI (2015) method.



TOWER BASE (m)	x (ft)	y (ft)	CROP LOSS (acs.)		TOTAL AREA (acs.)
			20%	100%	
9 x 9	20.76	51.91	0.494	0.089	0.583
10 x 10	22.40	56.01	0.516	0.104	0.620
11 x 11	24.04	60.11	0.560	0.136	0.696
12 x 12	25.69	64.21	0.560	0.136	0.696
13 x 13	27.33	68.31	0.583	0.154	0.737

Figure 7-2: Typical Crop Loss Sketch for a Tangent Suspension Tower

Mitigation for permanent land loss

Mitigation for permanent loss of agricultural land primarily involves reducing area of loss through design mitigation and compensation for land permanently removed from agriculture due to structure presence.

- Compensation will be provided according to Manitoba Hydro Land Compensation Program for land permanently removed from agriculture due to structure presence.
- Structure Impact Compensation is a one-time payment to landowners for each transmission tower placed on land classed as agricultural. Structure Impact Compensation will cover:
    - reduced productivity in an area of overlap around each tower structure;
    - additional time required to manoeuvre farm machinery around each structure; and
    - double application of seed, fertilizer and weed control in the area of overlap around each tower structure.
- Manitoba Hydro will contact directly affected landowners to discuss how to reduce effects on their agriculture activities.
- Manitoba Hydro will discuss and identify areas of concern and potential tower spotting preferences with potentially affected landowners.

Predicted changes to land value

The majority of studies on the effect of transmission lines on property value have generally focused on residential property near lines. Seventeen of 23 respondents to the landowner questionnaire were concerned about the transmission line effects on land values. The potential for the Project to effect residential property value is discussed under the Property and Residential Development VC (section 7.5.4). For agricultural land uses some landowners believe that the impediments to farm operation would decrease the value of their land. One study conducted in Montana (Headwater Economics 2012), reported on 19 transactions affecting properties with production agriculture - located within 500 feet of a transmission line. The properties were characteristic of crop and ranch land in eastern and central Montana, typically featuring a mix of native range and dry cropland, with a few instances of irrigated land and improved pasture. This is a similar description to land use in the RAA. The research was based on interviews and indicated that that while the transmission lines presented nuisance factors for farming operations, neither the interviews nor the sales data indicate that the nuisance translated to an impact on sale price (Headwater Economics

2012). The author cautions that for impact assessment, a professional land appraisal should be the basis of identifying effects to land value associated with the presence of a transmission line. As part of the easement acquisition process Manitoba Hydro will conduct land appraisals.

Mitigation for land values

The mitigation to address effects on land value is paying compensation pursuant to the Landowner Compensation Program.

Farm types and Infrastructure

Predicted changes to agricultural buildings and structures

Clearing of the ROW for the Project will involve removal of woody vegetation and creating a pathway for access and construction. Any buildings or farm structures in the ROW will also need to be moved for safety purposes during construction and operation of the transmission line.

Buildings were inventoried and recorded for the ROW from a survey conducted in 2016. The survey identified seven sites with structures and one site with a farm dugout within 300 m of the transmission centre line (Table 7-17). Three hundred metres was chosen mainly as a proximity concern expressed by farm operators on other Manitoba transmission projects. For buildings affected by the Project the three grain bins at the edge of the ROW will need to be removed to reduce any risk of contacting the overhead conductors with the large grain augers used to fill them (Table 7-17). Also, a farm dugout for livestock water supply appears to be active. The dugout may need to be relocated as its presence in the ROW may compromise necessary conductor clearances (in terms of safety), due to the elevated banks from the excavation spoil material in the ROW. Operations and maintenance may also be hampered by the presence of the dugout. Based on 2016 imagery, no livestock production facilities occur within the ROW.

Table 7-17: Building/structure inventory of final preferred route

Site	Building Type	Estimated proximity to Centreline	Area
Site 1	2 Out buildings 2 Grain bins 1 Agricultural shed 1 Livestock barn	80 m 100 m 150 m 160 m	LAA
Site 2	3 Grain bins	Within Row	PFA
Site 3	Unused farm shed	55 m	LAA
Site 4	Outbuilding	120 m	LAA
Site 5	Agriculture building part	95 m	LAA

	of livestock operation		
Site 6	Farm dugout, livestock watering	Within ROW	PFA
Site 7	Agriculture building	280 m	LAA
Site 8	Livestock watering facility in community pasture	160 m	LAA

Source: Manitoba Hydro 2017c

Mitigation for agricultural building and structures

Mitigation for changes to agricultural buildings and structures involves compensation that will be provided according to the Manitoba Hydro Land Compensation Program for the following:

- Damage to property, any relocation of incompatible agricultural buildings (e.g., grain bins and livestock overwintering shelter);
- Temporary loss of agricultural land; and
- Manitoba Hydro (landowner liaison) will contact directly affected landowners to discuss how to reduce effects on their agriculture activities.

Crop production

Predicted changes to invasive species (risks to biosecurity)

Project activities create risks of introducing and spreading disease agents (pathogens) to the RAA, which creates a biosecurity issue. During the construction and operations and maintenance phases of the Project vehicles, equipment and personnel will be moving along the ROW and crossing onto adjacent landowners land. This movement could cause biosecurity concerns by transporting and spreading invasive species seeds, diseases, and insect pests from field to field. Soil borne pathogens such as clubroot and blackleg can spread in soil particles attached to boots, clothing, equipment, and vehicles (M. Erb pers. comm). Weeds and invasive plant species can become established and move along the transmission line ROW infecting multiple fields causing crop loss. Livestock biosecurity is also a concern due to the risk of spreading disease.

Mitigation for invasive species (risks to biosecurity)

Mitigation to address biosecurity effects includes the following:

- Manitoba Hydro staff and contractors will follow and implement the Manitoba Hydro corporate policy on biosecurity through a Biosecurity Management Plan developed for the project.
- Manitoba Hydro (landowner liaison) will contact directly affected landowners to

discuss how to reduce effects on their agriculture activities.

Predicted changes to irrigation

According to the Manitoba Irrigation Survey completed for the province of Manitoba by Gaia Consulting Limited (2007), no lands in the RAA were under irrigation at that time. Irrigation suitability for some of the RMs in the RAA shows fairly low risk and large areas that could be suitable for irrigation (AAFC 1998 a-e). The majority of irrigated acres in Manitoba are for potatoes (Gaia 2007). Interestingly, there was no potato acreages recorded in census data for the region. Market forces and availability and quality of water may be factors in there being limited to no irrigation in the RAA. However, during public engagement for the Project in April 2017, one landowner indicated that they recently licensed irrigation on a quarter-section located in the Project Footprint. The landowner intended to start his pivot irrigation operation immediately. As such modifications to irrigation equipment may be required to prevent direct spray streams coming in contact with overhead conductors. The presence of the transmission line does not preclude irrigation on the quarter-section. Manitoba Hydro has met with the landowner and is working with the individual to ensure safe operation of their irrigation equipment.

Mitigation for irrigation

Mitigation measures for effects related to irrigation include the following:

- Ancillary damage compensation as part of the Landowner Compensation Program will be provided for damage to existing infrastructure, including irrigation.

Predicted changes to aerial application

High value crops like red spring wheat, canola and soybeans are often protected and managed with the use of herbicides, insecticides and/or fungicides. The RAA has a predominance of these high-valued crops. Many operations apply chemical on the ground, but there can be efficiency as well as a necessity under wet conditions for aerial application. The prevalence of aerial spraying in the RAA for crop protection is likely a function of cost and the ability to ground spray that can be impeded by wet conditions on clay soils with poor drainage (Manitoba Hydro 2014). When high valued crop areas are on these soils there is a high likelihood of aerial application of pesticides.

A landowner questionnaire completed by 23 respondents in Round 2 of the engagement process indicated aerial application to be used by half the respondents who had annual crops as part of their farm operations. As such aerial spraying is a relatively common crop management practice.

Transmission line crossing of cropland on a diagonal is particularly problematic for aerial applications. There are only 3 km of diagonal alignment on the cropped portion of the Project with less than 2 km of that on annual cropland.

A major length of the Project is adjacent to field edge through cropland. Even with an alignment parallel to road and half-mile line there can still be some effect on the ability to aerial spray crop inputs. Spraying parallel to the transmission line can be done, but opportunities are more limited due to wind conditions. According to Manitoba Aerial Applicators Association as reported in Manitoba Hydro (2015a), a buffer distance of approximately 22.5 m or corridor of approximately 45 m around a transmission line is not available for aerial application. For landowners, this represents a loss of 3.6 ha per quarter section (5.5 %) where aerial application of crop inputs is desired. This loss can be compensated for through the landowner compensation program (ancillary damages) if a loss can be demonstrated.

Mitigation for aerial application

Mitigation for interference with aerial application includes the following:

- Ancillary damages compensation will be provided for demonstrated yield reduction due to limited access for aerial and ground application of crop protection products during construction activities.

Livestock operations

Predicted changes to grazing

Livestock grazing occurs in the Project Footprint mainly for cattle, but also includes other animals. Cattle consume native or tame grasses and forages that grow in pastures as an essential source of nutrition. Livestock are grazed on grazing or pastureland that is managed to provide sufficient animal nutrition without damaging the land or limiting future grass or forage production. Depending on the timing of construction, grazing land could be affected by the Project due to the need to restrict livestock movement on the Project Footprint for the construction period. The resulting reduction of grazing area means fewer animals can be sustained on the adjacent managed pasture.

For active pasture on private lands affected by the Project Footprint, livestock would have to be restricted in the area during construction. Winter construction may preclude most issues unless a site is used for over-winter feeding. The options for the landowner are to move livestock to another site during construction or to use temporary fencing during sensitive construction or maintenance activities such as conductor stringing.

Manitoba Hydro will discuss with landowners on timing and necessity of livestock exclusion and related compensation.

The route also passes through the Spy Hill-Ellice Community Pasture. If construction equipment was used in the pasture during the growing season it would require separation of the ROW from livestock grazing, which would affect stocking rates for the pastures affected, or at least pasture rotation. This could result in temporary changes to pasture management including replacement of grazing land or rotation of animals to other pasture areas. Approximately 6.4 km of the route passes through the Community Pasture on a 60 m ROW for towers, for a total of 38.4 hectares affected (not including any additional access routes). As construction in this area is anticipated to primarily occur in the winter no effects are anticipated.

Mitigation for grazing

Mitigation for potential effects to livestock operations includes the following:

- Construction damages for private, agricultural lands will occur pursuant to the Manitoba Hydro Landowner Compensation Program.
- Compensation will be provided according to the Manitoba Hydro Land Compensation Policy: for damage to property or any relocation of incompatible agricultural buildings (e.g., grain bins and livestock overwintering shelter).
- Clearing and construction activities in the Spy Hill-Ellice Community Pasture will be carried out during frozen ground conditions to limit affects to vegetation and avoid sensitive timing window for wildlife.
- Rehabilitation in the Spy Hill-Ellice Community Pasture will include objectives for restoration of natural conditions and the use of native seed mixes in disturbed areas, if required.
- Tower foundations that limit disturbance of soil will be utilized within grassland habitat ESS sites within the Spy Hill-Ellice Archie Community Pasture.
- Marshalling yards and worker accommodations will not be developed in Spy Hill-Ellice Community Pasture.

Predicted changes from EMF

Recent findings from research reviewed by Exponent (Manitoba Hydro 2017i) on farm animals ". . . *do not suggest that magnetic or electric fields (or any other aspect of high voltage transmission lines, such as audible noise) result in adverse effects on the health, behavior, or productivity of fauna, including livestock such as dairy cows, sheep, pigs, and a variety of other species, including small mammals, deer, elk, birds, and*

bees. Studies were also conducted to evaluate whether EMF could affect crops or plants, but did not suggest any adverse effects on growth or viability."

Mitigation for EMF

Although no mitigation is required, Manitoba Hydro will continue to keep abreast of ongoing research and will share information to address concerns with respect to EMF.

Predicted changes from stray voltage

Stray voltage is the voltage difference between two animal contact points. A common example is the small voltage differences between the water bowl and floor of a dairy barn or any agricultural buildings that farm animals frequent. This is a concern for dairy operations where, for example, stray (or tingle) voltage can cause current to flow through cows, which can create a disturbance in herds and result in reduced milk production. Stray voltage may originate from on-farm or off farm sources (Manitoba Hydro 2006b). The Electric Power Research Institute (EPRI 2012) states that stray voltage on dairy farms is primarily related to electrical current in wiring on the farm and the power distribution system that supplies the farm. Manitoba Hydro (2006b) indicates that on-farm sources may include poor wiring, electrical short-circuits, defective underground cables, unbalanced loads, corroded neutral conductor connections, missing or inadequate grounding systems, and corroded or missing bonding connections. Stray voltage is not normally a power transmission issue because transmission line structure grounds are not generally connected to the distribution line grounds, and little current flows in transmission structure grounds except during faults (EPRI 2012). Only one landowner indicated stray voltage as a concern on the Round 2 Landowner questionnaire. Correcting on-farm deficiencies should be conducted by a qualified electrician and contact information will be available to address any concerns about stray voltage that landowners have.

Mitigation for stray voltage

Although no mitigation is required, Manitoba Hydro will work with agricultural producers affected by the development to address concerns with respect to stray voltage.

Predicted changes to GPS Interference

Modern agriculture employs satellite technology (GPS) for precision farming and auto-steer systems on farm equipment. There was a high level of concern about potential GPS interference expressed in the landowner questionnaire as part of the public engagement process (chapter 3).

In 2011, Manitoba Hydro conducted an independent study to analyze the ability of GPS receivers, the survey grade receivers typically used for precision farming, to operate under high voltage direct current power lines. This study concluded that very minor adverse effects on GPS receiver performance could be measured or detected from either the overhead lines or the structures that support the actual lines. The study confirmed that GPS data collected by the receivers had not been compromised (Manitoba Hydro 2011b). Manitoba Hydro also has noted that GPS units also function at a very different frequency than AC transmission lines and that there should be no interference with satellite-based GPS systems (Exponent *in* Manitoba Hydro 2013a).

Mitigation for GPS interference

No mitigation is required.

Project assessment significance conclusion

Potential effects to agriculture include effects that are temporary in nature (e.g., moving agricultural buildings and structures in the ROW during construction), as well as effects that are more permanent in nature (e.g., permanent loss of land underneath the tower footprint).

Given the application of the above-described mitigation measures the effects of the Project in terms of agriculture are summarized as follows:

- Direction: Adverse
- Magnitude: Small
- Geographic extent: Project Footprint (e.g., permanent land loss); Local (e.g., aerial application)
- Duration: Short-term (e.g., change in buildings and structures); Long-term (e.g., permanent land loss)
- Frequency: Infrequent (e.g., erosion and soil) compaction); Regular/Continuous (e.g., permanent land loss)
- Reversibility: Reversible (e.g., erosion and soil compaction); Permanent(e.g., permanent land loss)
- Resiliency: High

In summary, the Project will have adverse, small in magnitude effects and is therefore assessed as not significant.

7.5.5.4 Sensitivity to cumulative effects

As described in section 5.2.3, future plans for the RAA include several transportation and water treatment and supply infrastructure projects in the Russell area, water treatment and supply infrastructure in the Birtle area, and ongoing residential development in these larger urban communities, as well as some of the smaller settlements in the RAA such as St. Lazare. Mining and oil and gas exploration and development are also expected to continue in the RAA as well as in the Spy Hill-Ellice Community Pasture. Agriculture will also continue to dominate the landscape, and residential development will likely continue in more urban centres.

The nature and extent of cumulative effects will likely differ depending on the project. Permanent infrastructure in agricultural areas would result in agricultural land loss associated with these projects and are considered to be permanent in nature. The same could be said for other activities such as mining, oil and gas and additional residential development. The amount of agricultural land loss anticipated from ongoing residential development is unknown; however, residential development, including subdivisions and other residential development will continue to result in measurable levels of agricultural land losses. Ongoing monitoring of compatibility of land uses occur at a municipal and provincial level.

With the addition of Project effects and those of other projects, cumulative effects on loss of agricultural land are anticipated to be small in magnitude. While the towers associated with the Project will result in land loss that is considered permanent, its contribution to land loss in the RAA is not expected to measurably affect the capacity for agriculture in the RAA. The combined cumulative environmental effect will be measurable but is not anticipated to result in any impairment to the capacity of agriculture in the RAA and agriculture is anticipated to continue at or near pre-Project levels.

7.5.5.5 Sensitivity to climate change

According to the climate change information and scenarios presented in the section 5.2.3 and 7.5, average temperature and precipitation are expected to increase in the coming decades, with a potential for an increased frequency in more extreme events such as flooding and drought. While there are currently challenges in developing any precision on changes at the local scale, where factors such as land cover, topography, watercourses and other barriers may have a greater influence on local conditions, it is important to examine the resiliency of the VC against these potential changes.

While there may be some positive effects to agriculture from increased precipitation and temperature, concerns associated with climate change relate to extreme weather events such as flooding, drought, heat stress, disease and changes in green space. Rural communities are typically more sensitive to climate change given their dependence on natural resource sectors (i.e., agricultural communities, recreation/tourism communities). Communities that depend on these industries could face challenges. The agricultural industry has progressed further than other sectors in its adaptation efforts related to crop types and varieties grown, however (Sauchon and Kulshreshtha 2008).

Given the timelines associated with the projected precipitation and temperature changes and complexities in pathways of effect, there is some uncertainty in predicting how these changes will alter predicted agricultural activities. It will therefore be important to have on-going communication through the landowner liaison program to continue to identify and address any concerns that may arise. With these measures in place, the additional effects due to climate change are not anticipated to result in a change to the determination of significance for residual or cumulative effects.

7.5.5.6 On-going communication and coordination

No monitoring or follow-up is required. All Project-based effects are small in magnitude and will not have a material effect on the current baseline condition. However, throughout the construction phase of the Project Manitoba Hydro will continue to share information with directly affected and interested communities, stakeholders and individual property owners. As indicated, one mechanism that will be employed is the Landowner Owner Liaison Program where each affected property owner has a dedicated Manitoba Hydro Staff member to facilitate discussion and address issues as they arise during the property acquisition process.

7.5.6 Other commercial resource use

7.5.6.1 Summary of current status

Commercial resource use was selected as a VC in recognition of its importance to residents, communities and the regional economy of the RAA. During the public engagement process, some community members had questions about potential effects of the Project on mining activities and oil and gas development. During the engagement process (chapter 3) discussions occurred with representatives from the provincial Mines Branch and a key stakeholder in the area to learn about the current and future activities on the landscape to assist with routing the transmission line in order to mitigate against Project-based effects. Induction effects relating to proximity of the Project to oil and gas

developments are addressed under the Infrastructure and Services VC (section 7.5.2). Overall, the effects to other commercial resource use (shown in Map 5-6) are largely two-fold: disruption of the resource through area loss and disturbance/interference with resource extraction operations. Regarding mining, the RAA does not have any active mines; however, the key mineral and quarry interests in the RAA include the following:

- 13 quarry leases;
- 22 casual quarry permits;
- 179 private quarry permits;
- One potash exploration permit;
- 19 potash withdrawals (which covers all three RMs); and
- 18 quarry withdrawals (either sand or gravel).

For oil and gas development in the RAA, There are a total of 439 oil wells in the RAA, the majority of which are either freehold or proportional. The breakdown of wells in the RAA is as follows:

- 26 in the RM of Russell-Binscarth;
- 284 in the RM of Ellice Archie; and
- 129 in the RM of Prairie View.

There are also two oil/gas pipelines in the RAA; one in the RMs of Ellice Archie and Russell Binscarth, and the other in the RMs of Ellice Archie and Prairie View.

7.5.6.2 Relevant Project interactions

Effects of the Project will occur during both the construction and operations phases of the Project and for all Project activities. The presence of workers erecting infrastructure could preclude operators from accessing a resource, and the presence of the infrastructure could affect the development potential of the resource and restrict activities. Since works at Birtle South Station will be contained within the station property there are no anticipated effects for the station component of the Project on commercial resource activities.

7.5.6.3 Project assessment

Mining

Predicted changes to mining

The assessment of mining and aggregates focuses on the possible change in mining/aggregate extraction that could result from the Project. Issues and concerns associated with these effects consist of disruption of the resource through area loss and disturbance/interference with resource extraction operations. Through the routing process (chapter 6) active mines and quarries were identified as an area of least preference and avoided to the extent feasible.

Due to the presence of the Project, it will disturb or disrupt various mineral interests within the Project Footprint, including:

- One quarry lease (pending);
- Two private quarry permits; and
- Five potash withdrawals (four final and one pending).

There are also crown land encumbrances that will be affected that relate to mining interests.

During the Project operation and maintenance phase, there is potential for interference with current or future planned facility operations and the ability to develop mineral areas (e.g., quarry or aggregate deposits) for future commercial extraction. Operational limitations for an operator in relation to line proximity could result in a reduction of the amount of material excavated due to protection buffers (e.g., setback distance from transmission towers) implemented by Manitoba Hydro to protect its infrastructure (e.g., blasting setbacks).

Manitoba Hydro met with the Mines Branch to gain an appreciation for the mining activities in the area. It was noted that Potash development in the future is likely to occur. However, it was noted that due to technological developments horizontal drilling and mining is now possible. This would limit the amount of interference that the presence of a transmission line would have on Potash development activity.

Mitigation for mining

Mitigation measures for potential Project effects on mining include the following:

- Existing access road, roads, trails or cut lines will be used to the extent possible. Permission to use existing resource roads will be obtained, where applicable.
- Clearing and disturbance will be limited to defined rights-of-way and associated

access routes.

- Manitoba Hydro will work with mining/quarry operators to determine if blasting mats or other mitigation measures are required during quarry operations within or adjacent to the ROW.

Regarding blasting:

- No blasting shall be allowed inside the ROW.
- Blasting mats shall be used in a 300 m wide buffer parallel to ROW (both sides) to control blasting debris.
- Manitoba Hydro shall be informed of any blasting operations, 48 hours in advance.
- There are no blasting restrictions outside of the 300 m wide buffer.
- Stockpiling of any materials from quarry operations shall be prohibited within the ROW and any existing materials shall be removed from the ROW.

Oil and gas development

Predicted changes to oil and gas development

The assessment of change to oil and gas development focuses on changes to the development of the resource. Issues and concerns associated with these effects consist of disruption of the resource through disturbance/interference with resource extraction operations; during the operation and maintenance phase there is potential for interference with future planned facility operations.

Manitoba Hydro met with representatives from the provincial Mines Branch and a key stakeholder in the area regarding Oil and Gas development to determine the location of existing infrastructure. Oil and gas infrastructure was also included in the route selection process; oil well heads were an area of least preference and were avoided when routes were identified. Other infrastructure such as oil tank batteries (a group of tanks that are connected to receive crude oil production from a well) as well as lines that lead to the batteries were also considered when routes were developed. The nearest infrastructure to the preferred route is an oil well head that is located 19 m from the edge of the ROW (SE-25-16-28W) in the Rural Municipality of Ellice-Archie. Regarding future development of the resource, it was noted during discussion with the Mines Branch that horizontal drilling is now possible which would limit the effect on development potential of the resource due to the physical presence of the transmission line. Crown land encumbrance holders are also affected by the Project.

Mitigation for oil and gas development

Mitigation measures for potential Project effects on oil and gas development include the following:

- Manitoba Hydro will contact affected oil and gas development stakeholders prior to Project start-up.
- Existing access road, roads, trails or cut lines will be used to the extent possible. Permission to use existing resource roads will be obtained, where applicable.
- Clearing and disturbance will be limited to defined rights-of-way and associated access routes.

Project assessment significance conclusion

Potential effects to other commercial resource use (i.e., mining and oil and gas development) largely relate to disruption of the resource through disturbance/ interference with resource extraction operations; during the operation and maintenance phase there is potential for interference with future planned facility operations. Given the application of the above described mitigation measures the effects of the Project in terms of other commercial resource use are summarized as follows:

- Direction: Adverse
- Magnitude: Small
- Geographic extent: Footprint (area loss); Local (construction disturbance)
- Duration: Short-term (construction disturbance); Long-term (area loss)
- Frequency: Infrequent (construction disturbance); Regular/continuous (area loss)
- Reversibility: Reversible (construction disturbance); Permanent (area loss)
- Resiliency: High

In summary, the Project will have adverse, small magnitude effects that are not significant.

7.5.6.4 Sensitivity to cumulative effects

Section 5.2 includes a summary of historic, current and reasonably foreseeable projects that may overlap with the Project. The effects from projects and activities that overlap spatially and temporally with those from the Project have the potential to result in cumulative effects on commercial resource use. Cumulative effects arising from future activities have similar effects mechanisms as effects arising from the Project, including

disruption of the resource through area loss and/or disturbance/interference with resource extraction operations.

As described in section 5.2.3, future plans for the RAA include several transportation and water treatment and supply infrastructure projects in the Russell area, water treatment and supply infrastructure in the Birtle area, and ongoing residential development in these larger urban communities, as well as some of the smaller settlements in the RAA such as St. Lazarre. Mining and oil and gas exploration and development are also expected to continue in the RAA as well as in the Spy Hill-Ellice Community Pasture. Agriculture will also continue to dominate the landscape, and residential development will likely continue in more urban centres.

Implementation of the mitigation measures described for Project-based effects will reduce the effects on mining resources. Other proponents may adopt mitigation measures to mitigate their own Project effects or may be required to provide compensation as appropriate.

With the addition of Project effects and those of other projects, cumulative effects from the development of the required footprints for these infrastructure projects would be of small magnitude. The Project's contribution to cumulative environmental effects is not anticipated to result in a change that widely disrupts continued land use, or reduces the quality of sites or degrades present land use activities within the RAA that is not mitigated.

7.5.6.5 Sensitivity to climate change

According to the climate change information and scenarios presented in the section 5.2.3 and 7.5, temperature and precipitation are expected to increase in the future. These sections also note that it is difficult to develop any precision on changes at local scale, where factors such as land cover, topography, watercourses and other barriers may have a greater influence on local conditions.

Concerns in urban centres associated with climate change relate to extreme weather events, flooding, drought, heat stress, disease and changes in green space. Urban centres are more able to undertake climate adaptation. Rural communities are more sensitive to climate change given their dependence on natural resource sectors (i.e., agricultural communities, recreation/tourism communities). Communities that depend on these industries could face challenges.

While there is uncertainty regarding how a change in climate affects commercial resource use (i.e., resource extraction activities), efforts are being made by the industry to learn how climate change will affect their operations and, develop means to manage

potential effects. There is uncertainty regarding how increases in temperature and precipitation could alter interactions with the Project and commercial resource development, but is anticipated that developers will be resilient in addressing changes and in conjunction with Manitoba Hydro, will be communicating over time with regulators responsible for land management in dealing with issues that arise. As a result, climate change is not anticipated to alter the significance conclusion for the Project.

7.5.6.6 On-going communication and coordination

No monitoring or follow-up is required. All Project-based effects are small in magnitude and will not have a material effect on the current baseline condition. However, Manitoba Hydro throughout the construction phase of the project will continue to share information with directly affected and interested communities, stakeholders and individual property owners.

7.5.7 Recreation and tourism

7.5.7.1 Summary of current status

Recreation and Tourism was selected as a VC in recognition of its importance to residents and communities in the RAA. During the public engagement process (chapter 3) community members noted, as well as a representative from Valley Recreation District, the importance of recreation in the area and the sites of importance. Recreational facilities in the RAA include snowmobile trails and shelters, boat launches for recreational boating/canoeing, hiking/biking, fishing, ATV trails, cross-country ski trails, campgrounds and parks. Further information on the sites in the RAA can be found in section 5.5.8, and shown on Map 5-7.

The RAA falls within Game Hunting Area 22 and Game Bird Hunting Area 4, in which licensed hunting is managed for game species including white-tailed deer, black bear, wild turkeys, wolves, coyotes, migratory game birds and upland birds. Non-resident licensed hunting in the RAA is managed through outfitter allocations limited to migratory game birds, upland game birds, black bear and archery hunting for white-tailed deer. The RAA also falls in open area Trapping Zone 1. Commonly trapped species include coyote, beaver, muskrat, mink and raccoon.

7.5.7.2 Project interactions

The two potential effects related to this VC are impairment of recreation enjoyment and reduced harvest success rate. All construction activities have the potential to interact with nearby recreation receptors. No effects on recreation are expected during the

operations and maintenance phases due to the infrequent nature of the activities. Issues related to aesthetics are addressed under property and residential development.

7.5.7.3 Project assessment

Predicted changes to recreation and tourism

During transmission line routing, areas of least preference were identified and considered when developing alternative routes. Areas considered for avoidance included existing and proposed ecological reserves, legally protected WMAs, and parks. Transmission line routing also considered aspects such as proximity to campgrounds, picnic areas and recreational sites (e.g., golf courses, skiing areas), and recreation sites/trails. The final route avoided a number of important locations where residents recreate. The route avoided Hooper's Lake which is a destination for a variety of outdoor recreation; the route is approximately 7.3 km north of the recreation facilities. The route also avoided the nearest campground which is approximately 6.6 km west of the route in the RM of Ellice-Archie. In addition to the above, the route selected is approximately 1.5 km south of the Wady Loop that is maintained by the Birtle Ski Club.

Transmission line construction can diminish or disturb recreational activities in the RAA. Land clearing for ROW construction may physically interfere with recreational activities temporarily and may temporarily disrupt recreationalists from accessing preferred areas if there is construction occurring near these areas. Nuisance effects (e.g., Project-related noise, dust and reduced visual quality) may affect the experience of recreationalists. During Project construction there will be intermittent, elevated noise and dust levels in the vicinity of the active construction area for a short period of time. Due to the distance to sensitive receptors and short-term of the construction activities in the active construction zone the effects are anticipated to be minimal.

Regarding licensed hunting and trapping, sensory disturbances during construction (e.g., traffic, machinery) could result in temporary displacement of some wildlife (see section 7.4). In addition to the physical habitat affected by clearing, the avoidance of construction zones could temporarily displace some individual animals in the vicinity of the Project. However, the disturbance will be small in magnitude and short term and most wildlife will return quickly once the disturbance has ended. This was verified during a pilot project undertaken by Manitoba Hydro in 2012 for the Wuskwatim Transmission Line Project (Eagle Vision Resources and Joro Consultants Inc. 2012) and supported the assertion that furbearers avoided areas with consistent amounts of noise and disturbance during construction; however, furbearers returned to the area once the disturbance ceased. It is possible that trappers and/licensed hunters could see a decrease in capture/harvest rates in the short term.

Mitigation for recreation and tourism

The following are mitigation measures to limit the effects on recreation and tourism:

- Important wildlife features (*i.e.* mineral licks, stick nests) will be identified in mapsheets and flagged prior to clearing.
- Trees containing large nests of sticks and areas where active animal dens or burrows are encountered within the ROW will be left undisturbed until unoccupied.
- Artificial structures for nesting may be provided if unoccupied nests must be removed.
- Environmentally sensitive sites, features and areas will be identified and mapped before clearing.
- Construction activities will be restricted to established roads, trails and cleared construction areas in accordance with the Access Management Plan.
- Hunting and harvesting of wildlife or possession of firearms by Project staff will not be permitted while working on the Project sites.
- Critical wildlife habitat will be protected in accordance with provincial and federal legislation and provincial and federal guidelines. A 30 m setback distance will be applied to known federally-protected species at risk and a 10 m buffer will be applied to species of conservation concern occurrences within the Project Footprint. Setbacks and buffers along the ROW will be clearly identified by signage or flagging prior to construction, and signage or flagging will be maintained during construction to alert crews to the presence of the setback.
- Clearing activities will not be carried out during reduced risk timing windows for wildlife species without additional mitigation

Project assessment significance conclusion

Potential effects to recreation and tourism largely relate to impairment of recreation enjoyment and reduced harvest success rate.

Given the application of the above-described mitigation measures the effects of the Project in terms of recreation and tourism are summarized as follows:

- Direction: Adverse
- Magnitude: Small
- Geographic extent: Local
- Duration: Short-term

- Frequency: Infrequent
- Reversibility: Reversible
- Resiliency: High

In summary, the Project will have adverse, small magnitude effects that are reversible and therefore, not significant.

7.5.7.4 Sensitivity to cumulative effects assessment

This section identifies and assesses the cumulative effects of those residual effects likely to overlap in time and space with residual environmental effects of other projects and physical activities. Section 5.2 includes a summary of historic, current and reasonably foreseeable projects that may overlap with the Project.

Projects and activities that overlap spatially and temporally with the Project could result in negative cumulative effects on recreation and tourism. As described in section 5.2.3, future plans for the RAA include several transportation and water treatment and supply infrastructure projects in the Russell area, water treatment and supply infrastructure in the Birtle area, and ongoing residential development in these larger urban communities, as well as some of the smaller settlements in the RAA such as St. Lazare. Mining and oil and gas exploration and development are also expected to continue in the RAA including the Spy Hill-Ellice Community Pasture.

While there are several current and future projects occurring in the RAA, many will not occur in areas that are currently used for hunting or trapping. In particular, projects near developed areas will likely not affect hunting and trapping as these activities often occur further away from developments. Other developments may occur in areas that are previously disturbed and which provide little or no wildlife habitat. Additional project construction in the area and at the time could contribute to additional sensory disturbance temporarily displacing some individual animals in the vicinity of the projects resulting in reduced harvest success rate. However, as noted earlier, the effects will be small in magnitude and most wildlife will return quickly once the disturbance has ended so harvest success rate will not be affected for a prolonged length of time.

Regarding impairment of recreation enjoyment, the Project routing process took into consideration recreation and tourism and is not located near any receptors. Any future projects in the vicinity of the proposed Project will therefore have a negligible effect on impairment of recreation enjoyment due to its location. The combined cumulative environmental effect is not expected to measurably affect the current baseline condition of recreation and tourism.

Sensitivity to climate change

This section provides a summary of predicted future climate conditions to determine if there is a risk to the public or the environment in situations where the Project is the major factor related to the risk. The significance prediction is reviewed to evaluate if these predictions would change as a result of climate change.

According to the climate change information and scenarios presented in the section 5.2.3 and 7.5, temperature and precipitation are expected to increase in the future. These sections also note that it is difficult to develop any precision on changes at local scale, where factors such as land cover, topography, watercourses and other barriers may have a greater influence on local conditions.

Increased temperatures could lead to greater tourism visitation in recreation areas. Opportunities for nature-based recreation activities could increase due to the extension of the summer tourism season to include more favorable shoulder seasons (i.e., spring and autumn). Species of interest could similarly be affected by warmer temperatures through changes in habitat. As a result, species that have been viewed or hunted may no longer inhabit certain areas. This change could be offset by an increase habitat for deer. Warmer temperatures could also affect waterfowl hunting due to the loss of waterfowl habitat. Lower precipitation in the summer months could lower lake and stream levels and thus reduce opportunities for water-based recreation (i.e., swimming, fishing, boating, and canoe-tripping). Winter activities could be affected by less snow cover and shorter seasons, which could affect the timing of, and opportunities for, snowmobiling, cross-country skiing and snowshoeing (Sauchon and Kulshreshtha 2008). However, it is unlikely that the Project is going to preclude these future recreational activities under future climate scenarios.

On-going communication and coordination

No monitoring or follow-up is required. All Project-based effects are small and will not have a measurable effect on the current baseline condition. However, Manitoba Hydro throughout the construction phase of the Project will continue to share information with directly affected and interested communities, stakeholders and individual property owners.

7.5.8 Health

7.5.8.1 Summary of current status

Health was selected as a VC in recognition of its importance to residents and communities. During the public engagement process (chapter 3) community members

identified health concerns in the event they frequented areas where the transmission line will be located.

Health effects related to the Project are largely nuisance-based and/or perceived health effects. The following section includes a discussion on noise, air emissions and Electric and Magnetic Fields effects during the relevant Project phases. Each effect is discussed separately, but the significance determination on the Health VC is assessed collectively.

The Rural Municipalities in the RAA are part of Prairie Mountain Health. As indicated in the existing environment section regarding the current state of health in the area, the Rural Municipalities in Prairie Mountain Health have a slightly higher incidence of chronic conditions when compared to the province as a whole. Regarding noise and air quality, the Project is located in an area predominantly used for agricultural purposes. Land used for agriculture accounted for greater than 70% in the RAA (section 5.5.6). As described in section 5.3.2, existing noise and air quality conditions would not be expected to be an issue for the majority of the year. The exception may occur at harvest time when harvesting activities result in increased vehicular and equipment activities that would increase local noise and local air quality, including emissions and particulate matter from and reduced visibility from local crop residue burning programs.

7.5.8.2 Relevant Project interactions

The Project phase when noise and dust will be the most pronounced is during construction. Vehicles used during construction including excavators, loaders, dozers, graders, backhoes, cranes, semi-trailers, dump trucks, tracked vehicles, pick-up trucks, drill rigs and all-terrain vehicles are producers of noise and dust and will be used during all construction-based activities except accommodations. There are minor activities for patrolling the transmission line a few times a year which will not result in substantial changes to noise and dust for a prolonged length of time and, therefore, are not assessed. Furthermore, due to only minor upgrades at the station for termination, contained within the property, it is not considered in the assessment. The operation of the transmission line will also not result in a measurable change in noise from baseline conditions and, therefore, is not assessed.

Electric and Magnetic Fields are only produced during the operation of the transmission line and are assessed accordingly. Any increases in EMF levels due to line termination at Birtle South Station will be contained to the fenced area and, therefore, not assessed for that Project component as it relates to health.

7.5.8.3 Project assessment

Noise

Predicted changes to noise

Noise effects are described in sections 5.3.2.2 and 7.3.2. During the construction phase there will be increased noise levels from vehicles and equipment and activities during all phases of construction. Potential sensitive receptors including homes, daycares, schools, and hospitals were considered during the route selection process. There are no homes in the Project Footprint and only seven homes from 100 - 500 m of the edge of the ROW. No existing schools, daycares, hospitals, nursing homes or churches are located within the LAA (one mile on either side of the ROW).

During Project construction there will be intermittent, elevated noise levels in the vicinity of the active construction area. Elevated noise levels will lessen the further away the receptor is from the active construction area. As described in section 7.3.2, noise levels can range from slightly more than 100 dBA, to 137 dBA for blasting activities. The transmission line is located in an area zoned for agricultural use where activities often include elevated noise levels.

For splicing of conductors, Manitoba Hydro utilizes implosives to join the conductors together. When used, the sound produced would constitute a short and very loud bang. Manitoba Hydro will notify landowners in the vicinity of where implosives are being used regarding the schedule for this activity. Adverse noise and vibration effects due to construction related activities are anticipated to be short-term and small in magnitude.

The Province of Manitoba's Guidelines for Sound Pollution in residential areas indicates a maximum desirable sound level objective of 55 dBA (day) and 45 dBA (night). The higher sound levels generated during construction will be transient as equipment is moved along the ROW; therefore, nearby residents will not be affected for prolonged periods. Noise levels during the night will also remain unchanged from the existing conditions, as construction activities related to the assembly and installation of towers will only occur during the day.

Mitigation

This section highlights the key mitigation measures to be implemented during construction and operations to limit noise effects. Mitigation measures include the following:

- Noise and vibration causing construction and maintenance activities will be limited to normal working hours in developed areas and comply with all applicable municipal by-laws.

- Use of implosives will be restricted to normal working hours only.
- Advanced notification will be provided before use of implosives to nearby residences and businesses and adhere to the implosives schedule.

Air quality

Predicted changes to air quality

The effects of transmission stations and lines on air quality have been reported by Manitoba Hydro for its other projects (e.g., Manitoba Minnesota Transmission Project, 2015). Potential effects include local increases in fugitive dust and emissions as a result of vehicular traffic and the use of heavy equipment during construction. The storage and dispensing of fuels such as gasoline, diesel, and storage of lubricants has the potential to cause localized effects on air quality. The Project may result in increased fugitive dust, increased nitrogen oxide, sulfur dioxide, greenhouse gases and volatile organic compound emissions, and decreased carbon dioxide absorption in the vicinity of the Project site during the construction phase due to machinery operation. Potential effects are not expected to be a concern as the effects will be short-term in duration and small in magnitude.

Mitigation

This section highlights the key mitigation measures to be implemented during construction and operations to limit air quality effects. Mitigation measures include the following:

- Using acceptable dust control measures such as water or approved dust suppression agents on gravel roads to limit the amount of airborne dust;
- Storage, handling and transport of fuels will be in accordance with Manitoba Sustainable Development's Storage and Handling of Petroleum Products and Allied Petroleum Products Regulation and guidelines as well as Manitoba Hydro's Code of Practice for Storage and Handling of Petroleum Products and Allied Petroleum Products Storage Tank Systems (2003) and Environmental Protection Guidelines, Construction, Operation and Decommissioning, Manitoba Hydro Work Sites and Facilities (2006); and
- Hazardous substances will be subject to provincial and federal workplace hazardous materials information system regulations and guidelines, and the Manitoba Workplace Safety and Health, Workplace Safety and Health Regulation, and will be managed in accordance with Manitoba Hydro's Hazardous Materials Management Handbook (2016b).

Electric and magnetic fields

Predicted changes to electric and magnetic fields

This section discusses changes to electric and magnetic fields and how it relates to human health. Effects of electric and magnetic fields on Agriculture (e.g., Livestock) are discussed in section 7.5.5.

Electric and magnetic fields associated with the proposed Project will only occur during the operations phase. The electrical system carries power from generating stations to homes by transmission lines, stations and distribution lines. Each component of the system produces electric and magnetic fields in the extremely low frequency range that includes 60 Hz.

Electric fields are due to a system's voltage and area measured in kilovolts per meter (kv/m). Magnetic fields are due to the flow of electrical current and are measured in milligauss (mG). Electric and magnetic field (EMF) levels measured near any source depend upon a number of factors but diminish rapidly with increasing distance from the source. Canadian (Manitoba Clean Environment Commission 2001) and international studies including World Health Organization (2007) and International Agency for Research on Cancer (2001) have concluded that there is insufficient scientific evidence showing exposure to low EMFs can cause adverse health effects. Health Canada (2004) states that there is no conclusive evidence of any harm caused by exposures at levels normally found in Canadian living environments.

While Manitoba Hydro is sensitive to public concerns regarding potential health effects from electric and magnetic fields, there is at present no scientific evidence to justify modification of existing practices respecting facilities for the generation, transmission and distribution of electricity.

Mitigation

Although no mitigation is required, Manitoba Hydro continues to undertake the following actions regarding EMF concerns:

- Manitoba Hydro will design the transmission line to meet international standards and guidelines set forth by the ICNIRP (International Commission on Non-Ionizing Radiation Protection). These guidelines have been adopted by Health Canada and the World Health Organization.
- Monitoring of worldwide research programs on electric and magnetic fields for its large scale projects; and
- Maintaining communications and provision of technical information to interested parties, including the public and agencies responsible for public and occupational

health and the environment.

Project assessment significance conclusion

Potential effects to health include changes in air and noise emissions and perceived effects related to Electric and Magnetic Fields (EMF). Given the application of the above-described mitigation measures the effects of the Project in terms of health are summarized as follows:

- Direction: Adverse
- Magnitude: Small
- Geographic extent: Local
- Duration: Short-term
- Frequency: Sporadic/Intermittent
- Reversibility: Reversible
- Resiliency: High

In summary, the Project in predicted to have adverse, small magnitude residual effects that are reversible and is therefore assessed as not significant.

7.5.8.4 Sensitivity to cumulative effects

Overview

This section identifies and assesses the cumulative effect of those residual effects likely to overlap in time and space with residual environmental effects of other projects and physical activities. Section 5.2 includes a summary of historic, current and reasonably foreseeable projects that may overlap with the Project.

Projects and activities that overlap spatially and temporally with the Project could result in cumulative effects on health, in terms of noise, air quality and EMF. The nature and extent of cumulative effects will likely differ depending on the project. As described in section 5.2.3, future plans for the RAA include several transportation and water treatment and supply infrastructure projects in the Russell area, water treatment and supply infrastructure in the Birtle area, and ongoing residential development in these larger urban communities, as well as some of the smaller settlements in the RAA such as St. Lazare. Mining and oil and gas exploration and development are also expected to continue in the RAA including the Spy Hill-Ellice Community Pasture.

Noise

Future projects and activities in the RAA have the potential to interact cumulatively with the Project and could increase the overall exposure to noise experienced by people residing in or frequenting the RAA. Reasonably foreseeable projects and physical activities have the potential to interact cumulatively with the Project to cause change to noise (for example, agricultural activities, residential developments, and mining activities). However, effects will only be additive if noise-generating activities occur concurrently and within close proximity to one another. Implementation of the mitigation measures will reduce the effects of the Project on change to noise levels. Other proponents may adopt mitigation measures to mitigate their own project effects. Manitoba Hydro will work with other proponents and government agencies where appropriate to address cumulative effects, should this be a concern. The Project's contribution to cumulative noise level is considered small in magnitude.

Air quality

Future projects and activities have the potential to interact cumulatively with air emissions from the Project and could increase the overall exposure to change in air quality experienced by people living and working in the RAA. Given that air emissions associated with the Project will occur primarily during the construction phase, reasonably foreseeable projects and physical activities are only anticipated to interact cumulatively with the Project to cause change to air quality if construction activities occur concurrently in the same general area.

Implementation of the mitigation measures will reduce the effects of the Project on change to air quality. Other proponents may adopt mitigation measures to mitigate their own project effects. Manitoba Hydro will work with other proponents and government agencies where appropriate to address cumulative effects should they become a concern.

Overall, the possible future projects are likely to contribute to a change in air quality. These effects will be experienced primarily close to construction areas and they will be short-term and conclude at the end of construction. Landowners and residents living near to both the Project and the other projects and activities identified above are most likely to experience cumulative effects from the change in air quality. However, with mitigation measures, effects will be small in magnitude and reversible.

Electric and magnetic fields

Future projects and activities that generate EMF would increase the overall EMF exposure for people living and working near the Project. However, based on available information, no foreseeable projects generating EMF are planned in the vicinity of the

Project and therefore, no effects are anticipated. The current scientific evidence indicates that ELF EMF from transmission lines and other sources do not pose a risk to human health (Exponent 2015).

Summary

Overall, there will be a short-term and local effect regarding the contribution of the Project to air quality and noise, but no impact on EMF. The contributions of the effects of other projects on health are not expected to alter the Project significance conclusion.

7.5.8.5 Sensitivity to climate change

According to the climate change information and scenarios presented in the section 5.2.3, temperature and precipitation are expected to increase in the future decades. While air emissions and vegetation clearing from the Project will contribute to greenhouse gases, their relative contribution is not expected to be measurable and projected climate change scenarios for the Project are not anticipated to have a material effect on air quality, noise, EMF that would lead to a change in the Health VC; therefore, significance determinations for health are not expected to change.

7.5.9 Traditional land and resource use

7.5.9.1 Overview

Traditional land and resource use was selected as a Valued Component (VC) because Project activities have the potential to change land and resources used for traditional activities by altering the availability of resources or access to land used for traditional land and resource use. Interest and concern on traditional land and resource use was identified during the Indigenous Engagement Process (IEP), where Indigenous communities and organizations raised concerns about traditional land use, such as the changes in amount of land available to conduct resource harvesting activities and the experience doing so.

Traditional land and resource use is dependent on the distribution, abundance and health of resources relied upon to practice traditional activities. Information on these aspects of the VC was gathered primarily during the IEP, including self-directed studies received for the Birtle Transmission Project. Seven Indigenous communities and organizations were invited to participate in the process, including:

- Anishinaabe Agowidiiwinan (Treaty 2);
- Birdtail Sioux Dakota Nation;

- Canupawakpa Dakota Nation;
- Gambler First Nation;
- Manitoba Metis Federation;
- Waywayseecappo First Nation; and
- Sioux Valley Dakota Nation.

Throughout the Indigenous engagement process and prior to finalizing this assessment three groups participated in values and interests workshops (Canupawakpa Dakota Nation, Gambler First Nation and Waywayseecappo First Nation), two communities completed draft self-directed studies (Gambler First Nation and Waywayseecappo First Nation), and one group (MMF) provided a final self-directed study. Please see Chapter 4 for more discussion on these processes. Information provided after submission of the assessment will be considered in the environmental protection program for the Project.

Based on the above information from Indigenous communities and organizations (described in section 5.5.10), the following land and resource use indicators were used to understand effects to traditional land and resource use:

- Culturally important places; and
- Harvesting activities.

An effect to culturally important places was contemplated by considering a disturbance to cultural places or a change in access to those places.

An effect to the ability to conduct harvesting activities was contemplated by considering the following:

- Changes to plant or wildlife availability, including the aquatic environment;
- Changes to access of harvesting areas or culturally important places;

Some participants in the IEP also discussed changes to the harvesting experience, which considers factors like:

  - the success of harvesting activities; and
  - the perception of the ability to conduct harvesting activities or the perception of access limitations to harvesting areas or culturally important places

Discussion on these topics is included within this section; however, the concluding significance determination has not included the harvesting experience as it is personal and changes dramatically between harvesters and within the same individual over time.

The temporal boundaries for Traditional Land and Resource Use VC consider each group's current and future use of traditional lands. The boundary for past Traditional land and resource use information is limited by the living memory of traditional knowledge holders who provided information for this assessment. The boundary for future Traditional land and resource use is far reaching and includes the ability for traditional harvesting to occur in perpetuity. This temporal reference is beyond the life of the Project.

7.5.9.2 Summary of current status

Culturally important places

Overview

Both specific and general cultural places were shared through workshops, self-directed studies and through the Indigenous engagement process. Manitoba Hydro recognizes that not all culturally-important places or spaces will be shared through these processes. Four places described as culturally important by more than one community or organization include the Assiniboine River and areas adjacent, Fort Ellice and the area surrounding the site, the Spy Hill-Ellice Community Pasture and areas within it, and Ste. Madeleine specifically and its surrounding area.

Assiniboine River and area adjacent

Canupawakpa participants noted during workshop activities that areas along the Assiniboine River where creeks and rivers branch off into marshy areas are important for gathering plants. Trees and red willow were noted as being used as medicines and willow is also used in ceremonies. The Assiniboine River was noted as an important area as it was a main travel route and was compared to Highway #1. Participants spoke about a travel route that many families, including those from the other communities (Sioux Valley Dakota Nation, Birdtail Sioux Dakota Nation and Waywayseecappo First Nation), used to use for hunting. Participants shared that part of this route was somewhat of a loop that went around quite a large area, including the RAA. It was noted that they would travel up the Assiniboine River in the spring and complete the loop; the loop would also be done again in the fall.

Study authors of the MMF MLOUS identified a historically important access route adjacent the Assiniboine River (see Figure 9 for the MLOUS).

Participants in the Canupawakpa workshop spoke a great deal about 'Indian mounds' or rocks that are set in a pattern. They stressed that it was highly likely for these types of sites to be found along the Assiniboine River and that extra caution should be taken

along the river. It was explained that a ‘mound’ would have been a village or an area where a family gathered, and there would be a high potential of finding artefacts in these areas. Participants also noted that hills in fields close to the Assiniboine River can be places where ceremonies took place and that the majority of burials would be along the Assiniboine River given the importance it played as a major travel route.

Fort Ellice and surrounding area

A participant in a workshop held in Waywayseecappo First Nation identified a sacred site at Fort Ellice “*as there are burials and that is where Treaty 4 was signed by late Chief Waywayseecappo*.” The importance of this site was also discussed by participants in other community workshops and through other engagement activities, including members from Gambler First Nation, Waywayseecappo First Nation and Birdtail Sioux Dakota Nation. Waywayseecappo participants identified a site near St. Lazare/Fort Ellice they visit every June for a ceremony.

Spy Hill Community Pasture

Waywayseecappo participants indicated that they go to the [Community] pastures to gather plants. Gambler First Nation members shared that the [community] pasture is full of wildflowers that are not found elsewhere. Many Participants of the MMF MLOUS exclusively harvest on the Spy Hill – Ellice Community Pasture and feel as though it is one of the few areas where Metis citizens are able to exercise rights-based activities unimpeded.

Gambler First Nation members shared there is an important berry site within the community pasture where participants pick berries. Participants indicated areas east and west going into Gambler First Nation where they gather berries. There are areas with tiger lilies and crocuses that participants always visit throughout the year.

Ste. Madeleine and surrounding area

Gambler members indicated that the Ste. Madeleine site is sacred, as well as another area in Gambler First Nation proper. There is also a creek where ashes were spread. There are celebrations held annually in the Ste. Madeleine area, called Ste. Madeleine Days. Community members go there to pray for loved ones, share a meal and participate in traditions. Some participants indicated that all hunting areas would be sacred because it is their original territory. There were two burial sites identified (see Gambler First Nation values and interests report map). Ancestors were laid at the first site and it is a part of the community. The second is the cemetery located at Ste. Madeleine. The Manitoba Metis Federation provided substantial information on the cultural occupation and history of Ste. Madeleine, an area north of the Project in the

vicinity of the Spy Hill-Ellice Community pasture (MMF, 2017). More information is available on the events at Ste. Madeleine in section 5.5.10. It was explained by an MMF representative in the study that "*Ste. Madeleine is not just a symbol of the past but a marker of the future of the Metis in this area*." Many contributors to the MMF LUOS had family connections to the Ste. Madeleine community. There is contemporary use of the area, where events such as The Ste. Madeleine Days, campfires, funerals and general visits are currently held in the area.

In addition to the four places described above, other culturally important places described by participants include the following:

- Canupawakpa participants shared about poplar trees and willows being considered sacred as they are used in ceremonies; birch as well.
- Waywayseecappo participants identified harvesting or gathering sites in the Birdtail Creek valley.
- A member from Waywayseecappo noted that there are burial sites by the Birtle residential school. Participants also identified unmarked gravesites, referring to them as Gambler's burial sites.
- Canupawakpa community members clarified during verification activities that centennial farms are important to the community as some of their grandparents worked at those farms in their youth. Community members indicated that work at centennial farms was all the work available for a First Nations person. In addition, they noted that some centennial farms were used for raising horses.
- In Figure 9 of the MMF LUOS, study authors have provided the location of 'historically significant Metis site' (as both a linear feature and a point feature), a 'historic access route', 'burial sites', a 'cultural site' and a 'trading post.'

Harvesting activities

Harvesting and gathering activities were described by participants in the Indigenous engagement process as follows:

Waywayseecappo First Nation

Waywayseecappo First Nation indicated harvesting activities occur in the region and include hunting and fishing, berry and medicine picking (including sweetgrass, sage and tea). Wildlife noted by community members as valuable includes muskrat, beaver, moose, deer, ducks, geese and fish. Participants identified that hunting occurs on Crown land, as they are not allowed to hunt on private land. One participant indicated that they have to ask permission to hunt on their own land. Participants from

Waywayseecappo indicated that Gambler members hunt in the [Assiniboine] Valley, but not Waywayseecappo members.

Participants indicated that they go to the [Community] pastures to gather plants. They find Weke (sweet flag) in the valley and identified a Weke picking site.

Gambler First Nation

Gambler First Nation harvesting activities in the RAA include hunting, trapping, fishing (although members noted they are not 'big fishers'), firewood, medicine and berry picking (including raspberries, Saskatoon berries, pin cherries, strawberries, chokecherries and cranberries used to freeze, make jam and can). Wildlife noted by Gambler First Nation community members includes coyote, bear, skunk, caribou, elk, moose, rabbit, deer and cougar. Some of the participants hunt for coyote, rabbit, elk, deer, moose and prairie chickens. There is also an important elk area near the community. Participants identified hunting areas near Gambler First Nation (Map 4-4). Participants noted that they use the [community] pasture for hunting. Community members use the rapids [on the Assiniboine] for swimming and fishing.

Gambler First Nation members shared that the [community] pasture is full of wildflowers that are not found elsewhere. There is an important berry site where participants pick berries. Participants indicated areas east and west going into Gambler where they gather berries. There are areas with tiger lilies and crocuses that participants always visit throughout the year.

Canupawakpa Dakota Nation

Canupawakpa First Nation harvesting activities in the RAA include hunting, trapping, fishing, and gathering wood for fuel and plants for food and medicine. Wildlife noted as important to the community includes fish, beaver, deer, bear, skunk, turtles, rabbits and gophers. The majority of people noted that they do not harvest in the route planning area as it is quite north of the community; however, a few do. It was noted that hunters hunted for their family and that important areas for animals, fish or birds are generally anywhere water is (i.e., rivers, creeks, and lakes). Participants noted that areas along the Assiniboine River where creeks and rivers branch off into marshy areas are important for gathering plants. Trees and red willow were noted as being used as medicines and willow is also used in ceremonies. Berries such as chokecherries and Saskatoons were mashed and mixed with deer meat. Plums were also mentioned as being abundant along creeks. Purple cedar was identified as a plant of key importance.

The Assiniboine River was noted as an important area as it was a main travel route and was compared to Highway #1. Participants spoke about a travel route that many families used to use for hunting (see Map 4-3).

Participants noted that they do not use the community pastures for cultural activities but added that other people most likely do hunt in the pastures. One participant stated that the community pastures are a ‘touchy area’ for the community.

MMF

Many Participants exclusively harvest on the Spy Hill – Ellice Community Pasture and feel as though it is one of the few areas where Metis citizens are able exercise rights-based activities.

There is general concern from contributors to the report regarding the amount of lands available for Metis people to conduct activities considered as protected as a right. Contributors who provided survey responses as part of preparation for the MLOUS indicated they believe the Project would change access to harvesting areas or that the majority of Contributors would ‘avoid transmission lines for harvesting activities by at least 100 metres’.

The MLOUS indicated that there will be changes to the physical attributes of the land that would uniquely affect the experience of land use for Metis citizens. Contributors provided survey responses that indicated that even the perception of these changes to physical attributes of the area (including air quality, noise, smell and visual quality) would deter harvesting.

The MMF MLOUS noted that some information was drawn from a past land use and occupancy study conducted for other projects in 2015. From this past study they noted that the Project right-of-way (which they refer to as the PDA) is used for trapping coyote, mink, muskrat, rabbit and weasel. The PDA provides seasonal habitat for moose and important habitat for deer. Fishing occurs in the PDA, including historic sturgeon fishing. A deer kill-site was noted in the MMF LAA (a 3 km buffer on either side of the Project center line). Trapping occurs for beaver, mink, muskrat, and weasel in the MMF RAA (a 10 km buffer on either side of the Project centre line). Deer hunting and fishing for northern pike, pickerel, goldeye, catfish, sturgeon and suckers occurs in the MMF RAA. Plant and natural materials gathering occurs in the RAA and includes berries such as cranberry, raspberry and Saskatoons.

The MMF MLOUS report indicated that harvesting for Metis is not just a recreational activity, but that “*There are cultural, economic and subsistence components which encompass these exercises which are important for Metis identity and pride*.”

The MMF LUOS notes that the harvesting experience could be affected by the construction and operation of the Project through changes in locations available to those harvesters and changes to those species available for harvest.

Contributors to the study noted that with the construction and operation of the Project there may be a reduction in harvesting success. Participants in the MLOUS were asked to provide the distance they would avoid a variety of land use type and developments. Specific buffer distances were provided to indicate areas 'where Metis citizens have diminished preference.'

The MMF LUOS included a discussion on the perception of effects of the Project. Based on information provided in the study, contributors had the perception for negative effects on MMF harvesters exercising their Metis rights.

7.5.9.3 Project interactions

Overview

The approach used to identify effect pathways between Project components and an effect to any activity considered under traditional land and resource use was cautious, where Manitoba Hydro assumed an interaction would occur if there is any uncertainty associated with an interaction with the Project, or if there as a perceived effect. If there was any uncertainty in an interaction or a perceived interaction, an interaction was assumed.

Project interactions with culturally important places include all new Project components. Manitoba Hydro may not be aware of certain places, and to be inclusive, all aspects of the Project that are not already present were considered.

The ability to conduct traditional activities is often dependant on many factors, including the availability of plants and wildlife in an area. Project interactions with the aquatic environment are described in section 7.4.2. Project interactions with grassland, forest and wetland plants and animals are described in sections 7.4.3 – 7.45. The interactions described for these VCs apply when considering effects to 'the ability to conduct harvesting activities'.

Additionally, should plants and wildlife in an area be available and accessible, the experience had while conducting these activities is also important. A successful experience will depend on many things, including whether harvesters have knowledge about where, when and how to harvest, have access to proper tools and feel open and welcome to conduct activities in an area where they have knowledge.

The perception of a harvester's ability to access a site is also important (MMF, 2017). Study authors explained in the Metis Land Use and Occupancy Study for the Birtle Transmission Project that contributors to their assessment indicated that even the perception of a change to air quality, noise and visual quality, or the perception that access has changed, will deter harvesting. On page 63 of the MLOUS the report

describes how ‘Contributors may avoid the PDA and surrounding area throughout construction and maintenance activities due to a perceived risk of increased industrial odor.” Due to perceived effects, all new Project components have been considered to interact with the experience harvesters may have when conducting traditional land and resource use activities.

7.5.9.4 Project assessment

Culturally important places

Predicted changes to culturally important places

Manitoba Hydro representatives conveyed the specific and general culturally important places shared by participants in the Project Indigenous Engagement Process to the Project team. This understanding helped inform the route evaluation and selection process. Transmission line routing resulted in a final preferred route that avoided Fort Ellice and surrounding area, the location of the Birtle residential school and surrounding area, Ste. Madeleine and a 5 km buffer surrounding the site and many of the specific sites identified through mapping in workshops and draft and final self-directed studies. The final preferred route does not traverse the point location of the ‘historically significant Metis site’ or the ‘cultural site’ identified in Figure 9 of the MMF MLOUS. Heritage evaluations have been conducted at crossing sites along the Assiniboine River.

Access to culturally important places that interact with the Project will be consistent with current conditions except during a short period of time during construction and during certain maintenance events.

Mitigation for cultural places

Transmission line routing resulted in a final preferred route that avoided many of the culturally important places described above. The Assiniboine River will be traversed by the Project; however, several mitigation measures have occurred or are planned to reduce effects. An archaeological assessment to determine presence of heritage or cultural resources within the proposed transmission corridor was carried out prior to completing this assessment. The report provided recommendations that will be carried out prior to and during construction of the Project. In addition, areas along the Assiniboine River will be protected through a riparian buffer area where ground disturbance will be reduced in a management zone (an area that varies between 30 and 85 m in size depending on slopes), which includes a 7 m machine free zone (which only allows reaching into zone with equipment but not entering the zone except at trail crossing). These equipment restrictions reduce ground disturbance, which reduces the likelihood of disturbance to the cultural sites described along the river. Construction

crews will be made aware of the potential for sites, and to be aware of the potential to see ‘mounds’ along waterways.

Further mitigation measures to reduce or limit effects on cultural sites are as follows:

- Review and seek input on a draft Cultural and Heritage Resource Protection Plan (CHRPP) that describes processes and protocols to protect discovered cultural and heritage resources during construction with interested communities and organizations.
- Consider the specific sites described above that intersect the final preferred route as Environmentally Sensitive Sites. Create special protective measures for these sites as part of Environmental Protection Planning stage of the Project.
- Establish a Heritage and Culture Review (HCR) team to include the Project archeologist and a community representative.
- Community or organization representative will be invited to participate in pre-construction survey of the final preferred route with Manitoba Hydro representatives.
- Construction activities will be carried out within established buffer zones for environmentally sensitive sites following specific mitigation measures as outlined in CEnvPP.
- Orientation for Project staff working in construction areas will include cultural awareness training, including the importance of the sites described above and protective measures in place to protect sites
- All archaeological finds discovered during site preparation and construction will be handled in accordance with the CHRPP. Environmental protection measures for cultural places will be reviewed with the contractor prior to the commencement of any construction activities.

Harvesting activities

Overview

As indicated, the ability to conduct harvesting activities is often dependant on the availability of plants and wildlife in an area, and effects relate to the ability to access these resources, and the experience gained during this activity. Therefore, effects to harvesting are organized to address effects to those plant and animal resources, the ability to access those resources, and the harvesting activity experience.

Predicted changes to plant or wildlife availability

To understand the above potential changes, the outcomes of the following valued components are considered:

- Aquatic habitat;
- Grassland habitat;
- Forest habitat; and
- Wetland habitat.

The outcome of the above valued components was reviewed in consideration of how these may contribute to changes that may affect harvesters.

Project activities have the potential to interact with aquatic habitat at five stream crossing locations (e.g. riparian vegetation removal) where the Project may have indirect effects on fish and Aboriginal fisheries. With the implementation of mitigation measures, land-based, Project-related construction activities are not expected to increase sedimentation within the watercourses. Construction will occur outside the restricted activity periods (RAP), which will reduce disturbance to fish habitat, and avoid disruption of sensitive fish species or habitat for spawning and rearing. There will be minimal change in fish habitat availability because similar habitat is available beyond the LAA.

A loss of forest habitat will occur along the ROW, and loss of grassland habitat is anticipated at tower foundations. Project-related sensory disturbance such as construction noise, the presence of workers, vibrations, and exhaust and other odours may result in the temporary displacement of birds and mammals if they avoid otherwise suitable habitat during construction and due to inspection patrols and vegetation management during operation. Wildlife mortality could increase due to collisions with construction vehicles, and for birds due to nest predation and nest parasitism. The physical presence of the transmission line may have a minor effect on movements of individuals near and across the right-of-way during operation. Increased access to the area by predators and by resource users could result in increased mortality of prey and harvested species. Mortality of grassland birds and small mammals could increase because transmission towers could create perching areas from which birds of prey can hunt. Additional access may result in weed contamination from road activity, potentially negatively affecting vegetation and wildlife.

Mitigation for plant or wildlife availability

Transmission line routing resulted in a final preferred route that avoided many of the harvesting areas described above. Concerns raised during IEP about sensitive plant harvesting areas will be considered in the development of Environmentally Sensitive Sites (ESS).

In addition to the mitigation measures described in 7.4.2 to 7.4.5, and 7.5.5 further mitigation measures to reduce or limit effects to harvesting activities are as follows:

- Contractors will be restricted to established roads and trails, and cleared construction areas in accordance with the Access Management Plan.
- In situations where the ROW does not have completely frozen or have dry ground conditions alternative products such as construction mats will be used.
- Contractor-specific Erosion Protection and Sediment Control Plans will be prepared by the contractor, accepted by Manitoba Hydro prior to construction and updated annually.
- For clearly identified plant harvesting areas, Manitoba Hydro may use a variety of measures, including flagging of area, selective clearing methods, construction matting, non-chemical vegetation management - specific measures are assigned on a site by site basis.
- Manitoba Hydro will consider non-chemical vegetation management in clearly identified sensitive sites that contain plants that are of importance to Indigenous harvesters.
- Clearing within environmentally sensitive areas will be conducted in a manner that limits disturbance to existing organic soil layer.
- Areas identified for selective clearing (*e.g.*, buffer zones, sensitive sites) will be flagged prior to clearing.
- Disturbed areas along transmission line rights-of-way will be rehabilitated in accordance with site Rehabilitation and Weed Management Plan.
- Locations of equipment cleaning sites (when not contained within station boundaries) will be recorded and monitored during the following growing season as part of weed control in accordance with Rehabilitation and Weed Management Plan.
- Herbicides will not be used to clear trees during construction.
- Pre-construction surveys will be conducted for elements such as stick nests and mineral licks to identify areas for setbacks and buffers.
- Bypass trails, sensitive sites and buffer areas will be clearly marked prior to clearing. The contractor will be responsible for developing, implementing and maintaining Erosion Protection and Sediment Control Plans and procedures to be put in place prior to commencement of construction activities.

- Through ongoing engagement processes, interested Indigenous communities and organizations will be notified about when/where construction is occurring.

Predicted changes to access of harvesting areas

Specific gathering or harvesting locations identified by participants in the IEP that have potential to overlap with the Project include the Assiniboine River area, the Spy Hill-Ellice Community Pasture and specific areas within the pasture, the travel route described by Canupawakpa participants, and an area described by Waywayseecappo participants (described as SC-01 on their map). Manitoba Hydro will work with participants to define appropriate ESSs within these areas.

As indicated, it is anticipated that Manitoba Hydro will acquire easements to secure much of the private land base to construct and operate the transmission line. These agreements give Manitoba Hydro permission to access lands to build and operate a transmission line. The primary concern of all parties using lands where a transmission line is being built and operated is to provide for the safety of all other users of the area. Manitoba Hydro alerts people of whom it has knowledge when its employees and contractors will be in the area and asks the same of others using the area so as to address safety risks. Due to this safety concern, there will be a short period of time within active construction zones where access will be restricted for safety purposes. There will also be short times during maintenance events where access will be restricted. These events may temporarily reduce access to harvesting activities and cultural sites.

Manitoba Hydro understands that there is a perception that permissions may change as a result of the Project, and that these perceptions will result in a decrease in harvesting success. In the MMF MLOUS authors indicate that "*Changes in Access has the potential for negative effects on MMF citizens exercising their Metis rights*" (pg. 61). Land acquired through the easement process does not endow Manitoba Hydro with any priority right over Indigenous citizens; however, the MMF have indicated in their MLOUS that there is a perception that their rights are somehow diminished as a result of the granting of an easement and that this diminishment may affect a harvester in her practices. A calculation provided in the MMF's MLOUS describes how the MMF understand that harvesting success may change where the preferred land remaining in the LAA and RAA may change between 13 and 19%, depending on the harvesting activity. This area of reduced use has been contemplated in this assessment.

By creating a ROW and potentially new access points the project may alter the availability of resources or access to land used for traditional activities. With greater access to harvesting areas that were previously more difficult to access or accessed by fewer people, plant and animal populations harvested may be diminished. Harvesting

success may be diminished as a result of this increased competition for limited resources.

Mitigation for changes to access of harvesting areas

- An Access Management Plan (AMP) will be developed as part of the EPP to safeguard and support the preservation of environmental, socioeconomic, cultural and heritage values within the Projects' area of direct effect related to the creation of new access.
- Manitoba Hydro is limiting new access within the Spy Hill–Ellice community pasture along the right-of-way.
- Manitoba Hydro will develop material to better clarify harvesters ability to access rights-of-way and to clarify the limited nature of maintenance activities
- Manitoba Hydro will provide notification to harvesters through interested Indigenous communities and organizations to minimize disruption to harvesting activities notifying of Project construction and maintenance events.

Understandings from Communities and Organizations harvesting experience

Manitoba Hydro understands that the harvesting experience is unique to each harvester. Some communities have shared harvesting experience as part of this Project's IEP.

The MMF study describes harvesters' experiences. On page 80 of the MMF MLOUS the author states "*The construction and operation of this Project could potentially affect MMF harvester experience through changes in locations available to those harvesters and changes to the species available for harvest...Specifically, the harvesting experience could be affected by displacement of species of importance, reduction in solitude while harvesting in the area, and reduction in level of success; which would all contribute to changes to MMF harvesters preferred means of harvest*."

During engagement activities with Canupawakpa Dakota Nation, participants described that regulatory permissions around moose harvesting were unclear, and that this uncertainty currently reduced the harvester experience.

The harvesting experience is also dependant on having the knowledge of where, when and how to harvest. Should harvesters be disrupted or displaced from harvesting areas for a period of time, these harvesters may go elsewhere in the future. The MLOUS describes how this displacement may result in reduced transmission of knowledge to future generations, potentially affecting future harvesters. In the MLOUS authors indicated a diminished preference for areas with existing access restrictions, such as the community pasture. The MMF MLOUS describes this displacement when they state

"*Contributor patterns of use are adaptable to Project construction and can result in a continuous displacement of harvesting activities from the PDA.*" (pg. 85).

Although Elders who participated in the Waywayseecappo First Nation Traditional Knowledge Study did not specifically use the term 'harvesting experience' in their interviews, the report noted several changes to the land they have witnessed over time and describe the environmental and cultural impacts of those changes. They spoke of the transition from horses, buggies and trails to highways and automobiles and how electrical transmission lines '*have brought new services to local homes, but also cleared rights of way through wildlife habitat and introduced more chemicals to manage vegetation.*' This trade off, or change is expressed in different ways by participants in the IEP, with a range of experiences shared. Birdtail Sioux Dakota Nation discussed the need for a strong economic future, and that access to energy was part of that future.

Project assessment conclusion

Based on the above understandings drawn from Indigenous communities and organizations contributions through the IEP, effects to traditional land and resource use include a low potential for changes to culturally important places due to routing considerations and mitigation measures in place that reduce the likelihood of disturbance to any unknown sites. Access to culturally important places will remain consistent with current conditions except during a short period of time during construction and certain maintenance events on portions of the Project Footprint.

Effect to the ability to conduct harvesting activities was contemplated by considering changes to plant or wildlife availability and changes to access of harvesting areas. The distribution, abundance and health of resources relied upon to practice traditional activities will not change substantially from baseline conditions as use of the right-of-way will remain intact. Changes to the harvesting experience, which includes aspects such as the success of harvesting activities; and the perception of the ability to conduct harvesting activities or the perception of access limitations to harvesting areas or culturally important places are personal and change broadly between people.

Both Gambler First Nation and the MMF have provided information that indicates that their members' ability and perception to conduct harvesting activities has potential to change with the Project. As described in section 7.5.2.2, of the 46 km transmission line, 6.5 km crosses 10 parcels of crown land. All but one parcel is located in the community pasture. None of the Project components or activities will traverse unoccupied Crown land, a concern of particular importance to communities and organizations engaged in the assessment. Due to these current limitations on access to the Project Footprint, the small size of the Project relative to remaining areas available to harvest and the short duration of time access permissions will change, changes to harvesting activities are

anticipated to be moderate. Following construction access to traditional use sites will remain the same as conditions are today when accessing crown or private lands, except during brief periods of time during certain maintenance events.

Based on the mitigation measures listed to address potential changes to culturally important places and the ability to conduct harvesting activities, Project effects are reduced.

Given the application of the above-described mitigation measures the effects of the Project on traditional land and resource use are characterized as:

- Direction: Adverse
- Magnitude: Moderate
- Geographic extent: Local Assessment Area
- Duration: Long Term
- Frequency: Regular
- Reversibility: Permanent
- Resiliency: low to high

The residual effects to Traditional land and resource use are assessed as being adverse, moderate in magnitude, and in size as remaining areas to conduct harvesting activities is limited in the area. Effects may extend beyond the Project Footprint to the Local Assessment Area. Understandings shared from IEP participants regarding harvesting activities in the area were wide-ranging and varied, and as such the resiliency of traditional land and resource use differs among harvesters greatly. Routing of the project in lands where permissions for access will remain consistent with current conditions and away from many culturally-important places, as well as the ability to conduct harvesting activities in the Project area post construction results in residual effects assessed as being not significant.

7.5.9.5 Sensitivity to cumulative effects

Section 5.2 includes a summary of historic, current and reasonably foreseeable projects that may overlap with the Project. Past agriculture, residential and commercial resource development have contributed to the cumulative loss of resources traditionally harvested in the RAA, and has led to changes in the distribution and abundance of many plant and wildlife species and had disturbed culturally important places. This is particularly evident with the experiences shared in the MMF MLOUS and by Gambler First Nation about Ste. Madeleine. The MMF MLOUS describes the events that

occurred in the Ste. Madeleine area, as well as the effects those events had on the people living in the area then and now.

Ste. Madeleine was originally settled by a group of Metis homesteaders, some of whom were displaced from the Red River Settlement (see MLOUS). Ste. Madeleine became a place where the Metis could live safely and work on lands that were their own. This place was highly cherished by the Metis people. "*This area was historically, and is today, an important area to the Metis due to family connection, history and ongoing cultural transmission of harvesting skills to future generations of the Manitoba*." The MMF describe the loss experienced at Ste. Madeleine when they explain how the development of the Spy Hill community pasture by the federal government caused the forcible removal of people from Ste. Madeleine.

The events that occurred at Ste. Madeleine contribute to the cumulative effects to traditional land and resource use as the harvesting experience has been diminished by this event. Manitoba Hydro understands there may have been a loss of access to the site, and with this loss Metis harvesters adapted to new conditions and may have changed harvesting practices. The MLOUS shares that the connection to Ste. Madeleine is broader than the existing cemetery and extends throughout the Spy Hill-Ellice Community Pasture, as it is traditional harvesting territory for the Metis.

Additionally, the populations of many species of wildlife inhabiting the RAA are considered stable despite cumulative effects on habitat availability. The cumulative effect to plants and animals is adverse as some habitat in the RAA will be altered as a result of reasonably foreseeable future projects; including ongoing wetland drainage to support agricultural development, loss of forest and grassland habitat and uncertainly in the potential for the future expansion or increase in mining development for oil, gas, and potash in the RAA.

Residual cumulative effects will be continuous and permanent yet reversible upon the removal of infrastructure and rehabilitation of affected areas. The ecological context for the RAA is disturbed, as the majority of lands have been substantially previously disturbed by human development and human development is still present.

7.5.9.6 Sensitivity to climate change

According to the climate change information and scenarios presented in the section 5.2.3 and 7.5, temperature and precipitation are expected to increase in the future. These sections also note that it is difficult to develop any precision on changes at local scale, where factors such as land cover, topography, watercourses and other barriers may have a greater influence on the local environment in addition to complexities associates with local food webs.

A shorter winter and longer growing season could result in an expansion in distribution of vegetation species less tolerant of cooler conditions, and alter wetland habitat. An earlier spring and later fall may alter seasonal movements and the timing of activities such as break-up, freeze-up, waterfowl migration. As traditional land and resource use is dependent on the availability of species in the area, these changes could affect use.

Effects of climate change on traditional land and resource use are expected to be a function of this anticipated increase in temperature and associated extreme weather events (e.g., flooding, wildfires). Resulting effects to TLRU in the RAA may include:

- Changes to plant or wildlife availability as a result of changes in habitat composition resulting from extreme weather events such as wildfires or flooding, reduced food availability or shifts in species ranges;
- Changes to the harvesting experience, which considers factors like:
    - the success of harvesting activities; and
    - the perception of the ability to conduct harvesting activities or access to harvesting areas or culturally important places

Given the timelines associated with the predicted precipitation and temperature changes, natural habitats will likely be able to overcome these challenges through shifts in and the narrowing of the timing imbalance between wildlife breeding seasons (e.g., timing of egg laying, insect emergence, nesting) that is already being observed (Both et al. 2006).

The predicted climate change scenarios are not expected to change the significance determinations for traditional land and resource use as they are not anticipated to measurably increase the magnitude of effects of the Project. However this information does reinforce the importance of implementing a monitoring program, and maintaining open and ongoing communication with those that use the RAA.

7.5.9.7 Ongoing communication and coordination

Manitoba Hydro intends to continue to engage with communities and organizations through both the IEP and coordination efforts for the Heritage and Culture Review team. Key information will be shared, including notification of construction start dates. Manitoba Hydro will continue to be open to share information with interested communities and organizations and respond to questions throughout the construction and operation phase of the Project.

7.5.10 Heritage resources

7.5.10.1 Summary of current status

The results of the heritage inventory review showed six registered archaeological sites within 500 metres of the final preferred route. The HRB identified two additional sites immediately prior to the 2017 field program, EcMh-23 at a distance of 600 metres from the final preferred route and EcMh-63, a recently recorded sited which would not have been captured in earlier datasets nor in the predictive model. These sites were included in the assessment. All of these eight sites are of disturbed context found in open agricultural fields (Table 7-18).

Six of the eight sites date to the Precontact period. One of these, EcMh-24, is a rich but disturbed site that contained artifacts from all three main cultural periods including spearpoints from the rarely represented Paleo period, projectile points from the Middle Precontact period and evidence of clay ceramics from the Woodland period. The Middle Precontact period is well-represented in the area with four of the eight sites having material culture related to this period, EcMh-19, EcMh-26, EcMh-28 and EcMh-63. One site is only able to be dated to the general Precontact period due to the presence of lithic flakes. The two remaining sites have an undetermined cultural affiliation and it is not known what types of artifacts were recovered or who originally found and recorded the sites due to the lack of information from the original site forms.

Table 7-18: Listing of Registered Archaeological Sites within 600 metres of the PPR

Borden Number	Name	Site Type	Period	Distance to FPR
EcMg-2	N/A	H.Uninterpreted	Undetermined precontact	101 m
EcMh-19	N/A	H.Uninterpreted	Middle precontact	481 m
EcMh-23	N/A	H.Uninterpreted	Undetermined	582 m
EcMh-24	Huberdeau Cache Site	A.Campsite	Paleo; Oxbow; Avonlea; Pelican Lake; Woodland	197 m
EcMh-26	N/A	A.Campsite	Pelican lake (3300 to 1850 BP)	456 m
EcMh-27	N/A	H.Uninterpreted	Undetermined	314 m
EcMh-28	N/A	A.Campsite	Oxbow; pelican lake; avonlea	397 m
EcMh-63	N/A	H.Uninterpreted	Middle precontact (specifically 3000 BC to 1 AD)	399 m

A single Provincial Plaque is recorded within 500 metres of the PPR. Plaque #890 is related to the Oxford School and located within section SE 19-16-27W. The plaque

situated 103 m north of the final preferred route. This is a monument to the site of the former Oxford School, which operated from 1882 to 1901. The school was then relocated half a mile to the north to section NE19-16-27W where it remained open until 1960. At that time, the school building was relocated and renovated into a private residence (MHS 2017).

A second phase of the pre-investigation was to review the results of the predictive model (see Map 5-8) as well as examine orthoimagery to identify physical land features that may be conducive to the presence of heritage resources. Both methods were focused around the final preferred route. The results of the predictive model indicated that areas in proximity to known archaeological sites as well as those near waterways have the highest potential; this was specifically noted around the Snake Creek and Wattsview Plains area.

The results of the review identified 32 quarter-sections along the FPR for heritage investigation and in July 2017, these were provided to the HRB for review and comment. Upon review, the HRB requested an additional 13 quarter-sections to be included in the 2017 field program. This brought the total number of quarter sections to 45 parcels of land, which correlates to a coverage of 36 km length along the 45 km long FPR. Prior to accessing the lands, Manitoba Hydro implemented the landowner contact process and provided those parcels where permissions had been granted.

The archaeological assessment to determine presence of heritage or cultural resources within the proposed transmission corridor was carried out over two separate field trips. The first trip occurred between August 21 to 24 and the second was from October 10 to 13. Dividing the assessment into summer and fall programs allowed for the opportunity for local Indigenous participation and also to account for the harvesting of crops, which covered extensive tracts of land within the RAA.

During the August field visit, testing along a slight slope below the upper terrace of a branch Snake Creek resulted in finding square machine-cut nails, chinking and a possible retouched quartzite flake in his test. Testing was expanded around the positive test and many also returned positive results including artefacts such as historic white earthenware ceramics, calcined animal bone and two horse harness buckles. The artefacts indicate that there may have been a historic farm building or barn in this location due to the presence of architectural materials (chinking and nails) and farm hardware. The nails predate 1900 due to their manufacture. Archival research at the Manitoba Archives has found the property was first purchased in 1885 by John H Bartley, however township plans do not provide evidence of a building in that location.

During the October field program, testing occurred along the upper terrace edge of the east side of the Assiniboine River Valley. A thin strip of grass divided the ploughed field

and the forested downslope, and testing in this area, resulted in the discovery of historic materials in all three shovel tests excavated. Bottle glass, animal bone, ferrous metal and lead were recovered at depths between 10 and 15 cm below surface. One piece of glass was amethyst coloured indicating a manufacture date of pre-1914. Archival research will be undertaken on this parcel of land to determine historic ownership and if buildings were noted in the general location of the finds.

7.5.10.2 Relevant Project interactions

Heritage sites

As outlined in Table 7-1, there is the potential for the Project to interact with unknown heritage resources during transmission line construction activities that involve disturbing the ground surface; primarily during construction activities such as mobilizing equipment, developing and using access routes, grading marshalling yards, accessing quarried materials in borrow sources, establishing tower foundations, conducting geotechnical testing, installing towers and even rutting soil through operating vehicles during wet conditions. Furthermore, removal of vegetation may create unstable soil conditions that could result in displacement of exposed heritage objects.

The operation and maintenance phase also has the potential to disturb previously unknown sites; additional vegetation clearing in areas previously not disturbed by construction that may be required for maintenance of tower sites have a potential to expose unknown heritage resources. Activities related to station modifications will not interact with heritage resources.

7.5.10.3 Project assessment

Predicted changes to heritage resources

The result of the background review determined that there were no previously existing heritage sites within 100 metres of the proposed transmission right-of-way. The HRIA programs recorded two new archaeological sites within the PFA. These sites are small and are not of high heritage value. There is a potential for the Project to interact with these sites; however, they can be avoided by tower siting away from the area.

Mitigation measures

In general, routing to avoid known sites or areas of high potential for sites, and implementation of effective mitigation measures including general environmental protection measures (chapter 10), beneficial management practices, standard operating procedures, environmental protection plans and environmental restoration plans are

expected to manage residual effects to acceptable standards. It is standard practice for Manitoba Hydro to implement a Cultural and Heritage Resources Protection Plan as mitigation. Mitigation measures will include the following:

- All archaeological finds discovered during site preparation and construction will be left in their original position until the Project Archaeologist is contacted and provides instruction.
- Construction activities will be carried out within established buffer zones for heritage resources as approved by Project Archaeologist and HRB.
- Environmental protection measures for heritage resources will be reviewed with the Contractor and employees prior to commencement of any construction activities.
- Orientation for Project staff working in construction areas will include heritage resource awareness and training including the nature of heritage resources and the management of any resources encountered.
- Orientation information will include typical heritage resource materials and reporting procedures.
- The Contractor will report heritage resource materials immediately to the Construction Supervisor and will cease construction activities in the immediate vicinity until the Project Archaeologist is contacted and prescribes instruction.
- The Culture and Heritage Resource Protection Plan will be adhered to during preconstruction, construction and operations activities.
- Hand clearing or other low ground disturbance method in areas within 40 m of the two newly discovered archaeological sites within the PDA

Project assessment significance conclusion

Given the application of the above-described mitigation measures, the effects of the Project in terms of heritage sites are summarized as follows:

- Direction: Adverse
- Magnitude: Small (for previously recorded sites); Moderate (for undiscovered sites)
- Geographic extent: Project Footprint
- Duration: Permanent
- Frequency: Infrequent

- Reversibility: Long Term (Permanent as heritage resources are non-renewable and cannot be returned to baseline conditions)
- Resiliency: Low

The main residual effect of the Project is the potential discovery of unknown heritage resources particularly during the construction phase of the Project. However, with mitigation, residual environmental effects are considered to be not significant.

7.5.10.4 Sensitivity to cumulative effects

Lands cleared of standing vegetation for conversion to agriculture, cropping and land drainage, and resource extraction activities such as potash have acted cumulatively in the past to affect heritage resource sites either by partially disturbing or completely removing the site. Agricultural conversion has had the largest footprint and was primarily done before heritage legislation was enacted to manage and protect archaeological resources.

A key success factor in terms of mitigation of potential cumulative effects is monitoring, internal coordination, and reporting the regulatory agencies such as Manitoba Sustainable Development and the HRB. Active monitoring of Project potential effects on heritage resources will occur during construction, and any effects will be addressed through implementation of the mitigation measures described in section 12.5.2.2 and documented in the Project-specific CEnvPP and the CHRPP. In addition, other proponents in the Project area are also responsible for reporting Project activities to Manitoba Sustainable Development and HRB, and these regulators can inform Manitoba Hydro if it appears that there are unanticipated adverse cumulative effects occurring. The HRB also reviews land-based developments through the heritage resources impact assessment program as mandated by The Heritage Resources Act. Therefore, additional mitigation for cumulative effects is addressed by the provincial regulators, as they determine whether future projects will require heritage resource investigations.

The future projects proposed within the Project Footprint and LAA are primarily located on lands that have already been altered by agricultural activities.

As indicated previously, for all of its projects, Manitoba Hydro actively manages effects during construction to further avoid sites or salvage and restore sites, if required. Given this, the direction of the cumulative environmental effect with the Project is neutral, the magnitude is negligible, and the geographic extent is the LAA. The duration is short term, the frequency would be a single event; however, any changes in heritage resources are irreversible. The ecological context is a mix of undisturbed and disturbed

lands. With the requirement to report and coordinate with regulators responsible for all projects in the area, the direction of the cumulative environmental effect for the contribution from the Project to the overall cumulative environmental effect is predicted to remain neutral. The magnitude will remain negligible, and the geographic extent is the LAA.

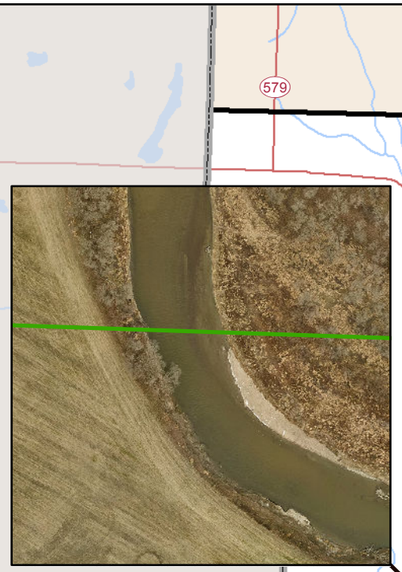
The assessment recognizes that there is a potential for unrecorded heritage resources to be inadvertently exposed during either construction or operation and maintenance. The CEnvPP and CHRPP will provide a detailed plan of follow-up and monitoring of known and discovered heritage resources during the construction phase.

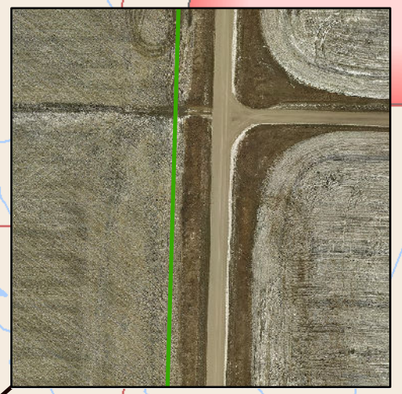
7.5.10.5 Sensitivity to climate change

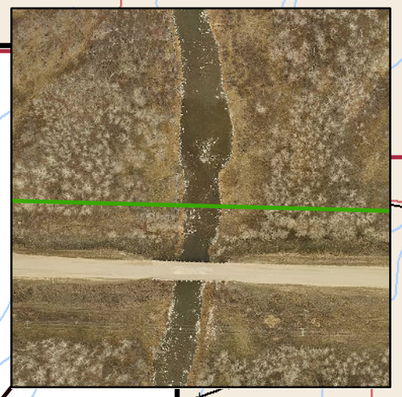
According to the climate change information and scenarios presented in the section 5.2.3, temperature and precipitation are expected to increase in the future.

While there is uncertainty in predictions several decades into the future, increased precipitation and temperature may serve to expose heritage resources, through changes in erosion patterns. This may provide opportunities to identify and salvage new sites, but may increase the risks of losing sites adjacent to large waterbodies. Project-specific monitoring will identify and manage any resources that are uncovered.

In general, future climate change is not anticipated to alter the prediction that the changes in heritage resource sites will not be significant as a result of the Project. Development of the Project will not create pathways to change previously recorded heritage resource sites. Mitigation and environmental protection measures will lessen the potential for disturbance to previously unrecorded heritage resources. If future climate change affects the Project Footprint or LAA of the Project after its life cycle, any heritage resource sites will have been adequately mitigated.







Manitoba Hydro

Birtle Transmission Project

Project Infrastructure

- Birtle South Station
- Final Preferred Route

Infrastructure

- Transmission Line

Stream Crossings

- Milani A or C Type Stream Crossing
- Milani E Type Stream Crossing

Planning Area

- Route Planning Area

Landbase

- Community
- Yellowhead Highway
- Road
- Railway Line
- First Nation
- Wildlife Management Area
- Province of Manitoba Boundary

Coordinate System: UTM Zone 14N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date: December 13, 2017
Available in accessible formats upon request.

N

0 4 8 Kilometres
0 2 4 Miles

1:150,000

Stream Crossings

Map 7-1

Waywayseecappo First Nation
Binscarth
Gambler First Nation
Silver Creek
Armstrong Creek
Assiniboine River
Qu'Appelle River
St-Lazare
Beaver Creek
Snake Creek
Birdtail Creek
Birtle
Birtle South Station
SASKATCHEWAN
MANITOBA
22
579
478
475
16
83
600
41
545
42
568
308

Available in accessible formats upon request