Manitoba-Minnesota Transmission Project Environmental Monitoring Plan

Draft

Manitoba Hydro

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ACRONYMS

AC	Alternating Current
ATK	Aboriginal Traditional Knowledge
ATKS	Aboriginal Traditional Knowledge Studies
EMP	Environmental Monitoring Plan
CEC	Clean Environment Commission
CEAA	Canadian Environmental Assessment Agency
CEAA 2012	Canadian Environmental Assessment Act 2012
CEnvPP	Construction Environmental Protection Plan
CHRPP	Cultural and Heritage Resources Protection Plan
DFO	Department of Fisheries and Oceans
EA	Environmental Assessment
EIS	Environmental Impact Statement
EnvPP	Environmental Protection Plan
EPIMS	Environmental Protection Information Management System
EPP	Environmental Protection Program
ESS	Environmentally Sensitive Site
FNMEP	First Nation and Metis Engagement Process
FRI	Forest Resource Inventory
GPS	Global Positioning Unit
km	Kilometre
kV	Kilovolt
LAA	Local Assessment Area

MBCA	Migratory Birds Convention Act
MBCDC	Manitoba Conservation Data Centre
SD	Manitoba Sustainable Development
MESEA	Manitoba Endangered Species and Ecosystems Act
MMF	Manitoba Metis federation
MMTP	Manitoba-Minnesota Transmission Project
NEB	National Energy Board
PDA	Project Development Area
PEP	Public Engagement Process
RoW	Right-of-way
SARA	Species at Risk Act
SOCC	Species of Conservation Concern
TSS	Total Suspended Solids
VC	Valued Component
VES	Visual Encounter Surveys

1.0 INTRODUCTION

1.1 PROJECT OVERVIEW

Manitoba Hydro is proposing to construct and operate a 500 kilovolt (kV) alternating current (AC) international transmission line in southeastern Manitoba that includes additions and upgrades to three associated transmission stations at Dorsey, Riel and Glenboro South. (Map 1-1) The proposed project is called the Manitoba-Minnesota Transmission Project (the Project) and consists of approximately 213 km of single circuit, 500 kV AC transmission line (D604I) that will start at the existing Dorsey Converter Station northwest of Winnipeg, in the RM of Rosser, and will connect at the Manitoba-Minnesota border to a new transmission line proposed by Minnesota Power, called the Great Northern Transmission Line. The proposed project is required for the following reasons:

- Export power to the United States based on current sales agreements
- Improve reliability and import capacity in emergency and drought situation; and
- Increase access to markets in the Unites States

Clearing and construction of the Project is expected to take approximately 2 ¾ years to complete with activities starting in the Q3 of 2017 and ending in Q1 2020. Subject to regulatory approvals, the in-service date of the project is 2020.

1.1.1 Regulatory Requirement

The Project is subject to environmental regulatory review and approval. The project is defined as a Class 3 Development (under the Classes of Development Regulation) that will be reviewed by Manitoba Sustainable Development (SD) and require an Environment Act License under *The Environment Act* (Manitoba).

Authorization for the construction and operation of the transmission line is also required under the *National Energy Board Act* and the project is subject to an environmental assessment by the National Energy Board (NEB) under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012).

This Environmental Monitoring Plan (EMP) has also been included in the Manitoba-Minnesota Transmission Project Environmental Impact Statement (EIS) submission to be reviewed and approved by regulatory authorities.

Map 1-1 Project Components Map

1.2 ENVIRONMENTAL PROTECTION PROGRAM

Part of Manitoba Hydro's commitment to environmental protection includes the development of a comprehensive Environmental Protection Program (EPP), this is further described in chapter 22 of the EIS. The purpose of the EPP is to provide the framework for implementing, managing, monitoring and evaluating environmental protection measures that are consistent with regulatory requirements and environmental guidelines. This EMP is a component of the EPP as illustrated in Figure 1-1.

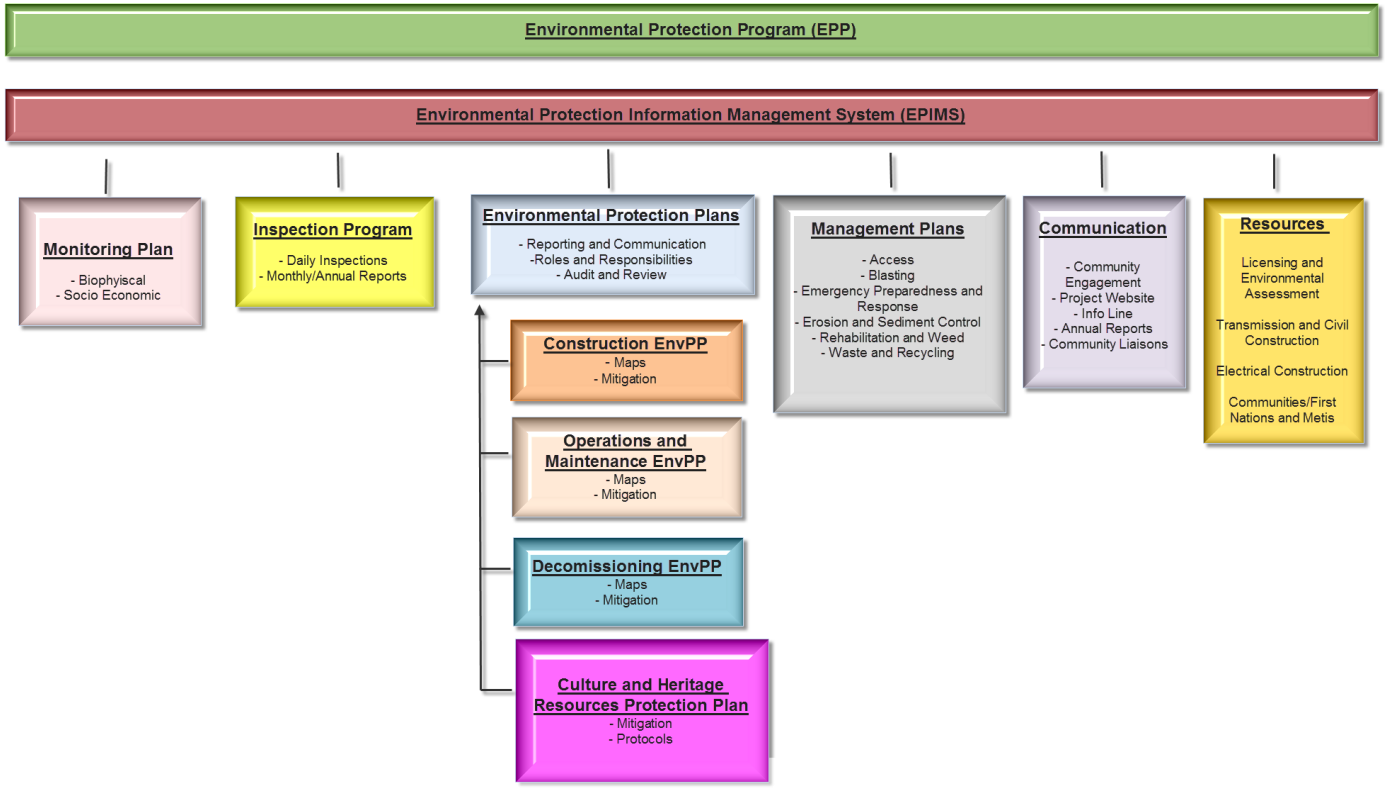

Figure 1-1 Transmission Environmental Protection Program

2.0 ENVIRONMENTAL MONITORING PLAN

This document describes the Environmental Monitoring Plan, which outlines the various monitoring activities that will occur to address follow-up requirements identified for the valued components included in the environmental assessment. Monitoring activities will be considered during all phases of Project development (i.e. pre-construction, construction and post construction). Follow-up requirements include actions implemented to assess the effectiveness of the environmental assessment and to confirm compliance with regulatory requirements.

This EMP is intended to describe how and provide assurance to regulators, environmental organizations, First Nations and Metis and the general public that potential environmental effects caused by the Project will be monitored, evaluated and reported on in a responsible and accountable manner.

An Environmental Protection Information Management System (EPIMS) was developed that will manage, store and facilitate the transfer of Environmental Protection Program data and information amongst the Project team. EPIMS will facilitate the transferring of knowledge and experiences encountered on a daily basis during construction activities from Environmental Inspectors to the Specialists that are responsible for monitoring project effects. EPIMS is an essential tool that manages vast amounts of data and information that will be generated through the implementation of this plan, allowing for Manitoba Hydro to adapt from its experiences on this project and apply that knowledge to future developments.

2.1 PURPOSE

The purpose of this EMP is to outline the potential effects identified in the EIS and the key activities that will be conducted as part of the monitoring and follow-up component of the EPP. The intended goal of this plan is to provide details on monitoring activities and how monitoring results will be used to trigger actions that lead to adaptive management decisions to further minimize the effects of the Project on the environment.

2.2 OBJECTIVES

The objectives of this monitoring plan are to:

- Confirm the nature and magnitude of predicted environmental effects as stated in the EIS;
- Assess effectiveness of mitigation measures implemented;
- Identify unexpected environmental effects of the project, if they occur;

- Identify additional mitigation measures to address unanticipated environmental effects, if required;
- Confirm compliance with regulatory requirements including approval terms and conditions; and
- Provide baseline information to evaluate long-term changes or trends.

2.3 SCOPE OF WORK

The scope of this EMP will include the biological and socio economic components of the environment. A Cultural and Heritage Resources Protection Plan (CHRPP) will also be compiled which outlines Manitoba Hydro's commitment to safeguard cultural and heritage resources and provide information on how to appropriately handle human remains or cultural and heritage resources discovered or disturbed during construction of the Project.

2.4 MANAGEMENT AND COORDINATION

As part of the EPP, Manitoba Hydro will have staff comprised of senior Manitoba Hydro management, as well as implementation teams committed to the implementation of the EMP for the Project. The Environmental Project Management Team will be responsible for the management of the environmental protection plans including compliance with regulatory and other requirements, quality assurance and control, consultation with regulators and activities related to the Public Engagement Process (PEP) and First Nation and Metis Engagement Process (FNMEP). The Environmental Protection and Implementation Team, which is comprised of Manitoba Hydro operational and office staff, will be responsible for the day to day implementation of environmental protection plans developed for the project which include monitoring, inspecting and reporting.

Manitoba Hydro will ensure that resources are allocated to the environmental aspects of project planning, development, implementation and operation for the successful implementation of environmental protection measures and follow-up including monitoring and other requirements. Manitoba Hydro will commit resources early in the planning cycle to ensure effective environmental assessment, mitigation and monitoring including an Environmental Monitor from the Licensing and Environmental Assessment Department that will lead the field monitoring program during the construction of the Project and provide field level support to the ongoing FNMEP.

2.5 PUBLIC COMMUNICATIONS AND ENGAGEMENT

In addition to extensive public engagement efforts that have occurred to date throughout the development of the Project, Manitoba Hydro welcomes all members of the public to contact the

corporation with questions or comments throughout the construction process. Manitoba Hydro's Manitoba-Minnesota Transmission Project website site (https://www.hydro.mb.ca/projects/mb_mn_transmission) will be maintained and updated regularly throughout the project with the summary of results of this EMP. As noted on the Project website, additional information is always available to the public upon request via a toll-free phone number, dedicated project e-mail address or by mail.

2.6 ABORIGINAL ENGAGEMENT & TRADITIONAL KNOWLEDGE

2.6.1 Traditional Knowledge

As of August 2015, the ATKS Management Team (Black River First Nation, Swan Lake First Nation, Long Plain First Nation), Peguis First Nation and Roseau River Anishinabe First Nation submitted ATK reports for the proposed Project. Dakota Plains Wahpeton First Nation began their ATK study in October 2014 in which their ATK report is pending and Sagkeeng First Nation began ATK studies in February 2015. First Nations, the Manitoba Metis Federation (MMF) and Aboriginal Organizations who chose to participate or conduct ATK studies in the later stages of the engagement process for the Project were information that their information would be used to inform the Environmental Protection Program.

More detailed information regarding Aboriginal Traditional Knowledge Studies completed can be found in Chapter 4.0 of the project EIS.

2.6.2 Ongoing First Nations and Metis Engagement Process

Manitoba Hydro has developed different approaches to its ongoing First Nation and Metis Engagement Process. These approaches for transmission project follow-up and monitoring programs began in 2008-2010 with the Wuskwatim Transmission Project, followed by the Bipole III and Keeyask Transmission Projects in 2013, both projects are planned to continue until 2018/19. Each of these projects had a different approach tailored to the geographic region, scope/scale of project and the number of communities involved. Through these past and current projects, accompanied by the desire to use active adaptive management in its community involvement programs for the construction of transmission projects, Manitoba Hydro has developed a new approach for this Project.

Manitoba Hydro's proposed approach to the ongoing FNMEP is based on experiences by other industries where the project is located within a traditional or current resource use area but not necessarily in close proximity to the community itself. The approach is also based on ATK field trips, self-directed reports received to date, and the desire within those reports for further investigation and mapping of sensitive sites, transfer of knowledge from elders to youth to

prevent loss of knowledge, updates on project progress and involvement in follow-up and monitoring.

The ongoing FNMEP would include inviting interested First Nations and MMF representatives to attend regular field trips to the construction areas with the focus being the highly valued undisturbed land or land with little disturbance (Black River First Nation, Long Plain First Nation, Swan Lake First Nation. 2015) as well as areas identified as sensitive sites (Peguis, 2015 and Roseau River, 2015). Field trips with representatives would take place throughout both the construction and monitoring and would be guided by various staff depending on topic, including Construction Supervisors, Environmental Inspectors and Specialists such as experts in botany, wildlife, and traditional medicinal plants. These field trips would be supported by a translator as required. During the construction field trips, representatives would learn and witness activities associated with various topics including:

- Mitigation measures;
- Project schedule;
- Clearing and construction practices;
- Inspection results; and
- Monitoring results.

During follow-up and monitoring field trips, representatives could participate with the Environmental Monitor in monitoring activities such as vegetation, traditional plant, stream crossing, mammal track, bird and camera trap surveys. Both construction and follow-up and monitoring trips would allocate time for representatives to share concerns and ask questions of the Project staff along with receiving a materials package and copy of photos/video taken that day to share with their First Nation or the MMF.

To enhance traditional knowledge transfer amongst generations, educate youth about Manitoba Hydro's EPP, and explain environmental career opportunities for youth, separate field trips involving youth and elders and a Manitoba Hydro representative could occur during school summer break. These Youth/Elder trips would be similar in nature to the construction and follow-up and monitoring trips described above but would focus opportunities for traditional knowledge sharing.

While specific details about the field trips are yet to be determined, Manitoba Hydro is looking forward to working with the First Nation and Metis to develop the approach for this Project, which will be guided by the following objectives;

- Awareness of the Project and EPP;
- Manitoba Hydro awareness of community concerns and communication back on how they are being addressed;
- "Boots on the ground" field experiences;

- Multiple First Nations and the MMF working together; and
- A Youth and Elder component.

Manitoba Hydro is committed to an ongoing engagement process to incorporate traditional knowledge within components of its Environmental Protection Program.

3.0 PAST, PRESENT AND FUTURE MONITORING PROGRAMS

Monitoring programs allow us to see how predicted effects from environmental assessments compare to the actual outcome from construction activities.

Good project planning in combination with effective monitoring is a major component for enhancing the effectiveness of development programs and projects. Monitoring and evaluation of projects help in the understanding and learning from past project successes and challenges which in turn helps to inform decision-making so that current and future monitoring programs for projects can be improved.

In order to ensure continual improvement of monitoring programs for future projects, information and results from past monitoring programs were reviewed to better understand the effects of transmission line construction on the biophysical and socio-economic components of the environment. This results in a reduction of project specific residual effects through project-based mitigation which demonstrates a commitment to continual improvement and sustainable development.

Past and current Manitoba Hydro projects that have implemented extensive monitoring programs include the Wuskwatim Transmission Project (2008 to 2012) and the Bipole III Transmission Project (currently one year of monitoring completed). Recently, the Environmental Monitoring Plan for the Keeyask Transmission project was approved by SD.

Appropriate methods accepted by Manitoba Hydro and SD were used to monitor environmental components, such as access, aquatics, mammals, birds, and vegetation, identified for both the Wuskwatim and Bipole III Projects and are also outlined in the Keeyask Transmission Project EMP.

Manitoba Hydro manages all its projects monitoring programs in a coordinated fashion so that knowledge gained from one program is combined with other programs for a more informed understanding of transmission line environmental effects.

4.0 MONITORING REQUIREMENTS

As defined under the *Canadian Environmental Assessment Act* (CEAA) *2012*, monitoring and follow up is required to verify the accuracy of the environmental assessment of a project and determine the effectiveness of measures taken to mitigate potential adverse environmental effects (CEAA, 2012). The National Energy Board (NEB) through their Regulatory Framework also requires "Lifecycle Compliance Monitoring" in which the NEB monitors and enforces compliance with requirements concerning the safety and protection of employees, the public and the environment as they may be affected throughout the life of the project (NEB, 2015). In addition the NEB will monitor and verify compliance with requirements during construction, operation and decommissioning through the use of audits, inspections, compliance meetings, investigations and response to concerns and complaints.

Through monitoring and follow up, EIS outcomes are realized, communicated and managed through refinement and improvement of mitigation strategies.

The EPP includes two main types of monitoring:

- Environmental monitoring – periodic or continuous surveillance or testing, according to a predetermined schedule, of one or more environmental indicators to establish/enhance knowledge of baseline conditions or to verify the accuracy of an environmental assessment and the effectiveness of mitigation measures. Pre and post disturbance and control-impact monitoring are the preferred approaches to monitoring environmental effects.
- Compliance monitoring – observation or testing conducted to verify whether a practice or procedure meets the applicable requirements prescribed by legislation, licence conditions, and/or Environmental Protection Plans.

Environmental monitoring is addressed through this EMP. Compliance monitoring is accomplished through the Inspection Program which will involve the use of dedicated Environmental Inspectors to observe and verify the implementation of the environmental protection plans. Information generated from these programs will be used within an adaptive management approach to improve both mitigation measure effectiveness and monitoring program design. A summary of compliance monitoring results will be presented in the annual report.

4.1 VALUED COMPONENT MONITORING

This section identifies the Valued Components that were selected for the environmental assessment that will be monitored including rationale for their selection. Additional information in this section includes key monitoring activities, task descriptions, duration, frequency and

timing of activities, Environmental Monitor input, Manitoba Hydro commitments and specialist and SD roles. Manitoba Hydro has developed the plan to address concerns expressed by stakeholders, local communities, First Nations and Metis, and regulators.

Where applicable, Decision Trigger(s)/Threshold(s) for Action have been identified for each valued component. These decision triggers or thresholds for action are mechanisms to promote adaptive management that cause Manitoba Hydro and its Specialists to stop and further evaluate the monitoring results and, if required, adapt mitigation measures or monitoring activities. Decisions triggers/thresholds cannot be identified for all situations, there are too many parameters and variables and lack of scientific data. It is for this reason why many government agencies, including Manitoba, have not yet published definitive thresholds for action for different wildlife management scenarios. Manitoba Hydro will continue to fund applicable research and contribute monitoring information from projects to the regulators.

4.1.1 Valued Component Selection

An initial step of the environmental assessment for the proposed project was the identification of Valued Components (VCs) that may be adversely affected by the Project this is fully discussed in Chapter 7 of the EIS).

VCs are 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 First Nations and Metis or a part of their current use of lands for traditional purposes;
- are of scientific, historical, archaeological importance;
- have been identified as important issues or concerns by stakeholders or by other effects assessments in the region.

Valued Components that require monitoring and follow-up were identified in each applicable chapter within the EIS. For each VC, one or more environmental indicators were selected to focus monitoring and follow up efforts.

Environmental indicators were selected to represent the valued components in the table below if the component had one or more of the following attributes:

- Scientific/regulatory importance (rare/endangered or protected status);
- Environmental importance;
- Socio-economic importance;

- Cultural importance (important to communities or society as a whole); and
- Vulnerable and sensitive to change.

Table 4-1 below provides a list of valued components and their environmental indicators that will require monitoring as well as the parameters being measured and rationale for their selection.

Table 4-1 Valued Components and Environmental Indicators

Valued Component	Environmental Indicator	Parameter	Rationale[1]
Fish and Fish Habitat	Stream Crossings	Riparian buffers, ground cover, erosion;	Environmental importance; protection of aquatic life; Regulatory importance
Vegetation and Wetlands	Wetlands	Species occurrence and area of wetland affected by the project	Environmental importance; protection of aquatic life, no net loss
	Plant Species of Conservation Concern	Species occurrence	Regulatory importance – MBESEA and SARA
	Invasive Plant Species	Species occurrence	Environmental importance
	Traditional Use Plant Species	Species occurrence	Cultural and environmental importance
Wildlife and Wildlife Habitat	Amphibians	Presence of northern leopard frogs, eastern tiger salamanders and habitat	Regulatory importance –SARA
	Common Garter Snakes	Presence of garter snake hibernacula	Regulatory importance – Manitoba *Wildlife Act*
	Bird-Wire Collision	Abundance and Mortality	Environmental and cultural importance; Regulatory

Table 4-1 Valued Components and Environmental Indicators

Valued Component	Environmental Indicator	Parameter	Rationale[1]
			importance – MBCA, Manitoba *Wildlife Act*
	Sharp-tailed Grouse Lekking Sites	Lek abundance Disturbance Mortality	Vulnerable and sensitive to change
	Bird Species of Conservation Concern	Presence /Absence Abundance	Regulatory importance - MESEA; SARA; MB CDC, designated Golden-winged Warbler critical habitat
	Birds of Prey	Raptor observations and recordings	Environmental importance
	Ungulates and Predators	Occurrence and/or seasonal distribution, vehicle collision related mortality	Environmental and cultural importance
	Black Bear	Occurrence, annual prevalence	Environmental and cultural importance
Employment and Economy	Project Employment	Total person years of employment Total number of hires. Total number of employees. Type (job classifications) of work available.	Socio-economic and cultural importance
	Direct/Indirect Business Effects	Direct project expenditures Indirect business	Socio-economic importance

Table 4-1 Valued Components and Environmental Indicators

Valued Component	Environmental Indicator	Parameter	Rationale[1]
		opportunities	
	Direct Labor Income and Taxes	Direct labour income. Project taxes generated (non-labour).	Socio-economic and cultural importance
Infrastructure and Services	Transportation	Increase in traffic volumes and accidents on key roadways.	Cultural importance
Land and Resource Use	Outfitter Resource Use	Change in occurrence of black bears frequenting bear bait sites	Socio-economic importance

4.1.2 Valued Component Monitoring Tables and Schedule

Table Figure 4-1 illustrates the proposed schedule of monitoring activities. The following tables 4.2 thru 4-17 summarize the key monitoring activities that will be conducted for each of the Valued Components and Environmental Indicators identified in Section 4.1.1 above. Detailed methodologies for each key monitoring activity are outlined in Section 7.0 of this report.

Figure 4-1 Proposed Monitoring Activities Schedule

Valued Component	Key Monitoring Activity	Pre-Construction Surveys	Clearing and Construction of the Transmission Lines and station modifications			Post Construction	
		Fiscal Year(s) (April-March)					
		2017/18 (1st-3rd Quarters)	2017/2018 (4th Quarter)	2018/2019	2019/2020	2020/2021	2021/2022
Fish and Fish Habitat	Stream Crossing Assessment			■	■	■	
Vegetation and Wetlands	Wetland Surveys	■		■	■	■	■
	Rare Plant Surveys	■		■	■	■	
	Invasive Species Survey	■		■	■	■	
	Traditional Use Plant Species Survey	■		■	■	■	■
Wildlife and Wildlife Habitat	Wetland Amphibian Survey	■				■	■
	Snake Hibernacula Survey	■				■	■
	Bird-Wire Collision Survey					■	■
	Sharp-tailed Grouse Lek Survey	■		■	■	■	■
	Bird Species of Conservation Concern Survey (5th yr. in 2025 not shown)	■		■		■	
	Raptor Nest Survey	■					
	Distribution / Occurrence Mapping Survey	■	■	■	■	■	■
	Camera Trap Survey	■	■	■	■	■	■
	Vehicle Collision Statistic Gathering		■	■	■	■	
	Mineral Lick Survey	■					
Employment and Economy	Project Employment Reporting			■	■	■	
	Direct/Indirect Business Opportunities Reporting			■	■	■	
	Direct Labor Income and Taxes Reporting			■	■	■	
Infrastructure and Services	Traffic Monitoring Survey	■		■	■	■	
Land and Resource Use	Black Bear Bait Site Camera Trap Survey	■		■	■	■	

Valued Component Monitoring Table Description Key

Environmental Indicator

Brief description of the environmental indicator in the context of the Project, and the potential effects of the Project on the environmental indicator.

Objectives

- *List of objectives the monitoring program is designed to fulfill.*

Applicable Project Component(s): *List of Project components that are being monitored due to the potential interactions between the project component and environmental indicators*

Monitoring Activities

Table x-x Name of Environmental Indicator

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Name of key monitoring activities (i.e. Bird Point Count Survey)	*The phase of the project the activities will take place (i.e., construction)*	*Description of the task being conducted (i.e. upstream/downstream water quality monitoring).*	*Identification of the parameters being measured by the task (i.e. species counts)*	*Locations in which the measurements of the parameters will be conducted (i.e. Assiniboine River)*	*How many years the activities will take place (i.e. three years)*	*How many times per year will the activity take place (i.e. annual – once a year)*	*The time of year the activity will take place (i.e. Spring and fall)*	*Units by which the parameters are being measured (total number of bird species observed) Or qualitative observations of effects (bird behaviours)*

Manitoba Hydro Commitment

- *This section will describe the activities the Manitoba Hydro is committed to conducting and resources it will provide to execute the monitoring plan.*

Responsibilities of Environmental Monitor include:

- *This section will describe the activities the Environmental Monitor will conduct and resources they will provide to execute the monitoring plan.*

Specialist will:

- *This section describes the activities the Specialist will conduct and resources it will provide to execute the monitoring plan, the specialist may be Manitoba Hydro staff or external consultants.*

Decision Trigger(s)/Threshold(s) for Action

- *Describes the scenarios which will trigger the requirement for adaptive management to be implemented. This section does not provide how Manitoba Hydro will respond to a particular action as there are an indefinite amount of possible scenarios and responses, Manitoba Hydro is committed to an adaptive management process as describe in Section 5 to fully evaluate the options and develop an appropriate response.*

4.2 FISH AND FISH HABITAT

4.2.1 Water Course Crossings

As outlined in Chapter 8 of the EIS, the Project will require overhead line crossings of 78 water courses of which 20 are fish bearing. There are no water courses in close proximity to the station upgrades. Habitat sensitivity was assessed as high at six water courses, moderate-high, moderate and low-moderate at one water course each and low at nine water courses. Two water courses were not assigned habitat sensitivity ratings.

A potential effect of the Project to fish habitat is the loss of riparian vegetation (vegetation along the water's edge) during construction. Riparian vegetation functions as fish habitat by providing bank stability, food and nutrient inputs (e.g., leaf litter and insect drop), and shading. The loss of riparian vegetation can result in increased sediment in water due to decreased bank stability, increased water temperature and decreased cover for fish. Increased suspended sediments can decrease light penetration resulting in decreased photosynthesis. Sedimentation of streams can bury or create unsuitable habitats for aquatic invertebrates, infill spawning habitats and reduce the spawning and feeding success of fish. In water construction activities have the potential to negatively affect fish health through changes in water quality. To validate EIS predictions, and to allow for adaptive management, construction monitoring will verify effectiveness of prescribed mitigation.

Objectives:

- *To verify the implementation and effectiveness of mitigation prescribed for areas adjacent to watercourses including: riparian buffers, erosion control, and temporary stream crossings.*

Applicable Project Component(s): *D604I Transmission Line*

Monitoring Activities:

Table 4-2 Fish and Fish Habitat

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Stream Crossing Assessment	*Construction*	*Stream Crossing Survey*	Riparian buffers, ground cover and erosion	*ESS*	*During construction*	*Annual*	*Spring*	*Riparian buffer width (m),* *Vegetative cover (% cover : % bare ground),* *Bank stability and erosion (%),* *Re-vegetation where soil was disturbed (% ground cover: % bare ground.*
	Post-construction	*Stream Crossing Survey*	Riparian buffers, ground cover and erosion	*ESS*	*1 yr.*	*Annual*	*Spring*	*Riparian buffer width (m),* *Vegetative cover (% cover : % bare ground),* *Bank stability and erosion (%),* *Re-vegetation where soil was disturbed (% ground cover: % bare ground.*

Manitoba Hydro is committed to:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report;*
- *Report immediately to SD any unanticipated project effects on stream crossing and encroachment areas discovered through monitoring activities and consult on any remediation plans; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, Metis and Manitoba Sustainable Development.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of mitigation performance at ESS sites within project footprint or access routes.*
- *Record observations with photo and waypoint and store in EPIMS*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase.*

Specialist will:

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of stream crossing requiring site survey and assessment of ROW effects;*
- *Review Environmental Inspector and Monitor daily reports for the performance and implementation of prescribed mitigation measures at each stream crossing site;*
- *Design and conduct specific survey methods that sample aquatics ESS sites and at sites where documentation by Environmental Inspectors is insufficient or site conditions warrant follow-up to verify accuracy of EIS predictions and effectiveness of mitigation measures implemented;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on stream crossings discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

Thresholds for Action/Decision Triggers

- *Bank stability and erosion equal to pre-construction stability.*
  - *Action: Implement site specific rehabilitation measures as required.*
- *Insufficient riparian buffer retained.*
  - *Action: Implement site specific rehabilitation measures as required.*

4.3 VEGETATION AND WETLANDS

4.3.1 Wetlands

Wetlands perform many important functions which include water storage, flood control, ground water recharge, sediment trapping, shoreline protection, nutrient cycling and carbon sequestration. Wetlands also provide valuable habitat for wildlife and plant species, and may support species of conservation concern. Wetland conservation is a priority under The Federal Policy on Wetland Conservation (Government of Canada 1991).

Wetland function includes three major components: habitat, hydrological and biogeochemical function (Halsey et al. 1997, Hanson et al. 2008). Wetland alteration can result in a loss of wetland function. Threats to wetlands include drainage, erosion and degradation, lowered water tables, increased run-off, and reduced plant productivity of adjacent areas.

Large intact wetlands are present in the Local Assessment Area (LAA) in addition to smaller degraded wetlands in cultivated areas. As described in Chapter 10 of the EIS, the Project LAA intersects approximately 1884 ha of wetlands, of which 56 ha are within the Project Development Area (PDA). Wetland classes occurring along the PDA include bog, fen, swamp, marsh, shallow open water and dugout. Main effects to wetlands as a result of the project include site disturbance or loss of plants from construction, maintenance and decommissioning activities. To validate EIS predictions, verify implementation of mitigation measures, and to allow for adaptive management, preconstruction, construction and post-construction monitoring will identify any changes to wetland area affected (ha), and species composition and abundance.

Objectives:

- *Pre-construction wetland surveys to confirm location and collect baseline vegetation information;*
- *Monitoring to document disturbance, and species composition and abundance of wetland vegetation at selected sites; and*
- *Verify the implementation and effectiveness of wetland protection measures.*

Applicable Project Component(s): *New ROW for the D604I Transmission Line*

Monitoring Activities:

Table 4-3 Wetlands

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Wetland Surveys	*Pre-construction*	*Ground surveys to confirm location and record baseline wetland information*	*Area of wetland intersected by the project, vegetation characterization*	*PDA*	*Pre-construction*	*Once*	*Summer*	*Area intersected by project footprint (ha); species composition and abundance*
	Construction	*Ground surveys to identify wetland changes not discernible from habitat mapping and to monitor wetland protection measures*	*Area of wetland affected by the project, vegetation characterization*	*PDA*	*During construction*	*Annual*	*Summer*	*Area affected (ha); species composition and abundance*
	Post-construction	*Ground surveys to identify wetland changes not discernible from habitat mapping*	*Area of wetland affected by the project*	*PDA*	*2 yrs.*	*Annual*	*Summer*	*Area affected (ha); species composition and abundance*

Manitoba Hydro is committed to:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors to conduct regular inspections of mitigation measure implementation;*
- *Map cleared project footprint;*
- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, Metis and Manitoba Sustainable Development.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of mitigation performance at Environmentally Sensitive Sites (ESS) within project footprint or access routes.*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase.*

Specialist will:

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of potential wetland sampling sites and assessment of ROW effects;*
- *Review Environmental Inspector and Monitor daily reports for identification of potential wetland sampling sites;*
- *Design and conduct specific survey methods that sample vegetation composition and abundance to verify accuracy of EIS predictions and effectiveness of mitigation measures implemented;*
- *Adhere to Manitoba's Hydro's Biosecurity procedures;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on wetlands discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

Thresholds for Action/Decision Triggers

- *Partially frozen wetlands are encountered during construction season.*
- *Action: Report to SD Conservation Officer mitigation options to reduce impacts (i.e. matting, ice roads, snow roads, hand clearing).Actual disturbance footprint exceeds the expected disturbance footprint.*
    - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed.*

4.3.2 Plant Species of Conservation Concern

Species of conservation concern include species of plants that are protected under *The Endangered Species and Ecosystems Act* (MBESEA) in Manitoba, the federal *Species at Risk Act* (SARA), The Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or are listed by the Manitoba Conservation Data Centre (MBCDC) as plants that are very rare to uncommon. These species generally exist in low numbers, play a role in helping to preserve species diversity, and/or have limited distributions.

As described in Chapter 10 of the EIS, three historical locations for plant species of conservation concern were previously known to occur along the Project Development Area (PDA); 15 were known to occur along the LAA and 660 along the Regional Assessment Area (RAA) (MBCDC records). No historical occurrences of protected plants or designated critical habitat occur within the Project PDA or LAA. Three protected species have historical occurrences within the RAA, Great Plains ladies' tresses (*Spiranthes magnicamporum*), Riddell's goldenrod (*Solidago riddellii*), and rough purple false-foxglove (*Agalinis asper*).

Field assessments in 2014 identified four species of conservation concern in the PDA at 10 locations. None of these species are listed under MBESEA, SARA or COSEWIC. Preconstruction field assessment will help identify any other locations where species of conservation concern may exist and ensure appropriate mitigation measures are implemented. Construction activities can potentially negatively affect plant species of conservation concern through the use of heavy equipment (crushing plants) and from clearing and grubbing (removal of roots) of vegetation. Herbicide use during maintenance activities can also negatively affect desirable species. So to validate EIS predictions, verify implementation of mitigation measures, and to allow for adaptive management, preconstruction, construction and post-construction monitoring will identify any impact to vegetation species of conservation concern.

Objectives:

- *Pre-construction surveys to identify species of conservation concern;*
- *Monitoring to document presence/absence of species post construction; and*
- *Verify the implementation and effectiveness of protection measures.*

Applicable Project Component(s): *New ROW for D604I Transmission Line*

Monitoring Activities:

Table 4-4 Plant Species of Conservation Concern

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Rare Plant Surveys	*Pre-construction*	*Ground surveys to record species of concern*	*Species occurrence*	*PDA*	*Pre-construction*	*Once*	*Summer*	*Species presence/ absence*
	Construction	*Ground surveys to monitor species of concern and protection measures*	*Species occurrence*	*ESS*	*During construction*	*Annual*	*Summer*	*Species presence/ absence*
	Post-construction	*Ground surveys to monitor species of concern not discernible from habitat mapping*	*Species occurrence*	*ESS*	*1yr*	*Annual*	*Summer*	*Species presence/ absence*

Manitoba Hydro is committed to:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, Metis and Manitoba Sustainable Development.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of rare plants and mitigation performance at ESS sites within project footprint or access routes;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase.*

Specialist will:

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of potential rare plant habitat sampling sites and assessment of ROW effects;*
- *Conduct pre-clearing rare plant surveys for project areas not previously surveyed;*
- *Review Environmental Inspector and Monitor daily reports for identification of potential rare plant sampling sites;*
- *Design and conduct specific survey methods that sample known rare plant sites for presence/absence to verify accuracy of EIS predictions and effectiveness of mitigation measures implemented;*
- *Adhere to Manitoba's Hydro's Biosecurity procedures;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on rare plants discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

Manitoba Sustainable Development may be requested to:

- *Provide historical and current data of species of concern to inform ongoing analyses related to biophysical monitoring (e.g. population survey data, observations, reports); and*
- *Provide guidance regarding mitigation strategies should unanticipated effects occur as a result of the project.*

Decision Trigger(s)/Threshold(s) for Action

- *Species of conservation concern has been disturbed by construction activities.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed.*
- *Discovery of new location of species of conservation concern.*
  - *Action: Report locations to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed. Develop and maintain a 10 meter buffer around plant species protected under legislation, and contact Wildlife and Fisheries Branch Conservation Data Centre for further guidance on necessary mitigation.*

4.3.3 Invasive Plant Species

As outlined in Chapter 10 of the EIS, the prevalence of non-native and invasive plant species (including noxious species) may increase as a result of the Project. Non-native species are plants that grow outside of their normal range while invasive species are plants that out-compete native species when introduced outside of their natural setting. Noxious species are invasive plants designated by regulation, The *Noxious Weed Act* (Manitoba).

Construction equipment and vehicles can introduce non-native and invasive plants. During the field assessments in 2014, nine noxious non-native species were observed at 35 different locations in the PDA. Twenty-seven of the occurrences were located in the Existing Corridor and four were located in the New RoW. About half of the species were encountered in areas of disturbance (i.e., cleared areas, gravel pits, roads, quad trail edges) or near agricultural fields (cultivated and pasture). Most common were Canada thistle (*Cirsium arvense*), common dandelion (*Taraxacum officinale*), quackgrass (*Elymus repens*), and field sow-thistle (*Sonchus arvensis*).

Non-native and invasive species are problematic for one or a number of reasons: these plants are capable of growing under a wide range of climatic and soil conditions; they produce abundant seeds that are easily disseminated and seeds that are long lived or can remain dormant through the winter season; they can continue to persist even after the removal of vegetative portions of the plant, and they often have vigorous growth and produce seeds under conditions adverse for other plants, and can therefore outcompete native species. So to validate EIS predictions, verify implementation of mitigation measures, and to allow for adaptive management, preconstruction, construction and post-construction monitoring will identify changes in baseline composition and structure of invasive species.

Objectives

- *Pre-construction surveys to identify non-native and invasive species;*
- *Monitoring to document the composition and abundance of non-native and invasive plant species at selected sites; and*
- *Recommend appropriate control and eradication programs, if there is a spread of species.*

Applicable Project Component(s): *New RoW for the D604I Transmission Line*

Monitoring Activities:

Table 4-5 Invasive Plant Species

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurable Parameter(s)
Non-native and Invasive Species Survey	*Pre-construction*	*Ground surveys to record non-native and invasive species*	*Species occurrence*	*PDA*	*Pre-construction*	*Once*	*Summer*	*Species composition and abundance*
	Construction	*Ground surveys to identify and measure occurrence of invasive species on ROW*	*Species occurrence*	*PDA*	*During construction*	*Annual*	*Summer*	*Species composition and abundance*
	Post-construction	*Ground surveys to identify and measure occurrence of invasive species on ROW*	*Species occurrence*	*PDA*	*1yr*	*Annual*	*Summer*	*Species composition and abundance*

Manitoba Hydro is committed to:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, Metis and Manitoba Sustainable Development.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of invasive plants within project footprint or access routes, and equipment cleaning stations;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase.*

Specialist will:

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of invasive and non-native species sampling sites and assessment of ROW effects;*
- *Review Environmental Inspector and Monitor daily reports for identification of potential invasive and non-native species sampling sites;*
- *Design and conduct specific survey methods that sample invasive and non-native species sites for composition and abundance to verify accuracy of EIS predictions and effectiveness of mitigation and control measures implemented;*
- *Adhere to Manitoba's Hydro's Biosecurity procedures;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on invasive and non-native species discovered through monitoring activities;*
- *Prescribe vegetation management options for invasive species control where required;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

Decision Trigger(s)/Threshold(s) for Action

- *Establishment and spread of invasive species along ROW.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed. Discuss the species, nature of spread and management options.*

4.3.4 Traditional Use Plant Species

As outlined in Chapter 11 of the EIS, a change in traditional plant species abundance and distribution is a concern to First Nations and Metis. Plants and plant communities have been identified as being particularly important to First Nations and Metis. These areas are valued for their provision of resources used by Aboriginals including gathering of food and medicines and harvesting plants and trees.

An Aboriginal Traditional Knowledge Study Community Report submitted by the Black River First Nation, Long Plain First Nation, and Swan Lake First Nation (May 2015) identified 76 traditional use plant species along the PDA at six locations. During the plant surveys for the project, 39 traditional use plant species were observed at 106 locations in the PDA. There were 529 occurrences of 63 traditional use species in the LAA.

First Nations have identified plant harvesting among the current use of land and resources for traditional use purposes throughout the region, including harvesting native plants for food, medicinal and cultural purposes. To validate EIS predictions, verify implementation of mitigation measures, and to allow for adaptive management, preconstruction, construction and post-construction monitoring will identify changes in baseline composition and structure of traditional use plant species.

Objective(s):

- *Document the composition of vegetation;*
- *Confirm actual Project effects on vegetation; and*
- *Verify the implementation and effectiveness of protection measures.*

Applicable Project Component(s): *New RoW for D604I Transmission Line*

Monitoring Activities:

Table 4-6 Traditional Use Plant Species

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurable Parameter(s)
Traditional Use Plant Species Survey	*Pre-construction*	*Ground surveys to identify traditional use plant species*	*Species occurrence*	*PDA*	*Pre-construction*	*Once*	*Summer*	*Species composition and area*
	Construction	*Ground surveys to confirm traditional use plant species presence*	*Species occurrence*	*ESS*	*During construction*	*Annual*	*Summer*	*Species composition and area*
	Post-construction	*Ground surveys to confirm identify traditional use plant species presence*	*Species occurrence*	*ESS*	*2 yrs.*	*Annual*	*Summer*	*Species composition and area*

Manitoba Hydro will:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*

- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report;*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, Metis and Manitoba Sustainable Development.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of tradition use plant species and mitigation performance at ESS sites within project footprint or access routes;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase.*

Specialist will:

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of sampling sites for plant communities important to First Nations and Metis and assessment of ROW effects;*
- *Conduct pre-clearing vegetation surveys for baseline composition and structure within plant communities important to First Nations and Metis;*
- *Review Environmental Inspector and Monitor daily reports for identification of potential traditional use plant species sampling sites;*
- *Design and conduct specific survey methods that sample known locations of traditional use plant species for composition and to verify accuracy of EIS predictions and effectiveness of mitigation measures implemented;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on traditional use plant species discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

First Nations and Metis will be asked to:

- *Provide historical and current data of traditional use plant species important to First Nations and Metis people to inform ongoing analyses related to biophysical monitoring; and*
- *Provide guidance regarding mitigation strategies should unanticipated effects occur as a result of the project.*

Decision Trigger(s)/Threshold(s) for Action

• *Significant decrease in abundance of traditional use plant species (excluding trees) at locations identified by communities in the PDA.*

- *Action: Report results to community that identified the area and discuss mitigation measures.*

4.4 WILDLIFE AND WILDLIFE HABITAT

4.4.1 Amphibians

As outlined in Chapter 9 of the EIS, herptiles favoring wetland habitat for part or all of their life cycle may be vulnerable to changes in habitat availability as a result of Project activity. The Northern Leopard Frog (*Lithobates pipiens*) is a Species of Conservation Concern (SOCC) found in wetlands within the Project's Regional Assessment Area (RAA). Eastern tiger salamanders (*Ambystoma tigrinum)* will also be included in amphibian monitoring because their distribution and population status are poorly understood in southeastern Manitoba, and may extend into the RAA.

Wetland monitoring, including water quality data collection and amphibian surveys, help characterize baseline habitat conditions and identify sensitive sites at permanent and semi-permanent ponds. Wetland water-quality information aids in providing baseline conditions or 'benchmark' data for comparison of pre-Project water quality to future construction-phase water quality conditions. Amphibian surveys also aid in providing benchmark data, as related to SOCC abundance and richness, as well as breeding and wintering staging activity for pre- and post-construction conditions.

To establish a robust benchmark for wetland condition prior to construction, further amphibian surveys and water quality parameters will be measured at wetlands known to support northern leopard frogs. To validate EIS predictions and verify implementation of mitigation protocols, construction-phase wetland monitoring will take place during the amphibian breeding period immediately following construction activity with the goal of detecting any changes in water quality following construction activity and breeding activity. Sites examined will include wetlands and waterbodies previously surveyed (Wildlife and Wildlife Habitat TDR 2015) and found to support northern leopard frogs. Construction phase monitoring would be conducted at wetlands within 500 m of locations where Project activity had occurred. This buffer represents the maximum activity restriction setback for northern leopard frog breeding ponds (Environment Canada 2009).

Establishing baseline conditions at wetlands is essential for future monitoring of potential changes in wetland breeding, summering, and overwintering habitat. Pre-construction wetland amphibian surveys will also be conducted on additional wetlands and watercourses on or adjacent to the Project Development Area (PDA) not previously surveyed during baseline environmental surveys to identify any additional sensitive northern leopard frog breeding and/or overwintering sites.

Objectives:

- *To monitor the presence of amphibians (as represented by the Northern Leopard Frog and Eastern Tiger Salamander) and water quality conditions at wetlands located within the PDA; and*
- *To verify the implementation and effectiveness of prescribed mitigation.*

Applicable Project Component(s): *New ROW for the D604I Transmission Line ~~and Glenboro Station South Transmission Line Modifications~~*

Monitoring Activities:

Table 4-7 Wetland Amphibians

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Wetland Amphibian Survey	*Pre-construction*	*Assess water quality & presence of northern leopard frogs and eastern tiger salamanders at wetland sites located on or adjacent to the PDA*	*Water quality; Presence of northern leopard frogs, eastern tiger salamander*	*Suitable wetland habitat on or adjacent to PDA*	*Pre-construction*	*Biannual*	*Spring and Fall*	*pH, electrical conductivity, TDS, TSS, water temperature, turbidity; Presence/absence of breeding activity & individual frogs/salamanders*

	Post-construction	*Revisit wetland sites to monitor presence of northern leopard frogs and eastern tiger salamanders and assess whether wetlands mitigation was successful*	*Water quality; Presence of northern leopard frogs, eastern tiger salamander*	*Suitable wetland habitat on or adjacent to PDA*	*2 yrs.*	*Biannual*	*Spring and Fall*	*pH, electrical conductivity, TDS, TSS, water temperature, turbidity; Presence/absence of breeding activity & individual frogs/salamanders*

Manitoba Hydro is committed to:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, Metis and Manitoba Sustainable Development.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of northern leopard frogs and eastern tiger salamanders and mitigation performance at ESS sites within project footprint or access routes;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase*.

Specialist will:

- *Use FRI habitat classifications, digital ortho-rectified imagery, and/or georeferenced video/photo products provided by Manitoba Hydro for identification of wetland habitat;*
- *Conduct pre-construction surveys during peak breeding activity in spring and during overwintering staging in the fall to identify important wetland sensitive sites and to monitor possible changes to wetland habitat post construction;*
- *Review Environmental Inspector and Monitor daily reports for identification of additional northern leopard frog or eastern tiger salamander habitat;*
- *Design and conduct specific survey methods to verify effectiveness of mitigation measures implemented;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on northern leopard frog or eastern tiger salamander discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

Thresholds for Action/Decision Triggers

- *Significant decline of wetland water quality within or adjacent to PDA.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed.*

- *Decline of breeding activity of northern leopard frog near proposed infrastructure.*
    - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed.*
- *Discovery of an eastern tiger salamander.*
    - *Provide SD Conservation Data Centre with GPS location and circumstances as incidents are detected.*

4.4.2 Common Garter Snakes

As outlined in Chapter 9 the EIS, the dependency of common garter snakes on overwintering den sites leaves snake populations vulnerable to disturbance, degradation and local extirpation (Kendell 1998). Common garter snakes overwinter in hibernacula or dens which are located in specific substrates, including limestone bedrock. No hibernacula were identified during desktop review, field studies or Key Person Interviews (Wildlife and Wildlife Habitat TDR). For this project, disturbance to snake hibernacula was identified as a key Project-related potential effect. Transmission line tower installation at or near suitable garter snake habitat could negatively impact local garter snake populations.

Potential garter snake habitat occurs within and adjacent to the PDA. Areas around Lonesand and Sundown, MB have the highest potential to support hibernacula based on surficial limestone mapping and abundance of snakes observed crossing roads and highways. In order to reduce the potential for Project-related disturbance, pre-construction (i.e. prior to RoW clearing) surveys for snake hibernacula at tower sites will occur in areas where the PDA overlaps with Sundown Road (near Lonesand Lake). If snake hibernacula are found, the effectiveness of mitigation applied (*i.e.* 200 m buffer) will be verified through follow-up monitoring.

Objectives:

- *To identify common garter snake hibernaculum sites located near proposed tower sites; and*
- *To verify the implementation and effectiveness of mitigation measures.*

Applicable Project Component(s): *New ROW for the D604I Transmission Line.*

Monitoring Activities:

Table 4-8 Common Garter Snakes

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Snake Hibernacula Survey	*Pre-construction*	*Investigate specific areas of the PDA having high potential to support snake hibernacula*	*Presence of garter snake hibernacula*	*Suitable garter snake hibernacula habitat within 200 m of proposed tower sites.*	*Pre-construction*	*Biannual*	*Spring and Fall*	*Presence/absence of hibernacula*
	Post-construction	*Revisit any identified snake hibernacula to monitor presence*	*Continued use of hibernacula by garter snakes*	*ESS*	*2 years*	*Biannual*	*Spring and Fall*	*Presence/absence of garter snakes in hibernacula*

Manitoba Hydro is committed to:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*

- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, Metis and Manitoba Sustainable Development.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of potential snake hibernacula and mitigation performance at ESS sites within project footprint or access routes;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase*.

Specialist will:

- *Use FRI habitat classifications, digital ortho-rectified imagery, and/or georeferenced video/photo products provided by Manitoba Hydro for identification of garter snake sampling sites and assessment of ROW effects;*
- *Where suitable garter snake habitat occurs, conduct pre-construction surveys for garter snake hibernacula during peak breeding activity in spring and/or possible movements back to hibernacula in the fall;*
- *Based on pre-construction survey results, provide recommendations for tower placement adjustments and/or mitigation measures to limit or avoid disturbance to hibernacula;*
- *Review Environmental Inspector and Monitor daily reports for identification of additional garter snake sampling sites;*
- *If suitable hibernacula habitat is identified, design and conduct specific survey methods that sample garter snake presence/absence to verify effectiveness of mitigation measures implemented;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on common garter snake discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

Thresholds for Action/Decision Triggers

- *Presence of hibernacula within 200 m of tower siting foundation*
  - *Action: Report the site to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed. Develop and maintain an appropriate sized construction buffer around the hibernacula site.*
- *Hibernacula located within tower footprint.*
  - *Action: Discuss tower design and location with Manitoba Hydro engineers.*

4.4.3 Bird – Wire Collision

As outlined in Chapter 9 of the EIS, the presence of transmission lines in proximity to areas of high bird activity may lead to bird – wire collisions which result in the injury and death of birds. In these areas, larger-bodied species such as waterbirds (ducks and geese), cranes and herons, are particularly vulnerable to collisions due to their daily movement patterns, which peak during low light periods around sunrise and sunset. The degree of risk is influenced by several factors relating to transmission line design, location, and mitigation, as well as physical characteristics of the bird (species, size) and flight behavior (flocking, aerial courtship displays). Manitoba Hydro has committed to installing bird diverters along transmission line sections which transect areas of high bird activity. Pre-construction surveys will serve to verify Environmentally Sensitive Sites (ESS) for birds and will gauge the level of bird activity at these sites at biological important times such as during migration and the rearing of offspring. The monitoring program will involve construction phase and post-construction phase studies to quantify any mortality to birds caused by the transmission line and will direct adaptive mitigation strategies to reduce or prevent any future mortality events.

Objectives:

- *Monitor avian mortality caused by transmission line infrastructure using a control-impact study design; and*
- *Determine the effectiveness of mitigation measures and, if appropriate, propose revisions to the existing plans or develop new mitigation options should high levels of avian mortality occur as a result of the transmission line.*

Applicable Project Component(s): *D604I Transmission Line*

Monitoring Activities:

Table 4-9 Bird – Wire Collision

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Bird- Wire Collision Survey	*Post-construction*	*Bird wire collision survey to evaluate diverter effectiveness*	*Mortality*	*Bird ESS sites*	*2 yrs.*	*Biannual*	*Spring and Fall*	*Mortality Presence/Absence*

Manitoba Hydro is committed to:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows access to daily inspection and monitoring reports from construction period;*
- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, Metis and Manitoba Sustainable Development.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of high bird activity areas within project footprint;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase*.

Specialist will:

- *Review Environmental Inspector and Monitor daily reports for identification of bird-wire collision sampling sites;*
- *Design and conduct specific survey methods that sample bird presence/absence, abundance, mortality and flight paths to verify accuracy of EIS predictions and effectiveness of mitigation measures implemented;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on birds discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

Thresholds for Action/Decision Triggers

- *Bird mortality statistics are above expected based on pre-construction abundance/flightpath surveys.*
    - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed.*

4.4.4 Sharp-tailed Grouse Lekking Sites

As identified in the EIS, grassland birds have experienced widespread habitat loss through most of the prairies, including Sharp-tailed Grouse (*Tympanuchus phasianellus*). Three active sharp-tailed grouse leks supporting approximately 25 Sharp-tailed Grouse were identified in the Regional Assessment Area (RAA) during the 2014 surveys. All three leks occur adjacent to the New ROW in areas southwest of Ste. Genevieve, MB and north and south of La Broquerie, MB. Sharp-tailed Grouse may be affected by the temporary loss of some habitat at tower sites and the compaction of vegetative concealment cover along the New ROW. Sharp-tailed Grouse are particularly vulnerable to increased rates of predation if birds of prey (raptors) use transmission line towers as perches when hunting or nesting, near lek sites. This monitoring program will validate EIS predictions and work to determine any project-related effects to sharp-tail grouse (pre- versus post-disturbance).

Objectives:

- *Identify the presence of lekking sites along the transmission line;*
- *Monitor predation of grouse near lekking sites in proximity to the transmission line compared to that at control sites; and*
- *Determine the effectiveness of mitigation measures and, if appropriate, propose revisions to the existing plans or develop new mitigation options should unexpected impacts to Sharp-tailed Grouse occur as a result of the transmission line.*

Applicable Project Component(s): *New ROW for the D604I Transmission Line*

Monitoring Activities:

Table 4-10 Sharp-tailed Grouse Lekking Sites

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Sharp-tailed Grouse Lek Survey	*Pre-construction*	*Lek site identification*	*Lek abundance*	*Where suitable breeding habitat overlaps with Project components (e.g., towers).*	*Pre-construction*	*Once*	*April 1 – May 31*	*Presence/Absence Abundance*
	Construction	*Lek disturbance monitoring*	*Disturbance*	*Leks found within 500 m of right-of-way (ROW) where construction activities overlap lekking activity.*	*During construction*	*Annual*	*April 1 - May 31*	*Presence/Absence Abundance*
	Post-construction	*Lek disturbance monitoring*	*Mortality*	*Raptor perching or nesting activity on towers near lek sites*	*2 yrs.*	*Annual*	*April 1 - May 31*	*Presence/Absence Abundance*

Manitoba Hydro is committed to:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows access to daily inspection and monitoring reports from construction period;*
- *Summarize results of key monitoring activities in an annual monitoring report;*
- *Share results of key monitoring activities with interested local stakeholders, First Nations and Metis; and*

- *Participate as a stakeholder in committees or working groups whose purpose is for the ongoing conservation of wildlife.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of lekking sites and mitigation performance at ESS sites within project footprint;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase*.

Specialist will:

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of potential lekking sites;*
- *Conduct pre-construction surveys for lekking sites within 500m of ROW;*
- *Review Environmental Inspector and Monitor daily reports for identification of lekking sites;*
- *Design and conduct specific survey methods that sample bird presence/absence, abundance, mortality and behaviour to verify accuracy of EIS predictions and effectiveness of mitigation measures implemented;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on lekking sites discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

Manitoba Sustainable Development will:

- *Provide guidance regarding mitigation strategies should unanticipated effects occur as a result of the project.*

Thresholds for Action/Decision Triggers

- *Lekking site discovered near project footprint.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed.*
- *Lekking sites near project footprint have significant reduction in abundance compared to pre-construction baseline and control lekking sites away from the project.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed.*
- *Lekking sites are disturbed by construction activities.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed. Develop and maintain an appropriate sized construction buffer around the lek site until the breeding season is over.*
- *Raptor nests or perching on transmission towers near lekking sites.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed.*

4.4.5 Bird Species of Conservation Concern

Species of conservation concern (SOCC) include species of that are protected under MESA, SARA or are listed as rare by the MBCDC. These species generally exist in low numbers and are sensitive to changes in habitat. As described under SARA (subsection 79(2)), monitoring of potential adverse project effects on SARA-listed wildlife species is required (SARA 2011). Fourteen bird species of conservation concern were identified in the RAA during the 2014 surveys; however, the only bird species within the RAA to have defined critical habitat is the Golden-winged Warbler (*Vermivora chrysoptera*). Critical habitat overlaps with the eastern part of the RAA near Ross, MB, south through Richer, La Broquerie, Marchand, and continues to the border near Sundown and Piney. Six golden-winged warblers were detected during the 2014 breeding bird surveys; three were observed along the FPR in areas southwest of Marchand and south of the Watson P. Davidson WMA, two were observed north of Marchand along the existing 230 kV transmission line, and one was observed south of Richer. Information from the recent *Manitoba Breeding Bird Atlas* survey effort was also used to understand the spatial distribution of golden-winged warblers in the LAA and RAA. Manitoba Hydro has been a strong supporter of the Manitoba Breeding Bird Atlas since its inception and considers it efforts very valuable to the ongoing monitoring of species of conservation concern. Field observations from this project as with all Manitoba Hydro major projects will continue to be shared and incorporated into the atlas.

ROW clearing is the primary project activity that may result in a direct and measurable change in habitat for bird species of conservation concern, particularly for Golden-winged Warbler, because it involves clearing in forested and successional areas of the ROW and grubbing at transmission tower sites. Indirect effects on habitat are those that reduce the effectiveness of existing or remaining habitat for wildlife. Indirect effects may occur through sensory disturbances (e.g., noise, light) causing temporary displacement of some wildlife from otherwise suitable habitat. One of the objectives of the Integrated Vegetation Management Plan will be to manage ROW vegetation at prescribed locations to enhance habitat suitability for golden-winged warbler. Therefore, the monitoring program will validate EIS predictions, verify implantation of mitigation measures, and concentrate on determining any project-related effects to bird species of conservation concerns (pre- versus post-disturbance).

Objectives:

- *Identify the location of bird species of conservation concern within or in close proximity to the Project footprint with the purpose of establishing a Control-Impact monitoring program for known individuals and/or groups;*
- *Monitor species of conservation concern in close proximity to the transmission line and compare annual site fidelity and abundance to nearby control sites; and*
- *Determine the effectiveness of mitigation measures and, if appropriate, propose revisions to the existing plans or develop new mitigation options should unexpected impacts to birds occur as a result of construction or operation activities.*

Applicable Project Component(s): *All Project Components*

Monitoring Activities:

Table 4-11 Bird Species of Conservation Concern

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Bird Species of Conservation Concern Survey	*Pre-construction*	*Bird Point Counts*	*Presence/Absence Abundance*	*Select areas of PDA known to support SOCC*	*One-time*	*Once*	*April 1 - July 31*	*Presence/Absence Abundance*
	Post-clearing	*Bird Point Counts*	*Presence/Absence Abundance*	*Select areas of PDA known to support SOCC*	*1,3,5 yrs.*	*Annual*	*April 1 - July 31*	*Presence/Absence Abundance*

Manitoba Hydro is committed to:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*

- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows access to daily inspection and monitoring reports from construction period;*
- *Summarize results of key monitoring activities in an annual monitoring report;*
- *Share results of key monitoring activities with interested local stakeholders, First Nations and Metis; and*
- *Participate as a stakeholder in committees or working groups whose purpose is for the ongoing conservation of wildlife.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of bird species of concern and mitigation performance at ESS sites within project footprint;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase*.

Specialist will:

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of potential species of concern habitat;*
- *Review Environmental Inspector and Monitor daily reports for identification of bird species of concern;*
- *Design and conduct specific survey methods that sample site fidelity and abundance and compare to controls sites to verify accuracy of EIS predictions and effectiveness of mitigation measures implemented;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on species of concern discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

Manitoba Sustainable Development will:

- *Provide updated data of species of concern populations to inform ongoing analyses related to biophysical monitoring (e.g. population survey data, observations, reports); and*
- *Provide guidance regarding mitigation strategies should unanticipated effects occur as a result of the project.*

Thresholds for Action/Decision Triggers

- *Species of concern are observed within the project footprint and at control locations.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed.*

- *Species of concern point count sites within project footprint have significant reduction in abundance compared to pre-construction baseline and control point counts away from the project.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed.*

4.4.6 Birds of Prey

As described in Chapter 9 of the EIS, raptor nests are considered important habitat features as they can be used year after year by different species. While land clearing of the ROW has the potential to destroy raptor nests, the resulting transmission towers have shown to provide suitable nesting habitat where electrical safety concerns are not an issue. Only one raptor nest (unknown species) was identified near, but outside of the ROW during the 2014 aerial surveys (northwest of Ste-Genevieve, approximately 140 m west of the FPR); however, the absence of evidence of nests within the ROW does not preclude the possibility that a cryptic nest was overlooked or that a new nest has not appeared prior to clearing of the ROW. As such, ongoing ROW surveys for raptor nests are proposed for the purpose of determining removal or relocation once nest has been abandoned.

Objectives:

- *Identify raptor nests in Project footprint that require removal or relocation*

Applicable Project Component(s): *D604I Transmission Line and Glenboro South Station Transmission Line Modifications*

Monitoring Activities:

Table 4-12 Birds of Prey

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurable Parameter(s)
Raptor Nest Survey	*Pre-construction*	*Raptor Nest Search*	*Nest site locations*	*PDA*	*Pre-construction*	*Once*	*Fall*	*Presence/Absence of nests# of Nests requiring removal or relocation*

Manitoba Hydro is committed to:

- *Supply nest site, nest removal or relocation activities and any mortality locations observed to SD; and*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages project monitoring data and allows access to daily inspection and monitoring reports from construction period and a Transmission Line Maintenance System that records raptor nest observations and nest relocations during operation period.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of raptor nests, mortality and mitigation performance at ESS sites within project footprint;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase*.

Specialist will:

- *Conduct pre-clearing non-invasive nest surveys;*

- *Based on pre-clearing survey results flag buffer zones around active bird nests;*
- *Review Environmental Inspector and Monitor daily reports for identification of raptor nests;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on raptors discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

Manitoba Sustainable Development may be requested to:

- *Provide guidance regarding mitigation strategies should unanticipated effects occur as a result of the project.*

Thresholds for Action/Decision Triggers

- *Active nest site identified in pre-construction survey.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed. Develop and maintain an appropriate sized construction buffer around the nest site until the nest is no longer active.*

4.4.7 Ungulates and Predators

White-tailed deer are the predominate ungulate in the Project area. Transmission line corridors create habitat edges for white-tailed deer that provide an ecotone with high quality forage resources and accessible hiding cover in adjacent forest (Reimers *et al*. 2000). Disturbed vegetation is favoured by white-tailed deer because of the high diversity of plants in those areas (Stewart *et al.* 2011). Riparian areas, edge habitats, and linear features function as important habitats for travel and forage. Therefore, white-tailed deer are not particularly susceptible to the effects of habitat fragmentation, but may be susceptible to increased mortality associated with moving through higher risk areas created as a result of habitat loss and degradation of matrix quality (Stewart *et al*. 2011). The ROW and project-related access development may enhance predator mobility into areas that were previously secure habitat for prey species, decrease predator search times for prey, and/or make prey escape more difficult. Predators such as wolves and coyotes may benefit from enhanced access, leading to increased predation of ungulates.

Chapter 9 of the EIS identified a potential project effect of increased mortality risk from hunters and predators as a result of enhanced access of white-tailed deer habitat in eastern portions of the project, however the effect is expected to be minimal with no measurable effect on abundance anticipated. In that portion of the project, deer concentrations were noted in areas near Ste. Genevieve, Richer, Sundown and Piney, MB, and in the Watson P. Davidson and Spurwoods WMAs. The deer population in the area is considered to be stable. Habitat loss and sensory disturbance effects from ROW clearing are considered minimal and short-term, ultimately resulting in a positive effect of enhanced deciduous browse forage and increased edge habitat during the operation phase.

As described in Chapter 9 of the EIS, the Vita elk population in Manitoba (fall/winter range) is shared with Minnesota (summer range) and is the only elk population with potential to interact with the Project. Long-term census data in Manitoba for this elk population are limited, with a stable population estimate of 100-150. Annual surveys (2004-2008) conducted in Minnesota estimated the population at 112 – 215 elk (MDNR 2009). The Vita elk range in Manitoba may overlap an eastern portion of the Project RAA in areas near Vita and Caliento, however, EIS field studies did not detect elk occurrence within the ROW or Local Assessment Area (LAA; a 1 km buffer around the project footprint), or Regional Assessment Area (RAA; a 15 km buffer around the project footprint). The closest observations during baseline surveys were 20 km from the final preferred route. The ROW avoids the core areas known to support elk near Vita and Arbakka, with no anticipated significant adverse project effects on the population. In 2016, Manitoba Hydro also supported an elk GPS collaring project led by the RM of Stuartburn, Manitoba Sustainable Development, and the Nature Conservancy Canada. This project aimed to understand movements and home range size of cow elk in southeast Manitoba. Early results from the eight collared elk study suggest that they do not occupy areas near LAA.

Moose were a common ungulate species in southeastern Manitoba prior to the late 1990s but populations in the region have since collapsed (Dettman 2015, pers. comm.; Leavesley 2015, pers. comm.; Rebizant 2015, pers. comm.). Despite the presence of suitable moose habitat (e.g., shrubby wetlands, alder swamps, sub-climax deciduous forest; Banfield 1974), moose are rare in southeastern Manitoba due to a combination of factors such as habitat fragmentation, predation by wolves, parasites, fires suppression, and unregulated harvest (Leavesley 2015, pers. comm.; Rebizant 2015, pers. comm). The areas south of the Watson P. Davidson Wildlife Management Area heading southeast to the Spur Woods WMA and south of Piney, in the RAA was identified as containing moose habitat, especially near Piney (Black River First Nation, Long Plain First Nation and Swan Lake First Nation 2015). No specific monitoring for moose is being proposed, however moose observations in all aerial survey and camera trap surveys will be documented.

White-tailed deer, elk and moose are highly valued by resource users, First Nations and Metis. White tailed deer are an important livelihood for local outfitters. There is public concern that the Project may increase white-tailed deer vulnerability to mortality (hunting and predation) resulting from increased access. Change in habitat availability associated with ROW clearing and mortality resulting from increased access is anticipated to be negligible for the Vita elk population because routing of the ROW avoids the core areas known to support them.

Monitoring will focus on validating EIS predictions, verifying the implementation of mitigation measures, and assist in determining if project-related access has altered distribution and occurrence of ungulates and predators, resulting is altered mortality-risk from hunters and predators, relative to baseline state (pre- versus post-disturbance).

Objective(s):

- *Expanding the baseline knowledge of occurrence, distribution and abundance of ungulates and predators interacting with the Project;*
- *Investigating the influence of the Project on white-tailed deer at two scales:*
    a. *Local Scale: Spatial dynamics using indicators such as occurrence and distribution patterns relative to Project-related access development before and after construction in relation to predator occurrence and project-related linear disturbance. Mortality risks will be assessed as they pertain to predicted Project effects if sufficient and suitable data can be acquired.*
    b. *Range Scale: Population occurrence and distribution in relation to project-related changes in habitat availability (fragmentation/increased edge habitat) and access.*

Applicable Project Component(s): *New ROW for the D604I Transmission Line*

Monitoring Activities:

Table 4-13 Ungulates and Predators

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Distribution / Occurrence Mapping Surveys and Camera Trap Survey	*Construction*	*Winter aerial surveys and remote IR camera traps*	*Change in occurrence and / or seasonal distribution relative to project infrastructure and wolf distribution*	*Survey blocks on eastern portion of RAA*	*During construction*	*Annual (aerial component)* *Continuous (ground component*	*Winter (aerial component)* *Year-round (ground component)*	*Range scale change in population occurrence and seasonal distribution*
Distribution / Occurrence Mapping Surveys and Camera Trap Survey	*Post-construction*	*Winter aerial surveys and remote IR camera traps*	*Change in occurrence and / or seasonal distribution relative to project infrastructure and wolf distribution*	*Survey blocks on eastern portion of RAA*	*2 yrs.*	*Annual (aerial component)* *Continuous (ground component)*	*Winter (aerial component)* *Year-round (ground component)*	*Range scale change in population occurrence and seasonal distribution*
Vehicle Collision Statistic Gathering	*Construction*	*Gather statistics on project-related vehicle collisions*	*Deer/Moose vehicle collisions*	*RAA*	*During construction*	*Continuous*	*Year-round*	*Number of project related deer/moose vehicle collisions*
Mineral Lick Survey	*Pre-construction*	*Locate mineral licks within the project footprint*	*Location of mineral licks*	*LAA*	*Pre-construction*	*Annual*	*Fall*	*Location of mineral licks*

Manitoba Hydro is committed to:

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*

- *Provide qualified Environmental Inspectors to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report;*
- *Share results of key monitoring activities with interested local stakeholders , First Nations and Metis; and*
- *Participate as a stakeholder in relevant committees or working groups whose purpose is for the ongoing conservation of wildlife.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of deer/moose and tracks, mineral licks, human access, and mortality sites within project footprint or access routes;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase*.

Specialist will:

- *Use existing habitat suitability model to predict suitable ungulate habitat and to assess project footprint effects on habitat suitability and occurrence (pre-disturbance vs post disturbance)*
- *Design and conduct specific survey methods to collect ungulate occurrence and distribution data during the disturbance and post-disturbance project phases, in relation to project linear disturbance and predator occurrence*
- *Collect and analyze ungulate and predator data to assess if there are project-related effects at the local (LAA) or landscape (RAA) scale on occurrence or seasonal distribution.*
- *Report on monitoring efforts, including identification to Manitoba Hydro of any unanticipated effects on ungulates discovered through monitoring activities*
- *Through an adaptive management process, make recommendations for ongoing improvements to the monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analyses*

Manitoba Sustainable Development may be requested to:

- *Provide guidance regarding mitigation strategies should unexpected impacts occur as a result of the transmission line*

Decision Trigger(s)/Threshold(s) for Action

- *More than five ungulate project related vehicle collisions per year*
  - *Action: Provide SD Conservation Officer with GPS location and circumstances as incidents are detected.*
- *Elk observed within the LAA during aerial or camera trap surveys.*
  - *Action: Provide SD regional wildlife biologist/manager with GPS location and circumstances as incidents are detected.*
- *Identification of mineral lick within LAA.*
  - *Action: Provide SD regional wildlife biologist/manager with GPS location and proposed contingency action.*
- *Significant change in ungulate or predator occurrence or, distribution relative to baseline data.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed.*

4.4.8 Black Bear

Black bears favor high landscape connectivity and are sensitive to significant habitat changes and disturbances that affect access to, and availability of, food resources (Gunson 1993, Kindell & Van Manen 2007, Rogers & Allen 1987). They are widely distributed as a consequence of food resource availability both spatially and seasonally (Costello & Sage 1994, Gunson 1993, Pelton *et al.* 1999, Pelton 2000), but local abundance may be variable depending on annual severity of weather and food availability. Bears may avoid linear development with active human activity with typical avoidance distances of >200m (Forman *et al.* 1997). Denning black bears are particularly sensitive to noise disturbance within 1 km of dens (especially within 200m of dens), and may abandon the den in response to disturbance, especially early in the denning period (Linnell *et al*. 2000).

The EIS indicates the black bear population within the RAA is stable (possibly increasing), with common occurrence and widespread distribution throughout areas supporting forest habitat; particularly at the forest-agricultural habitat interface, primarily east and south of the Watson P. Davidson WMA. Field studies identified bear activity within the vicinity of the proposed D604I ROW, along existing transmission line M602F, and other forested parts of the RAA, occupying forested areas near the communities of Richer, Marchand, Sundown, and Piney.

Black bears are an important species to subsistence users (First Nations and Metis) and to the livelihood of local commercial outfitters. The Project footprint will contribute to habitat fragmentation of natural habitat patches that may affect bear habitat availability, occurrence, and distribution. Measurable changes in abundance are not anticipated as a result of Project activities or disturbance because of routing and scheduling of construction activities. Monitoring will focus on validating EIS predictions, verifying the implementation of mitigation measures, and assist in determining if project-related disturbance has significantly impacted habitat availability, or altered occurrence and distribution relative to baseline state,

Objective(s):

- *Expand the baseline knowledge of distribution, abundance, and population characteristics of black bears interacting with the Project*
- *Investigating the influence of the Project on black bear at two scales:*
  a. *Local Scale: Monitor the influence of the Project on black bear prevalence in areas along the ROW using remote IR cameras to examine spatial dynamics using indicators such as local occurrence and distribution patterns relative to Project-related access development before and after construction, where pre-existing baseline data permits.*
  b. *Range Scale: Habitat suitability modelling to assess population occurrence and distribution in relation to project-related changes in habitat availability (fragmentation/increased edge habitat) and access.*

Applicable Project Component(s): *New ROW for the D604I Transmission Line*

Monitoring Activities:

Table 4-14 Black Bear

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Camera Trap Survey	*Construction*	*Monitor black bear prevalence using remote IR cameras*	*Change in prevalence and occurrence in relation to the project footprint*	*LAA*	*During construction*	*Continuous*	*Year- round*	*# of Black bears observed, Change in prevalence*
Camera Trap Survey	*Post-construction*	*Monitor black bear prevalence using remote IR cameras*	*Change in prevalence and occurrence in relation to the project footprint*	*LAA*	*2 yrs.*	*Continuous*	*Year- round*	*# of Black bears observed, Change in prevalence*

Manitoba Hydro is committed to:

- *Provide camera trap equipment;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report;*
- *Share results of key monitoring activities with interested local stakeholders, First Nations and Metis; and*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of bear, dens and tracks, ungulate mortality sites within project footprint or access routes;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, and provide first hand overview of site conditions during construction phase*.

Specialist will:

- *Use digital ortho-rectified imagery and geospatial datasets provided by Manitoba Hydro to develop a habitat suitability model to predict suitable black bear habitat, to predict project footprint effects on black bear habitat suitability and occurrence (pre-disturbance vs post disturbance), and to inform survey design*
- *Design and conduct camera trap survey to collect black bear occurrence and distribution data*
- *Collect and analyze black bear data to assess if there are project-related effects at the local or regional scale on occurrence and distribution.*
- *Report on monitoring efforts, including identification to Manitoba Hydro of any unanticipated effects on black bear discovered through monitoring activities*
- *Through an adaptive management process, make recommendations for ongoing improvements to the monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analyses*

Manitoba Sustainable Development may be requested to:

- *Provide guidance regarding mitigation strategies should unexpected impacts occur as a result of the transmission line*

Decision Trigger(s)/Threshold(s) for Action

- *Bear den location is detected within LAA by project staff.*
  - *Action: Provide Conservation Officer with GPS location and circumstances as incidents are detected.Develop and maintain an appropriate sized construction buffer around the bear den site until the den is not longer active.*
- *Significant project-related change in black bear occurrence.*
  - *Action: Report to SD regional wildlife biologist/manager through annual meetings where reports are presented and results are discussed.*

4.5 SOCIO-ECONOMIC AND RESOURCE USE

4.5.1 Employment and Economy

The economic monitoring activities that will occur during construction include employment, income and business outcomes associated with the project. The estimates of the economic impact of the project are documented in the EIS, and the intent is to compare predictions made in the EIS to actuals.

The EIS estimated the workforce for all project components. Estimates vary by project component and year depending on the activity. The majority of employment opportunities will occur during the construction phase of the project with fewer opportunities during the operations phase of the project. Due to seasonality constraints for some aspects of the work certain project components will have activities concentrated at specific times of the year, while other project construction components will occur throughout the entire year. Monitoring employment results will provide data on actuals incurred on the project and will provide an indication of the overall economic impact of the project.

Construction of the project will result in business opportunities locally, regionally and throughout the province and Canada. Manitoba Hydro has policies in place to promote local businesses on its projects. The goal is to enhance business relationships with the communities and to assist them in building capacity and competitiveness of their businesses through involvement in Manitoba Hydro contracts. Monitoring both direct and indirect business effects will provide data on the success and effectiveness of efforts to enhance local business participation, as well as an indication of the general economic impact of the project in communities in the vicinity of the Project.

Labour income is an important indicator of direct economic impact of a project. Income levels also affect the general standard of living of individuals and families by influencing the acquisition of basic human needs including housing, food and clothing. Consequently, monitoring income levels can provide a general indication of a project's contribution to the overall standard of living. The estimate of labour income reflects the direct income of wages and salaries associated with direct person-years employment. Regarding taxation, direct taxes paid reflect incremental revenue sources generated for governments as a result of the project. The incremental revenues, in turn, contribute to societal programs and general well-being.

Objective(s)

- *The objective of economic monitoring it to gather project information relating to economic parameters and compare to predictions made in the EIS regarding employment and workforce, business opportunities, labour income and tax revenue.*

Applicable Project Component(s): *All Project Components*

Monitoring Activities:

Table 4-15 Employment and Economy

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Project Employment Reporting	*Construction*	*Determine project employment associated with the project*	*Collect and report using Construction Employment Database.*	*All project components*	*During construction*	*Annual*	*April*	*Total person years of employment for each project component,* *Total number of hire,* *Total number of employees,* *Type (job classifications) of work available.*
Direct/Indirect Business Opportunities Reporting	*Construction*	*Determine direct/indirect business opportunities*	*Collect and report using Manitoba Hydro's existing accounting and tracking system and purchasing reports.*	*All project components*	*During construction*	*Annual*	*April*	*To determine the extent of direct/indirect business effects associated with the project.*
Direct Labor Income and Taxes Reporting	*Construction*	*Determine direct labor income and taxes generated by the project.*	*Manitoba Hydro's existing accounting and tracking system and labour reports.*	*All project components*	*During construction*	*Annual*	*April*	*To determine direct labor income and contribution of the project to tax revenue.*

Manitoba Hydro is committed to:

- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, Metis and Manitoba Sustainable Development.*

4.5.2 Infrastructure and Services

4.5.2.1 Transportation

The construction of each major component will have distinct effects on the existing road network. The road network consists of provincial highways and municipal roads in southeast Manitoba. Each Project component has unique traffic generation, vehicle mix, travel patterns and mode choices, which are variable throughout the life of the Project. Traffic accidents will be obtained through Manitoba Hydro reporting to the extent possible. This data will be used to potentially link project related incidents to certain conditions, whether it be related to the traffic volume, truck load size, time of collision, weather or road conditions.

Objective(s)

- *The objective of traffic monitoring is to track the number of accidents/potential near misses associated with the project and to track traffic volumes at key locations and to compare to baseline volumes*

Applicable Project Component(s): *All Project Components*

Monitoring Activities:

Table 4-16 Transportation

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Traffic Monitoring Survey	*Construction*	*Determine the increase in traffic volumes, near misses and accidents on key roadways potentially as a result of the project.*	*Increase in traffic volumes, near misses and accidents on key roadways.*	*All project components*	*During construction*	*Annual*	*Continuous*	*Traffic volumes – compare actual traffic volumes from estimates in the EIS on key roadways.* *Traffic accidents and near misses in the project area on key roadways through Manitoba Hydro incident reports as available.*

Manitoba Hydro is committed to:

- *Summarize results of key monitoring activities in an annual monitoring report;*
- *Share results of key monitoring activities with interested local stakeholders, First Nations and Metis; and*

Specialist will:

- *Design and conduct traffic monitoring survey to collect traffic volume, near misses and accidents as a result of the Project*
- *Report on monitoring efforts, including identification of any unanticipated effects on traffic volumes and accidents discovered through monitoring activities*
- *Through an adaptive management process, make recommendations for ongoing improvements to the monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analyses*

4.5.3 Land and Resource Use

4.5.3.1 Outfitter Resource Use

Manitoba Hydro is planning to continue its work with the local black bear outfitter in the project area to further understand development effects on their operations. In 2014, camera traps were established at bait sites within the Project Development Area and in control areas to understand baseline conditions of bear occurrence and prevalence. As some bait sites are in close proximity to the Final Preferred Route, it is possible that their continued use may be affected by the Project. Manitoba Hydro is proposing to work with the outfitter to establish new bear bait sites prior to construction and include them in a continued camera trap survey along with the baseline locations. Bear occurrence and prevalence is measured by number of trail camera trigger events occurring at minimum 30 minute intervals.

Objective(s)

- *The objective of the Black Bear Bait Site Camera Trap Survey is to analyse bear occurrence and prevalence at bait site locations prior to, during and post construction of the Project*

Applicable Project Component(s): *New ROW for the D604I Transmission Line*

Monitoring Activities

Table 4-17 Outfitter Resource Use

Key Monitoring Activity	Phase	Task Description	Parameter(s)	Site Location	Duration	Frequency	Timing	Measurements/Observations
Black Bear Bait Site Camera Trap Survey	*Pre-construction*	*Camera Trap survey to measure use of bear bait sites prior to development*	*Number of black bears frequenting bait sites*	*Bear Bait Sites*	*Pre-construction*	*Biannual*	*Spring and Fall*	*Occurrence and Prevalence*
	Construction	*Camera Trap survey to measure use of bear bait sites during to development*	*Number of black bears frequenting bait sites*	*Bear Bait Sites*	*During construction*	*Biannual*	*Spring and Fall*	*Occurrence and Prevalence*
	Post-construction	*Camera Trap survey to measure use of bear bait sites post development*	*Number of black bears frequenting bait sites*	*Bear Bait Sites*	*2 yrs*	*Biannual*	*Spring and Fall*	*Occurrence and Prevalence*

Manitoba Hydro is committed to:

- *Provide camera trap equipment;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations, Metis and Manitoba Sustainable Development.*

Responsibilities of Environmental Monitor include:

- *During construction phase daily activities, record observations of bear, dens and tracks, ungulate mortality sites near bait sites within project footprint or access routes;*

- *Record observations with photo and waypoint and store in EPIMS.*

Specialist will:

- *Work with local outfitter to conduct camera trap survey to collect black bear occurrence and prevalence data*
- *Collect and analyze black bear data to assess if there are project-related effects on outfitter operations.*
- *Report on monitoring efforts, including identification to Manitoba Hydro of any unanticipated effects on black bear bait sites discovered through monitoring activities*
- *Through an adaptive management process, make recommendations for ongoing improvements to the monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analyses*

Decision Trigger(s)/Threshold(s) for Action

- *Trail camera trigger events at bait site locations near the PDA decline significantly relative to bait site locations distant from the PDA.*
  - *Action: Report results to the local outfitter and discuss findings.*

5.0 ADAPTIVE MANAGEMENT

The Canadian Environmental Assessment Agency (CEAA) defines adaptive management as "the implementation of new or modified processes, procedures and or mitigation measures over the construction and operation phases of a project to address unanticipated environmental effects" (CEAA, 2015). Adaptive management is considered a planned and systematic process used to continuously improve environmental management practices by learning about their outcomes. The use of an adaptive management process allows for the flexibility to identify and implement new mitigation measures or to modify existing ones during the life of a project (CEAA, 2015). Although definitions of adaptive management vary depending on the source, there are fundamental concepts of adaptive management that are universal and fundamental (British Columbia Ministry for Forests and Range, 2015) which include the following:

- Learning and reducing key uncertainties
- Using what is learned to change policy and practice
- Focus is on improving management
- Adaptive management is formal, structured and systematic

Manitoba Hydro has accumulated information and lessons learned from previous monitoring programs. The successes of those programs have been reviewed and considered in the development of this plan. Previous weaknesses have been adapted and improved upon to further enhance this plan's approach, methods and key environmental monitoring activities.

The Environmental Protection Program, of which the Manitoba-Minnesota Transmission Project Environmental Monitoring Plan is part of, will be designed to be adaptive and responsive throughout the Project lifecycle. The management of any low to moderate levels of uncertainty can be achieved for the proposed project by the implementation of an adaptive management process which will help to facilitate actions if any unforeseen effects occur and will result in the identification of new or modified mitigation (British Columbia Environmental Assessment Office, 2013).

Program documents, processes, procedures and mitigation measures will be continuously evaluated by inspection, monitoring and communication programs. Audits and reviews will be conducted to facilitate updates to the program through an adaptive management process (Manitoba Hydro, 2013). Within the Environmental Protection Program, adaptive management will take place in two primary areas: at the management level, involving changes with the program structure itself; and at the implementation level, which will involve individual mitigation measures as management and implementation teams evaluate the on-site effectiveness of mitigation strategies or the program as a whole. Scheduled update meetings between

departments, annual reviews of the program and its effectiveness will take place to foster the adaptive management process.

Annual reviews will be conducted by Licensing and Environmental Assessment in consultation with Contractor and Manitoba Hydro personnel, regulators and stakeholders. The results of each annual season review will be summarized in a report that documents the issues addressed and provides recommended updates to applicable components of the Environmental Protection Program.

6.0 REPORTING

Reports detailing results of monitoring activities will be submitted to SD on an annual basis. Reports will be generated annually, and provided to Manitoba Sustainable Development. Notifications of new reports on the website will be communicated to relevant federal and provincial regulatory agencies.

In addition to annual reports summarizing activities and general findings, technical reports will be prepared at appropriate intervals during the construction and post construction phases of the Project. These reports will on a cumulative basis compile and analyze monitoring results during the relevant period, and based on those results, make recommendations concerning the need for any changes to the mitigation or monitoring approach. Manitoba Hydro will present and discuss monitoring results with SD, First Nations and Metis on request as the project proceeds.

Any significant unanticipated project effects discovered through monitoring activities or where regulations dictate will be reported immediately to SD.

7.0 MONITORING METHODS

This section provides detailed information on the methods to be used to monitor the Valued Components and environmental indicators identified in Section 4.0.

7.1 FISH AND FISH HABITAT

7.1.1 Stream Crossing Assessments

Stream crossing sites will be evaluated for adherence to prescribed mitigation and effectiveness of mitigation.

Field studies will be undertaken at all stream crossings assessed as fish habitat during active construction and in the first spring following construction. Riparian buffers will be evaluated by measuring their width from the stream or floodplain and comparing to the width prescribed, as well as evaluating the amount of vegetation left in the buffer and the clearing method used. Stability of stream banks and floodplain will be evaluated visually and rutting, slumping, or other damage to the ground noted. The presence of slash or disturbed sediment within the buffer will be recorded, as well as any evidence of erosion. Road crossings will be evaluated for appropriate grade and angle across the stream, and the presence of any organic debris remaining from a temporary bridge. If any erosion control measures were in place (blankets, silt fences) their effectiveness will be evaluated. Tower locations will be assessed to determine if they adhered to prescribed mitigation. Any further reclamation needed to meet the prescribed mitigation will be recommended.

7.2 VEGETATION AND WETLANDS

Information collected and prepared for the Project that will assist with environmental monitoring will be reviewed prior to fieldwork. Review documents include the vegetation and wetlands technical report and the Project Environmental Impact Statement. Applicable regulatory documents will also be referred to for environmental monitoring requirements including the Environment Act Licence and the Transmission Project Report on Public Hearing.

To select monitoring sites for the Project, Manitoba Hydro's Environmental Protection Information Management System (EPIMS) map viewer will be used to view recent project footprint imagery (pre-clearing digital ortho-rectified imagery). Previous sampled sites and environmentally sensitive sites, identified from the Project Environmental Assessment, will be considered for potential sampling locations. Suitable sites will also be selected based on vegetation type, accessibility, disturbance, landowner permission, and whether invasive and non-native species may establish and proliferate. Sites selected on private lands will be

submitted to Manitoba Hydro to determine property ownership and contact information. Landowners will be contacted to request permission for access to their properties.

Components of the biophysical environment to survey and monitor for the Project include wetlands, species of conservation concern, non-native and invasive species, and traditional use plants.

7.2.1 Wetlands

Wetland vegetation will be sampled, and the accuracy of EIS predictions and effectiveness of mitigation measures implemented will be verified. Digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of wetlands and potential sampling sites for assessment of RoW effects will be used. Pre-construction surveys will involve quantitative native vegetation surveys in selected wetlands along the transmission line RoW.

Sites selected for native vegetation surveys will have plots established for future vegetation monitoring. The native vegetation survey will consist of establishing sample plots on sites with relatively homogenous vegetation. Vegetation will be sampled for composition, abundance and structure. Sampling of selected sites will follow methods outlined by Redburn and Strong (2008) and involve the establishment of five 2.5 m by 2.5 m quadrats with a 1 m by 1 m nested quadrat spaced at 5 m increments along a 30 m transect for wetland shrubs 1 - 2.5 m tall and herbs and low shrubs ≤1 m tall, respectively. Transects will be located on sites considered representative of the stand being sampled. The first quadrat will be placed at the 5 m mark. The composition of wetland tree cover >2.5 m tall will be estimated using a 20 m by 30 m plot centered on each transect. Transects will be permanently located along the transmission line RoW, longitudinally, and approximately in the centre of the RoW, but off the equipment path. Plant cover will be estimated to the nearest 1% for species <15% cover and nearest 5% for those with higher cover. Other incidentally observed species will be recorded. GPS coordinates and photographs will be taken at each sampling site. Wetlands will be classified according to the Canadian Wetland Classification System (National Wetlands Working Group 1997).

Environmental monitoring of wetlands will occur on cleared portions of the RoW. Environmental monitoring will involve vegetation monitoring using the identical quantitative methods described above (native vegetation survey). Wetlands will be sampled for herbaceous and shrub cover along the RoW to assess the vegetation. Incidental species observations will be recorded. All sites will be photographed.

Permanently located sampling areas will be used to record the change in vegetation that can be systematically monitored through time. The collection of wetland vegetation information will occur at a similar time during the growing season to maximize the comparability of data. A

sample size will be accomplished that will allow for the detection of differences statistically in vegetation over time, that will consider size of area and accessibility.

7.2.2 Plant Species of Conservation Concern

Surveys for species of conservation concern, and the accuracy of EIS predictions and effectiveness of mitigation measures implemented will be verified. Pre-construction surveys for species of conservation concern will be conducted in portions of the project footprint that were not previously surveyed and have the greatest potential for supporting these plants along the transmission line RoW. Digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro will be used for the identification of potential survey sites and assessment of RoW effects.

Rare plant surveys initially will involve the review of species observed previously along the transmission line RoW, as well as the database compiled by the Manitoba Conservation Data Centre for species of conservation concern, which includes species that are rare, disjunct, or at risk throughout their range or in Manitoba. Species of conservation concern encompasses plants ranked very rare to uncommon by the Manitoba Conservation Data Centre, and those listed under the provincial *Endangered Species Act*, the federal *Species at Risk Act,* or listed by the Committee on the Status of Endangered Wildlife in Canada. Flowering times and preferred habitat for species of conservation concern known to occur in the Project area will be reviewed.

Surveys will be conducted on foot by experienced vegetation ecologists. Survey transects are anticipated to be 100 m in length, with one or two parallel transects per quarter section located perpendicular to the ROW. Transects will begin at the edge of the PDA and continued perpendicular across the ROW to the opposite end of the PDA. Transect survey speed will range from approximately 0.5 km per hour to 5 km per hour depending on vegetation density at each site. Each transect will be placed at least 100 m away from any disturbance (*e.g.* roads). Transect locations will be determined in the field. All vascular plant species observed will be identified and recorded until no new species were found. Survey methods follow the *Species Detection Survey Protocols for Rare Prairie Plant Surveys* from the Government of Saskatchewan (2014). Rare plant locations will be recorded using a GPS receiver. Rare plant individuals will be counted, phenology will be recorded and population extent will be estimated. Additional information collected will include associated plants observed. Photographs will be captured in the field.

Environmental monitoring for species of conservation concern will occur after clearing of the RoW. Monitoring for species of conservation concern will involve the review of species previously observed during pre-construction surveys. Monitoring will occur at selected sites along the RoW to investigate the presence/absence of the plants which were observed prior to clearing and construction. Species of concern observed in the field will have the following

information recorded: GPS coordinates verification, individuals counted, population extent estimated, phenology recorded, and associated plants recorded. Photographs will be captured in the field.

7.2.3 Invasive Plant Species

Sampling will occur for invasive plant species introduction, and the accuracy of EIS predictions and effectiveness of mitigation measures implemented will be verified. Initially, digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of potential sampling sites and assessment of RoW effects will be used. Pre-construction surveys will involve quantitative native vegetation surveys at selected sites along the transmission line RoW.

Sites selected for native vegetation surveys will have plots established for future vegetation monitoring. The native vegetation survey will consist of establishing sample plots on sites near roads, rail lines, rivers or disturbances, which may provide pathways for these species. Vegetation will be sampled for composition, abundance and structure. Sampling of selected sites will involve the establishment of five 2.5 m by 2.5 m quadrats with a 1 m by 1 m nested quadrat spaced at 5 m increments along a 30 m transect for shrubs 1 - 2.5 m tall and herbs and low shrubs ≤1 m tall, respectively. The first quadrat will be placed at the 5 m mark. The composition of tree cover >2.5 m tall will be estimated using a 20 m by 30 m plot centered on each transect. Transects will be permanently located along the transmission line RoW, longitudinally, and approximately in the centre of the RoW, but off the equipment path. Plant cover will be estimated to the nearest 1% for species <15% cover and nearest 5% for those with higher cover. Other incidentally observed species will be recorded. Ground cover estimates (%) will be recorded and include exposed soil, litter, rock, water and wood. Site condition measurements will include slope and aspect. GPS coordinates and photographs will be taken at each sampling site.

Environmental monitoring will occur after clearing, and along the RoW. Environmental monitoring will involve vegetation monitoring using the identical quantitative methods described above (native vegetation survey). Vegetation will be sampled for herbaceous and shrub cover along the RoW to assess the vegetation. Incidental species observations will be recorded. Relative population densities and extent will be recorded for incidental invasive species observed. All sites will be photographed.

Permanently located sampling areas will be used to record the change in vegetation that can be systematically monitored through time. The collection of vegetation information will occur at a similar time during the growing season to maximize the comparability of data. A sample size will be accomplished that will allow for the detection of differences statistically in vegetation over time, that will consider size of area and accessibility.

7.2.4 Traditional Use Plant Species

Vegetation will be sampled for traditional use plant species important to First Nations and Metis. The accuracy of EIS predictions and effectiveness of mitigation measures implemented will be verified. Digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of potential sampling sites for assessment of RoW effects will be used. Pre-construction surveys will involve native vegetation surveys at selected sites along the transmission line RoW.

Sites selected for surveys will have plots established for future vegetation monitoring. Vegetation will be sampled for composition, abundance and structure. Sampling of selected sites will involve the establishment of quadrats spaced at 5 m increments along a 30 m transect for shrubs and herbs. The composition of tree cover will be estimated using a plot centered on each transect. Transects will be permanently located along the transmission line RoW, longitudinally, and approximately in the centre of the RoW, but off the equipment path. Plant cover will be estimated to the nearest 1% for species <15% cover and nearest 5% for those with higher cover. Other incidentally observed species will be recorded. Ground cover estimates (%) will be recorded and include exposed soil, litter, rock, water and wood. Site condition measurements will include slope and aspect. GPS coordinates and photographs will be taken at each sampling site.

Environmental monitoring will occur after clearing, and along the RoW. Environmental monitoring will involve vegetation monitoring using the identical methods described above. Vegetation will be sampled for herbaceous and shrub cover along the RoW to assess the vegetation. Incidental species observations will be recorded. All sites will be photographed.

Permanently located sampling areas will be used to record the change in vegetation that can be systematically monitored through time. The collection of vegetation information will occur at a similar time during the growing season to maximize the comparability of data. A sample size will be accomplished that will allow for the detection of differences statistically in vegetation over time, that will consider size of area and accessibility.

7.3 WILDLIFE AND WILDLIFE HABITAT

7.3.1 Herptiles

7.3.1.1 Amphibians

To establish a benchmark for wetland condition prior to construction, wetland surveys will be conducted at wetlands supporting northern leopard frogs. Pre-construction wetland surveys will include water quality measurements and amphibian surveys in the spring and fall, at wetlands that are within or are adjacent to the Project Development Area (PDA). Spring surveys (late-April through mid-May) will overlap the northern leopard frog breeding period; fall surveys (late-August to late-September) will overlap their overwintering congregation period. Any additional sites within or adjacent to the PDA not previously examined during baseline environmental surveys will be identified through land cover mapping and ortho-photo interpretation and will be included in the wetland surveys. All northern leopard frog surveys will also include surveys for eastern tiger salamander.

Water quality data to be collected will include: pH, electrical conductivity, total dissolved solids, total suspended solids, temperature, and turbidity. Measurements will be taken at three locations in the shallow water zone at the edge of each wetland at approximately 30-50 cm depth and 2-5 m from the shoreline. Measurements from the three locations will be averaged to estimate site composite values at each wetland. Additional site characteristics will be recorded, including vegetation community (e.g., dominant plant species, presence of emergent and submergent vegetation) and weather conditions (e.g., temperature, wind direction and speed, cloud cover and precipitation).

Amphibian surveys during the spring survey period will include daytime call surveys during water quality monitoring, nocturnal call surveys, visual encounter surveys, and incidental detections. Fall surveys will include visual encounter surveys (VES) and incidental detections of both northern leopard frogs and salamanders.

Call surveys consist of a 5 minute listening period following a 2 minute waiting period to allow disturbance associated with observer access to subside. Relative abundance and call rank will be recorded, based on the widely accepted protocol by Mossman et al. (1998) and Saskatchewan Ministry of Environment (2014a, 2014b). In the case of nocturnal call surveys, surveys will be conducted between 0.5 hrs after sunset and 0100h and in weather conditions with winds <20km/hr, ambient temperature ≥5°C, water temperature ≥10°C, and/or rain no heavier than a drizzle (Kendell 2002; USGS 2012). Visual encounter surveys will consist of two biologists walking side by side 5 m apart along wetland margins or stream banks while documenting any amphibians observed within the waterbody 1 m from shore, in a 1 m strip of the shoreline, and within 3 m upland from the shoreline/water's edge. In wetland ponds that may

be suitable for salamanders (i.e. no fish, not marshy), biologists will wade through the pond watching for larval movement, which could represent salamanders. The VES will be conducted for a prescribed amount of time (20 minutes) and under seasonal air temperatures. Surveys will be suspended if precipitation exceeds a light rain or ambient air temperatures drop below 15°C. Incidental observational data will be collected opportunistically throughout the survey periods.

Construction phase wetland monitoring will take place during the amphibian breeding and overwintering congregation periods immediately following construction activity. Water quality readings will be taken at similar times of day to pre-construction readings. Construction phase monitoring would only take place within wetlands where Project activity had occurred.

7.3.1.2 Common Garter Snakes

Pedestrian surveys will occur within 200 m of select portions of the New ROW tower locations prior to ROW clearing where potential suitable habitat or hibernacula is identified. The pedestrian survey will be conducted by two biologists, and will include a grid-like walk of the area while 10 m apart. Where suitable habitat or hibernacula are identified (i.e. rock piles, rock outcrops, or pits), the effectiveness of applied mitigation (*i.e.*, setback distances) will be verified through follow-up monitoring. Follow-up monitoring will consist of a walk-through of the known suitable habitat or hibernacula area immediately following construction to determine whether mitigation measures were adhered to.

7.3.2 Birds

7.3.2.1 Bird – Wire Collisions

Bird diverter monitoring will test the hypothesis that bird diverters are sufficient in reducing mortality of birds due to collisions with the transmission line to a level that is negligible in areas determined to have a high risk of collision. As such, the null and alternate hypotheses state:

- H_0 (null): The mortality of birds at high-risk areas with bird diverters will not be different than the mortality of birds at low-risk areas without bird diverters.
- H_1 (alternate): The mortality of birds at high-risk areas with bird diverters will be greater than the mortality of birds at low-risk areas without bird diverters.

To test this hypothesis, a Control-Impact study design will be implemented. The Before-After Control-Impact study cannot be implemented for this study as mortality of birds is not expected prior to the installation of the transmission lines. For the purpose of this study, control sites will consist of ESS's considered to be 'low-risk' and impact sites will consist of ESS's considered to be 'high-risk', as identified in the EIS.

If transmission lines containing diverters yield negligible avian mortality, then the mortality of

birds relative to the number of bird passes at high-risk transmission lines with diverters should be comparable or lower than those at low-risk transmission lines with no diverters. Using the ratio of mortality to number of bird passes instead of simply the numbers of avian mortality allows correction for differences in bird activity between 'high-risk' and 'low-risk' sites.

Statistical analysis will be conducted using Generalized Linear Models to compare estimated mortality rates at high-risk versus low-risk sites. Assumptions of parametric testing will be determined and data transformations applied where necessary and/or appropriate. Non-parametric testing will be applied where assumptions were violated and/or data could not be transformed. Analyses will be conducted separately for each season and then with data from all seasons pooled. If no significant difference is observed between high-risk versus low-risk sites, then mitigation measures (placement of diverters) will be considered effective in maintaining low avian mortalities due to collisions with wires. Additionally, mortality studies may allow for the determination of the biological, environmental and engineering factors important in influencing collisions as well as the circumstances (e.g., weather, time of day, season) under which birds are most likely to collide with the wires.

Flight Activity Surveys

Before every mortality survey, biologists will monitor flight activity of birds across the transmission line right-of-way (ROW) section being searched that day. Biologists will count the number of birds that fly across the ROW within each of the paired spans within a period of three hours (three one-hour intervals). Mortality searches will be conducted directly after these visual flight surveys. All birds will be recorded to allow for collision rate estimates (CRE). CRE will be calculated as the estimate of total collisions (based on carcass surveys and correction factors described below) divided by the estimated number of possible bird-wire interactions per day.

Carcass Searches

To estimate the mortality of birds along the transmission line per year at the Project site and test the adequacy of diverters, carcass searches will be conducted at select ESS's. Due to the many confounding variables involved in monitoring avian mortality at transmission lines, no standardized protocols have been developed for post-construction mortality searches for transmission lines. The Avian Power Line Interaction Committee (APLIC,2012) and methodology proposed by De la Zerda and Rosselli (2002) and by Barrientos *et al*. (2011) provide valuable guidance and considerations for designing mortality studies and these will be included in this proposed monitoring plan.

Searches for dead or injured birds will be performed at high-risk sites and an equivalent number of low-risk sites. Each of the mortality monitoring sites will consist of the area under one span of hydro wires. A span is defined as the length of ROW between two

transmission towers. The spans closest to the location where monitoring is desired will be surveyed. Surveys will be focused during peak activity seasons which will include spring migration (April and early May), late breeding season when adults will be feeding chicks (mid-June and July) and fall migration (late August to late September). During each of the three survey seasons, four rounds of carcass searches will be conducted at each ESS.

Carcass searches will be conducted by two trained biologists. Every morning, biologists will conduct both mortality searches and bird passage monitoring. Teams will note environmental conditions at the start and end of each survey day including notable weather events during the previous seven days (high winds, storms, fog) based on Environment Canada historical data, where available. Surveyors will position themselves at opposite ends of a linear transect running from one of the transmission towers to the other. Using a rope to maintain position along the transect, biologists will maintain a distance of 3 m from the rope and walk parallel to the rope at a constant pace toward each person‘s opposite tower. At completion of the linear transect, the guiding rope will be moved 12 m beside the previous line and the biologists will survey a second transect line. This procedure will be repeated until five linear transects have been searched which will approximately cover the width of the ROW under each span. While conducting searches, biologists will search for any dead birds within a 6 m field of view. Upon finding an avian carcass, the following data will be recorded:

- GPS position of the carcass;
- Location of the carcass with respect to the transmission line;
- Species;
- Sex;
- Age;
- Date or approximate time of death;
- Physical injuries and general body condition;
- Probably cause of death; and
- Evidence of scavenging.

Sampling Biases

Several factors affect the accuracy of mortality estimates recorded in the field. Four sampling biases are of particular importance in estimating the number of birds killed by a section of transmission line:

- Searcher efficiency;
- Scavenger removal;
- Habitat differences; and
- Crippling loss.

Searcher Efficiency Trials

Biologists conducting mortality searches within the ROW may not find all of the carcasses present. Carcasses may be overlooked depending on a number of factors including the density and height of vegetation in the ROW, the route walked by the searcher, the state of the carcass, etc. As such, searcher efficiency trials aid in correcting this bias. During the course of the mortality search studies, a known number of carcasses will be placed by a tester at locations within the search area unknown to searchers being tested. The proportion of purposefully placed carcasses found by searchers will represent their searcher efficiency and will be used to correct for this bias when estimating avian mortality at the Project site. To account for differences in searcher efficiency between different sized birds, birds of all major size categories will be represented in searcher efficiency trials.

Scavenger Removal Trials

Scavenger removal trials are used to estimate the rate at which carcasses are removed from the ROW by other wildlife. Scavenger removal trials will consist of placing carcasses at known locations within the ROW and checking these locations periodically to determine if and when they are removed. Trials will continue until all carcasses are removed or have completely decomposed. Scavenger removal trials may be conducted concurrently with mortality searches. To account for differences in scavenging rates between different sized birds, birds of all major size categories will be represented in the scavenger removal trials.

Habitat Differences

Due to a variety of factors, some portions of a PDA may not be searchable. Most of the unsearchable habitats will be avoided to the extent possible during the initial selection of ESS's. For sites where this is not possible, the total area searched at those sites will be calculated and search area will be corrected in the calculated mortality estimates.

Crippling Loss

Crippling loss is the percentage of birds killed or injured by striking a component of a transmission line, yet may fall or move beyond the Study Area. Crippling loss may be studied by monitoring the number and behaviour of birds flying past a section of transmission line or may be implied from other studies.

7.3.2.2 Sharp-tailed Grouse Lekking Sites

Sharp-tailed grouse have a reproductive system known as lekking, where males form large groups and vocalize and display at the same time in attempts to attract females. Leks are generally elevated sites associates with sparse or disturbed vegetation and are typically used

for many years. Sharp-tailed grouse nesting usually occurs in shrub habitat located close to the lek.

The construction and installation of the transmission line has the potential to adversely affect the abundance of Sharp-tailed grouse at lekking sites by way of habitat loss or disturbance during construction. It also has the potential to increase rates of predation if birds of prey (raptors) nest on nearby transmission line towers. As such, the Sharp-tailed grouse lek monitoring will test two hypotheses: 1) that the installation of the transmission line affects the abundance of male Sharp-tailed grouse displaying at lekking sites, and 2) that the installation of the transmission line increases Sharp-tailed grouse predation by raptors. As such, the null and alternate hypotheses state:

Hypothesis 1:

- H_0 (null): The installation of the transmission line does not affect the abundance of male Sharp-tailed grouse at lekking sites.
- H_1 (alternate): The installation of the transmission line does affect the abundance of male Sharp-tailed grouse at lekking sites.

Hypothesis 2:

- H_0 (null): The installation of the transmission line does not increase Sharp-tailed grouse nest predation by raptors.
- H_1 (alternate): The installation of the transmission line does increase Sharp-tailed grouse nest predation by raptors.

To test these hypotheses, a BACI study design will be implemented. Monitoring for Sharp-tailed grouse will require conducting searches for leks in the vicinity of Sharp-tailed grouse habitat and grouse observations as presented in the EIS. Due to the large area of habitat for this species along the proposed transmission line route, an aerial survey for groups of Sharp-tailed grouse will be undertaken in early spring to scope for potential lekking locations. Aerial surveys offer an efficient means of covering a large area and locating individuals of a species that is secretive yet flushes easily. Sharp-tailed grouse stay close to breeding sites all year-round, meaning baseline observations may indicate the nearby presence of a lekking site. The location and number of flushed grouse will be recorded on a GPS and the lek will be subsequently surveyed from the ground. Impact and control sites will be selected in areas within and beyond the predicted zone of impact, respectively.

Once leks are identified, ground surveys will consist of scanning candidate lekking sites with binoculars and a spotting scope and listening for sounds of displaying grouse. Surveys will be conducted on foot or by driving along roads and stopping near candidate sites. When a lek is located, it will be monitored using the Sharp-tailed Grouse Survey Protocol (WDNR, 2013) and

Sensitive Species Inventory Guidelines (Government of Alberta, 2010) or other applicable monitoring protocols. Following the WDNR (2013) protocol, surveys will begin 45 minutes before sunrise and will end 1 - 2 hours after sunrise. All lekking activities will be recorded as well as the number of males and females present. Weather conditions will be recorded and surveys will only be conducted on clear, calm mornings with winds less than 15 km/hr. Other environmental conditions such as anthropogenic noise, nearby infrastructure or the presence of other wildlife (particularly nesting or perching raptors) will also be recorded. All efforts will be made by surveyors to minimize disturbance to all birds present at the lekking sites.

7.3.2.3 Birds of Species of Conservation Concern

Species of conservation concern, which includes SAR and provincially rare species, have the potential to be adversely affected by the construction of the transmission line. Such impacts may include displacement of birds and/or decreased nesting success due to habitat disturbance. The species of conservation concern monitoring will test the hypothesis that the development of the transmission line adversely affects the density and diversity of species of conservation concern in the vicinity of the Project, particularity golden-winged warbler. As such, the null and alternate hypotheses state:

Hypothesis 1:

- H_0 (null): The construction and installation of the transmission line does not affect the density and diversity of species of conservation concern.
- H_1 (alternate): The construction and installation of the transmission line does affect the density and diversity of species of conservation concern.

To test these hypotheses, a BACI study design will be implemented to evaluate Project-related effects on species of conservation concern. Permanent monitoring plots (point count stations) will be established along transects throughout the transmission line route and will be stationed at areas identified in the EIS as supporting species of conservation concern, including those areas not predicted to be impacted by the Project (control sites). Non-species of conservation concern will also be recorded during these surveys to document changes in overall species density and diversity. Permanent plots (both impact and control plots) will be established and monitored using protocols established by Bird Studies Canada (BSC) which includes a minimum of two site visits spaced approximately ten days apart. Where feasible, efforts to pair permanent monitoring plots with baseline survey stations, as identified in the Wildlife and Wildlife Habitat Technical Data Report, will be incorporated into the design.

Permanent monitoring plots will include a mixture of early morning breeding bird surveys completed between sunrise and no later than five hours after sunrise, marsh monitoring surveys using playback devices completed within three hours of sunset, and crepuscular bird

surveys completed after sunset. The number of monitoring plots may vary depending on accessibility, weather constraints and/or logistical constraints.

Morning breeding bird surveys and marsh bird surveys will be conducted as ten minute point counts located at least 250 m apart in which all birds are recorded at intervals of 0-50 m, 50-100 m, >100 m and flyovers to allow for the calculation of abundance, density and species diversity (based on birds per unit area). Crepuscular bird surveys (e.g., for Eastern Whip-poor-will, Common Nighthawk and Short-eared Owl) will be based on methodology provided in BSC's Whip-poor-will Roadside Survey Participant's Guide. Crepuscular bird surveys will consist of six minute point counts along a predetermined route where surveyors listen for calling nighthawks or use binoculars to scan for flying nighthawks or owls. Surveys will conclude at the onset of complete darkness. All crepuscular bird surveys will be conducted from roadside locations due to health and safety concerns relative to work at night in remote areas.

Statistical analysis will be conducted using Generalized Linear Models and/or non-parametric techniques to evaluate the effects of the Project on the density and diversity of breeding birds, with an emphasis on species of conservation concern.

7.3.2.4 Birds of Prey

An aerial survey for raptor nests will be conducted in the year prior to construction to locate any raptor stick nests within the proposed footprint, or within 500 m of the proposed footprint. Surveys will occur on calm, clear days with good viewing conditions and will be flown at an altitude of 150 feet and at a speed of 100 km/hr. One observer skilled in identifying raptor species and their nests will be positioned on both sides of the helicopter.

During construction, crews will be given instructions on how to look for large raptor stick nests while clearing vegetation for the ROW and other project components, in order to prevent destroying these nests. Post-construction, incidental surveys for raptor nests will be conducted by maintenance staff and during asset inspection surveys.

7.3.3 Ungulates and Predators

Natural wildlife habitat in the Project EIS was assessed using the Forest Resource Inventory (FRI), a linear disturbance and protected areas. Project effects were predicted by overlaying the proposed project footprint on to the habitat map. .

Project-related clearing, disturbance, roads and trails will be documented through a combination of aerial and ground surveys and remote-sensing imagery. . The data will be spatially referenced and stored in GIS for ongoing analyses during the mammals monitoring effort. The information will be used to generate a terrestrial habitat map for construction, and to determine if there are any impacts outside of the designated project footprint.

7.3.3.1 Elk

Baseline data for elk were gathered using a combination of methods described in Chapter 9 of the EIS: large mammal survey using camera trap arrays, aerial winter track surveys, and elk breeding survey using call broadcasts.

The camera trap program consisted of 56 cameras, 18 of which were located in a paired configuration along the final preferred route, 18 in a paired configuration along an alternate route, and 20 non-paired cameras along the existing M602F 500 kv transmission line (Map 7-1). In the paired configurations, one camera was located on a proposed transmission line route and the other in comparable habitat located approximately 500-800 meters from the route (i.e., in control sites). Control cameras were located at distances greater than the zone of reported linear disturbance effects on elk (Storlie 2006; Morgantini [1996] in Jalkotzy 2005). The cameras recorded mammal data between April and October, 2014. In 2015 and 2016, they were redeployed along the final preferred route (FPR) and select locations along M602F from April to October.

Systematic aerial winter track surveys were conducted in five 20 x 20 km survey blocks in February 2014 (Map 7-2), in four 20 x 20 km survey blocks in January 2015 (Map 7-3), and in two 20 x 20 km survey blocks in March 2016 (Map 7-4). Survey design was modified each year as route options were refined. In 2016, surveys focused on the southernmost survey blocks (Map 7-4) having the greatest potential to support elk. The area between these survey blocks was also surveyed to increase coverage of the entire southern portion of the preferred route (Map 7-4).

Elk breeding surveys were conducted along five road-based transects during the elk breeding period (September 2014) (Map 7-5). Surveys were repeated throughout the month to improve the potential of detecting elk if elk were present in the area.

As described in the EIS, a change in habitat availability associated with ROW clearing is anticipated to be negligible for the Vita elk herd because routing of the New ROW avoids the core areas known to support the elk (*i.e.*, near Vita and Arbakka, MB). As such, elk monitoring will test the following null and alternate hypotheses:

Hypothesis 1:

- H_0 (null): The construction and operation of the transmission line does not affect the distribution and occurrence of the Vita elk population.
- H_1 (alternate): The construction and operation of the transmission line does affect the distribution and occurrence of the Vita elk population.

To test this hypothesis, a Before-After-Control-Impact (BACI) study will be implemented using methods applied during baseline mammal surveys. The distribution and occurrence of the Vita elk population will be mapped using data gathered from systematic aerial track surveys, incidental observations (by project staff, and reported by other sources), and remote infrared (IR) camera trap arrays (Kays *et al.* 2009) situated along the ROW and adjacent suitable habitat where the RAA and the Vita elk range overlap. In Manitoba, the Vita elk range is considered to be fall/winter range, therefore monitoring effort will largely be concentrated during the fall and winter period, during the construction and initial operation stages of the Project. Annual spring pellet group transects (Kie 1988) will be considered as a supplemental or alternative method (if needed based on the initial year of data collection using other methods) to monitor occurrence and distribution during construction and operation phases. Elk-crop damage reports will be compiled and reviewed for evidence that would suggest elk use of the LAA is changing.

A change in mortality-risk will be measured by monitoring incidents of elk-vehicle collisions (construction phase) related to project access and activities. Change in available access, and elk occurrence in relation to project-related access will be used to help measures change in hunter and predator accessibility to suitable elk habitat. Occurrence of predators (i.e. wolves utilizing project disturbance) will be compared to elk location data to qualitatively assess overlap and potential predation-risk to elk from pre-disturbance state.

Large Mammal Camera Trap Study

Large mammals are the primary target of the camera trap study, but it will also be used to detect other species. In this study, IR camera traps arrays are used to monitor mammal activity along the FPR (i.e., potentially affected sties) and adjacent control areas (>500 m from the FPR). Minimum distance for control sites is based on elk response to road and transmission line disturbance. Storlie (2006) found reduced elk use within 200 m of primary roads and 100 m of secondary roads. Morgantini [1996] (in Jolkotzy 2005) found reduced elk use within 300 m of paved roads and transmission lines during the fall hunting season.

A grid system will be laid over the project between Provincial Trunk Highway (PTH) 12 and the Canada-United States border that includes:

- 1x1 km grid cells centered over the RoW (affected cells); and

- 1x1 km grid cells filling the remainder of the RAA (unaffected cells).

Each monitoring year, remote cameras will be deployed in a random sample of grid cells that is stratified by habitat type and potentially affected/unaffected survey areas. A relative abundance index (RAI; number of photo events / camera days) will be calculated for elk and other focal species, by season. The RAIs will then be related to underlying habitat data (FRI and burn history) and other biologically relevant covariates (*e.g.*, road and trail density). Logistic regression models and an information theoretic approach will be used to test hypotheses relating to the distribution and relative abundance of elk in relation to the Project. Biologically relevant models and candidate model sets will be developed *a priori* and Akaike Information Criterion (AIC) will be used to compare and rank competing models (Burnham and Anderson 2002). Annual results will be used to compare pre- and post-construction survey periods.

Aerial Winter Track Survey

Aerial winter track surveys will be conducted in 2- 20 x 20 km survey blocks located along the the FPR. In 2016, the area between these two blocks (a 10 km buffer of the FPR; Map 7-4) was added to enhance coverage of the section of the FPR with the greatest potential for improved local hunter and predator access. This area will also be monitored during construction and operation.

Surveys are conducted along 400-m-wide, east-west transects spaced 1 km apart using a Bell 206 Jet Ranger helicopter and three observers: the front-left and rear-right observers act as primary observers on their respective sides while the data recorder in the rear-left acts as a secondary observer. Surveys are conducted at approximately 120 m above ground level at speeds between 90-110 km/hr during periods of good environmental conditions:

- wind <30 km/h;
- cloud ceiling >150 m;
- precipitation not exceeding a light, intermittent snowfall;
- absence of fog;
- during periods of adequate daylight (from one half hour after sunrise to one half hour before sunset); and
- with a snow base of ≥25 cm (MCWS 2015, unpublished).

To identify mammal tracks in the snow during aerial surveys, surveys are typically undertaken within two to three days after a snowfall event (5-10 cm; BC RIC 1998).

A handheld GPS will be used to collect a track log that recorded coordinates at one-second intervals. Upon observation of a mammal track or individual, the data recorder will record the species, number of tracks, and number of individuals, along with the associated time (hh:mm:ss) which will be used to extract a matching coordinate from the GPS track log. The georeferenced data will be summarized and mapped using ArcGIS® (ESRI 2012).

7.3.3.2 White-Tailed Deer

Baseline data for white-tailed deer were gathered using a combination of methods described in Chapter 9 of the EIS: large mammal survey using camera trap arrays and aerial winter track surveys. Both of these survey programs, summarized under Section 7.3.3.1, also yielded data on white-tailed deer.

As described in the EIS, clearing of the new ROW during construction may cause temporary avoidance by white-tailed deer due to sensory disturbance. However, as vegetation re-establishes along the ROW during operation, deer may be attracted to the edge habitat that forms along parts of the ROW, particularly in areas previously forested. The use of the ROW by deer and the access it creates for predators (e.g., wolves and coyotes) and hunters may elevate mortality risk to deer during operation. As such, white-tailed deer monitoring will test the following null and alternate hypotheses:

Hypothesis 1:

- H_0 (null): The construction of the transmission line does not affect the distribution of white-tailed deer.
- H_1 (alternate): The construction of the transmission line does affect the distribution of white-tailed deer.

Hypothesis 2:

- H_0 (null): The operation of the transmission line does not affect the distribution of white-tailed deer.
- H_1 (alternate): The operation of the transmission line does affect the distribution of white-tailed deer.

Hypothesis 3:

- H_0 (null): The operation of the transmission line does not change the mortality risk for white-tailed deer.
- H_1 (alternate): The operation of the transmission line does affect the mortality risk for white-tailed deer.

To test these hypotheses, a Before-After-Control-Impact (BACI) study will be implemented using methods applied during baseline mammal surveys. Distribution mapping of white-tailed deer will involve systematic winter aerial surveys of monitoring blocks along the project ROW to assess change in seasonal distribution relative to project infrastructure and predator (e.g., wolf and coyote) distribution. Monitoring will focus on suitable habitat on the eastern portion of the RAA. The survey blocks will be consistent with those used in 2015 and 2016 so that direct

comparisons can be made between baseline state and project disturbance states (construction and initial operation phases) (pre- versus post-disturbance). More information on how baseline data was collected can be found in the Wildlife and Wildlife Habitat TDR. Annual spring pellet group transects (Kie 1988) may be considered as a supplemental or alternative method (if needed based on the initial year of data collection using other methods) to monitor occurrence and distribution during the construction and initial operation phases.

Mortality-risk will mainly be assessed by monitoring incidents of deer-vehicle collisions (construction phase) related to project access and activities. Change in hunter and predator accessibility to suitable deer habitat will be assessed by comparing winter deer occurrence (pre- versus post-disturbance) relative to project-related access. Occurrence of predators (wolves/coyotes) utilizing project disturbance will be compared to deer location data to assess overlap and potential predation-risk to white-tailed deer. Deer-vehicle collisions will be monitored during the construction phase using incident reports from Project workers.

A change in mortality-risk will be measured by monitoring incidents of deer-vehicle collisions (construction phase) related to project access and activities. Change in available access, and deer occurrence in relation to project-related access will be used to help measures change in hunter and predator accessibility to suitable deer habitat. Occurrence of predators (i.e. wolves utilizing project disturbance) will be compared to deer location data to qualitatively assess overlap and potential predation-risk to elk from pre-disturbance state.

Large Mammal Camera Trap Study

The large mammal study and white-tailed deer data analysis will be carried out in the same manner as described previously for elk (See Section 7.3.3.1).

Aerial Winter Track Surveys

Aerial winter track surveys and white-tailed deer data analysis will be carried out in the same manner as described previously for elk (See Section 7.3.3.1).

7.3.3.3 Black Bear

Baseline data for black bear were gathered during the Large Mammal Study using camera trap arrays as described for elk in Section 7.3.3.1.

As described in the EIS, movement patterns of mammalian predators including black bear, may change in response to the cleared ROW. In areas of contiguous forest, use of the ROW by predators may increase during Project operations due to the ease of mobility. The use of the ROW by hunters may increase the mortality risk to black bears using the transmission line ROW As such, black bear monitoring will test the following null and alternate hypotheses:

Hypothesis 1:

- H_0 (null): The construction and operation of the transmission line does not affect the distribution of black bear.
- H_1 (alternate): The construction and operation of the transmission line does affect the distribution of black bear.

To test this hypothesis, a Before-After-Control-Impact (BACI) study will be implemented using methods applied during baseline mammal surveys. Distribution of black bear will be mapped relative to the project ROW using data collected by remote IR camera trap arrays (Kays *et al.* 2009). Use of cameras is a non-invasive and effective method to collect distribution data. During the construction phase Project workers will also record incidental sightings of black bear.

7.3.3.4 Wolves and Coyotes

Baseline data for wolves and coyotes were gathered using a combination of methods described in Chapter 9 of the EIS: large mammal survey using camera trap arrays and aerial winter track surveys. Both of these survey programs, summarized under Section 7.3.3.1, also yielded data on wolves and coyotes.

As described in the EIS, movement patterns of mammalian predators, including wolves and coyotes, may change in response to the cleared ROW. In areas of contiguous forest, use of the ROW by predators may increase during Project operations due to the ease of mobility. Use of the ROW by predators may increase the mortality risk to prey species such as white-tailed deer. As such, predator monitoring will test the following null and alternate hypotheses:

Hypothesis 1:

- H_0 (null): The construction and operation of the transmission line does not affect the distribution and occurrence of wolves and coyotes.
- H_1 (alternate): The construction and operation of the transmission line does affect the distribution and occurrence of wolves and coyotes.

To test this hypothesis, a Before-After-Control-Impact (BACI) study will be implemented using data gathered during mammal baseline and monitoring surveys. Distribution of wolves and coyotes will be mapped relative to the project ROW using data collected during aerial surveys and by remote IR camera trap arrays (Kays *et al.* 2009). Use of cameras is a non-invasive and effective method to collect occurrence and distribution data. During the construction phase Project workers will also record incidental sightings of wolves and coyotes.

Large Mammal Camera Trap Study

The large mammal study and wolf and coyote data analysis will be carried out in the same manner as described previously for elk (See Section 7.3.3.1).

Aerial Winter Track Surveys

Aerial winter track surveys and wolf and coyote data analysis will be carried out in the same manner as described previously for elk (See Section 7.3.3.1).

7.4 EMPLOYMENT AND ECONOMY

7.4.1 Project Employment

The EIS estimated the workforce for all project components. Estimates vary by project component and year depending on the activity. The majority of employment opportunities will occur during the construction phase of the project with fewer opportunities during the operations phase of the project. Monitoring parameters for employment/workforce include employment data to be collected for all project components during the construction phase could include:

- Total person years of employment for each project component – Person years of employment are defined as the amount of work that one worker could complete during twelve months of full-time employment;
- Total number of hires – Refers to the number of people hired on the project site for any duration;
- Total number of employees – Refers to the number of individuals hired. The variance between hires and employees can be attributed to an individual being hired to the project more than once;
- Average duration of work on the project; and
- Type (job classification) of work available

Employment data will be collected on-site by contractors through an employee self-declaration form designed for the project. All completed forms will be provided by on-site contractors to Manitoba Hydro and stored in a central database. Analysis of data will occur on an annual basis and reported in the annual report.

7.4.2 Business Opportunities

Monitoring both direct and indirect business effects will provide data on the success and effectiveness of efforts to enhance local business participation, as well as an indication of the general economic impact of the project in communities in the vicinity of the Manitoba – Minnesota Transmission Complex. The following parameters will be monitored in conjunction with the project:

- Direct project expenditures; and
- Indirect business opportunities.

Purchasing data of supplies and services will be collected through Manitoba Hydro's existing accounting and tracking systems. Data will be collected on the total number and value of purchases made.

7.4.3 Labour Income and Tax Revenue

Labour income is an important indicator of direct economic impact of a project. Income levels also affect the general standard of living of individuals and families by influencing the acquisition of basic human needs including housing, food and clothing. The following parameters will be monitored during the construction phase:

- Labour income – direct income earned by workers from employment on the project
- Taxes paid:
    - Provincial sales tax
    - Payroll tax
    - Corporate capital tax
    - Fuel tax

Labour income that will be calculated using aggregate information on wages paid to employees based on information provided by contractors and Manitoba Hydro. Taxes paid will reflect Manitoba Hydro's actual payments to government associated with the project - examples include sales tax, payroll tax, corporate capital tax and fuel tax.

7.5 INFRASTRUCTURE AND SERVICES

7.5.1 Transportation

The construction of each major component will have distinct effects on the existing road network. The road network consists of provincial highways and municipal roads in southeast

Manitoba. Each Project component has unique traffic generation, vehicle mix, travel patterns and mode choices, which are variable throughout the life of the Project.

Parameters to be monitored during the construction phase will include:

- Traffic volumes – compare actual traffic volumes from estimates in the EIS on key roadways in the Manitoba – Minnesota Transmission Project area;
- Traffic accidents and near misses on key roadways through Manitoba Hydro reporting processes.

Existing Manitoba Infrastructure and Transportation traffic counters will be used to acquire monitoring information relating to traffic.

Traffic accidents and near misses will be obtained through Manitoba Hydro reporting processes.

7.6 LAND AND RESOURCE USE

7.6.1 Outfitter Resource Use

The objective of the Black Bear Bait Site Camera Trap Survey is to analyse bear occurrence and prevalence at bait site locations prior to, during and post construction of the Project.

Manitoba Hydro is planning to continue ito work with a local black bear outfitter in the project area to further understand construction effects. Camera traps were established at bait sites within the Project Development Area and in control areas to understand baseline conditions of bear occurrence and prevalence. As some bait sites are in close proximity to the Final Preferred Route, it is possible that their use may be affected by the Project. Manitoba Hydro is proposing to work with the outfitter to establish new bear bait sites prior to construction and include them in a continued camera trap survey along with the baseline locations.

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