Manitoba Hydro

Keewatinoow Construction Camp Lagoon and Start-Up Camp – Environment Act Proposal

Date:

March, 2012

Executive Summary

Manitoba Hydro is proposing to construct a wastewater treatment lagoon and construction start-up camp (the Project). The purpose of the Project is to provide initial staff accommodations and treatment of wastewater generated at the construction camps during the construction of the Keewatinoow Converter Station (KCS).

The project site is located approximately 65 km northeast of the Town of Gillam along the existing Conawapa Access Road.

The scope of the Project includes:

- Construction, operation and decommissioning of the Keewatinoow construction camp lagoon;
- Construction, operation and decommissioning of the 75 person stage 1 Keewatinoow start-up camp (S1); and
- Construction of the 350 person stage 2 Keewatinoow start-up camp (S2).

Construction activities are anticipated to begin in late spring 2012, following issuance of the Environment Act Licence. With this schedule, the lagoon will be ready for operation in October 2012. The lagoon will be decommissioned following completion of the KCS construction.

Overview of Environmental Studies

The environmental setting (baseline) for the assessment was characterized using existing information sources and environmental field studies. The information and studies addressed the physical, biological and socio-economic components of the environment.

Summary of Environmental Effects

The potential environmental effects of the proposed works on the physical, biological and socio-economic components were considered in the assessment.

With the selected design, construction sequence and the implementation of the proposed mitigation measures and monitoring programs, the proposed works are not anticipated to result in any significant adverse environmental effects.

Acknowledgements

The key individuals involved in the production of this environmental assessment are provided below:

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1. Introduction

Manitoba Hydro is proposing to construct a wastewater treatment lagoon and collection system and construction start-up camp. The purpose of the Project is to provide initial staff accommodations and treatment of wastewater generated at the construction camps during the construction of the Keewatinoow Converter Station (KCS).

The project site is located approximately 65 km northeast of the Town of Gillam along the existing Conawapa Access Road as shown in Figure 01.

1.1 Background

Construction of the KCS is scheduled to start in the late fall of 2012, pending issue of an Environment Act Licence (application submitted in December 2011 by Manitoba Hydro), and is expected to take approximately five (5) years to complete. During this construction period, accommodations will be required for the construction workers. A start-up camp with the ability to accommodate up to 350 people, will be constructed at the site of the existing Conawapa exploration camp. This will be followed by the construction of a main camp (the assessment of which is included as part of the Bipole III Transmission Project) southwest of the wastewater treatment system to accommodate approximately 550 people for the duration of the KCS construction. A wastewater treatment system, consisting of a two-celled lagoon, outfall, forcemain and lift station, will be required to convey and treat wastewater generated by the start-up camp as well as the main camp.

In addition to the start-up camp and main camp, mobile camps (the assessment of which is included as part of the Bipole III Transmission Project) will be used to accommodate staff working on the Bipole III Transmission Project in the area surrounding the KCS. Wastewater generated by the mobile camps and construction work areas associated with the KCS will be transported back to the wastewater treatment lagoon for treatment or to another licensed wastewater treatment facility depending on proximity.

1.1.1 Existing and Historical Licences

A general permit (GP 61348) was previously issued for the Conawapa exploration camp and Environment Act Licence No. 1325 was issued in 1989 for the Conawapa Access Road.

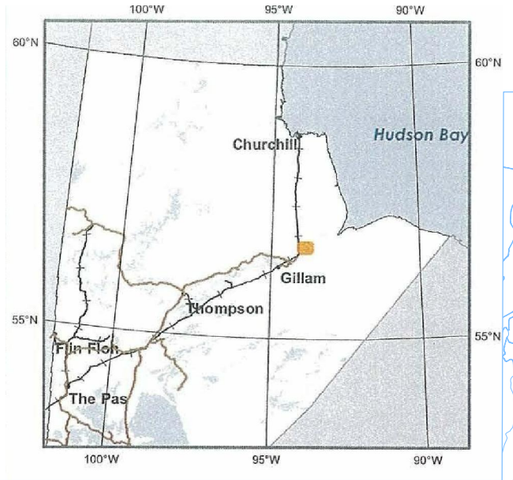
1.1.2 Project Funding

Project funding will be provided by Manitoba Hydro.

1.2 Project Purpose

The purpose of the Project is to provide initial staff accommodations and treatment of the wastewater generated at the construction camps during the construction of the KCS. A two-stage start-up camp (S1 and S2) will be constructed at the existing exploration camp site to accommodate the workforce until the main camp is constructed. The wastewater treatment lagoon will be constructed in the area of a former borrow pit site (N-10-2) located between the start-up camp and main camp on the east side of the Conawapa Access Road.

The purpose of this report is to assess the construction, operation and decommissioning activities associated with the wastewater treatment lagoon and collection system and the stage 1 start-up camp (S1) as well as the construction of the stage 2 start-up camp (S2).



HUDSON BAY

N

Herchmer

Marsh Point

North Indian Lake

Churchill

Gauer Lake

CONAWAPA ACCESS ROAD

River

KEEWATINOOW (PROJECT SITE)

LIMESTONE

Waskaiowaka Lake

Baldock Lake

Stephens Lake

280

290

GILLAM

Nelson River

Kaskattama River

Gods River

Fox River

Hayes River

River

Leaf Rapids

Granville Lake

Rat Lake

I.R. 171

I.R. 171A

Split L

Ilford

I.R. 1

Kelsey

Shamattawa

I.R. 1

391

Highrock Lake

I.R. 170

Nelson House

I.R. 170A

I.R. 170B

Burntwood

THOMPSON

I.R. 3

6

Pikwitonei

Paint Lake

Thicket Portage

River

Sipiwesk Lake

Atik Lake

Bear Lake

Knee

Burntwood Lake

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LEGEND

ROADWAYS

RAILWAY TRACKS

WATERWAYS / LAKES

Manitoba Hydro
Keewatinoow Construction Camp Lagoon & Start-up Camp

AECOM

Project Location Map
Figure - 01

1.3 Scope of Project

The scope of the Project includes:

- Construction, operation and decommissioning of the Keewatinoow construction camp lagoon;
- Construction, operation and decommissioning of the 75 person stage 1 Keewatinoow start-up camp (S1); and
- Construction of the 350 person stage 2 Keewatinoow start-up camp (S2).

1.4 Regulatory Process

This report has been prepared pursuant to *The Environment Act* (Manitoba) to obtain an Environment Act Licence for the Project. The wastewater treatment lagoon is classified as a Class 2 Development under the Classes of Development Regulation (164/88).

It is not expected that an environmental assessment under the *Canadian Environmental Assessment Act* is required, therefore there will not be any federal Responsible Authorities.

An Environmental Impact Statement for the works associated with the construction, operation and decommissioning of the Bipole III Transmission Project (including the KCS, Main Camp, Mobile Camps, Bipole III Transmission Line and remaining associated facilities) was submitted to Manitoba Conservation for approval in December 2011. The construction, operation and decommissioning activities associated with S1 and wastewater treatment lagoon and collection system as well as the construction of S2 as presented in this report, is considered to be a separate project from the Bipole III Transmission Project, as such a separate Environment Act Proposal has been prepared.

1.4.1 Environmental Permits and Approvals

Based on communication with Manitoba Conservation, a general permit and a work permit will be required for the start-up camp and lagoon as they are located on Provincial Crown Land. An application for the general permit has been submitted by Manitoba Hydro and an application for the work permit will be filed by Manitoba Hydro coincident with submission of this Environment Act Proposal.

2. Project Description

The proposed Project consists of the following general components:

- Construction, operation and decommissioning of the wastewater treatment lagoon and collection system;
- Construction, operation and decommissioning of S1; and
- Construction of S2.

The proposed Project consists of the start-up camp and wastewater treatment lagoon and collection system. The start-up camp, as outlined below, will be constructed in two stages. S1 will use the existing exploration camp facilities (with a capacity of 75 people) to accommodate workers constructing S2 (expansion to 350 people) and the wastewater treatment lagoon and collection system. The wastewater treatment lagoon and collection system will be used to treat wastewater generated from the start-up camp, main camp, mobile camps and other required facilities during the construction of the KCS. It will consist of manholes, gravity lines, a two-celled lagoon, an outfall, a lift station and a forcemain.

A description of where the Project is located as well as the activities associated with the project components are described in the following subsections.

2.1 Project Location

The Project, inclusive of the development of both stages of the temporary start-up camp (S1 and S2) and temporary wastewater treatment lagoon and collection system, is located approximately 65 km northeast of the Town of Gillam along the existing Conawapa Access Road and 4 km northeast of the proposed Keewatinoow Converter Station (KCS), 5 and 6-89-2 E2. It is approximately 32 km downstream, along the Nelson River, from the Limestone Generating Station, as shown in Figure 01. The start-up camp will be located at the site of the existing Conawapa exploration camp and the wastewater treatment lagoon will be located directly southwest of the start-up camp along the Conawapa Access Road, with the majority of the lagoon located within a former borrow pit (N-10-2), as shown in Figures 02 and 03. The start-up camp, wastewater treatment lagoon and collection system and ancillary facilities require approximately 18 ha of land within the 33 ha project site.

2.1.1 Existing Land Use/Land Use Designation

The proposed site (including the start-up camp and wastewater treatment lagoon and collection system) is situated on Provincial Crown land within the Fox Lake Resource Management Area.

The existing land use at the site is generally undeveloped, although a 75 person exploration camp is currently present in the proposed location of S1 (Photograph 1, Appendix 2) and a borrow pit is present in the location of the proposed lagoon (Photographs 4-6, Appendix 2). The location of the start-up camp has been used by various Manitoba Hydro exploration camps for over 20 years, housing up to approximately 200 people at any given time.

Approximately 11 ha of the required 18 ha within the project site has been previously disturbed and/or cleared for historic activities, including the existing exploration camp (and other exploration camps over the last 20 years), borrow pit and access road right-of-way, and as such are sparsely vegetated. The start-up camp, secondary cell and forcemain will be predominantly located in these disturbed areas. As a result, clearing activities are expected to be limited to the primary cell, portions of the forcemain, the lift station and ancillary facilities. Minor clearing around the perimeter of the site is also expected to occur. As a result, it was conservatively estimated that approximately 7 ha of the project site will require clearing activities.

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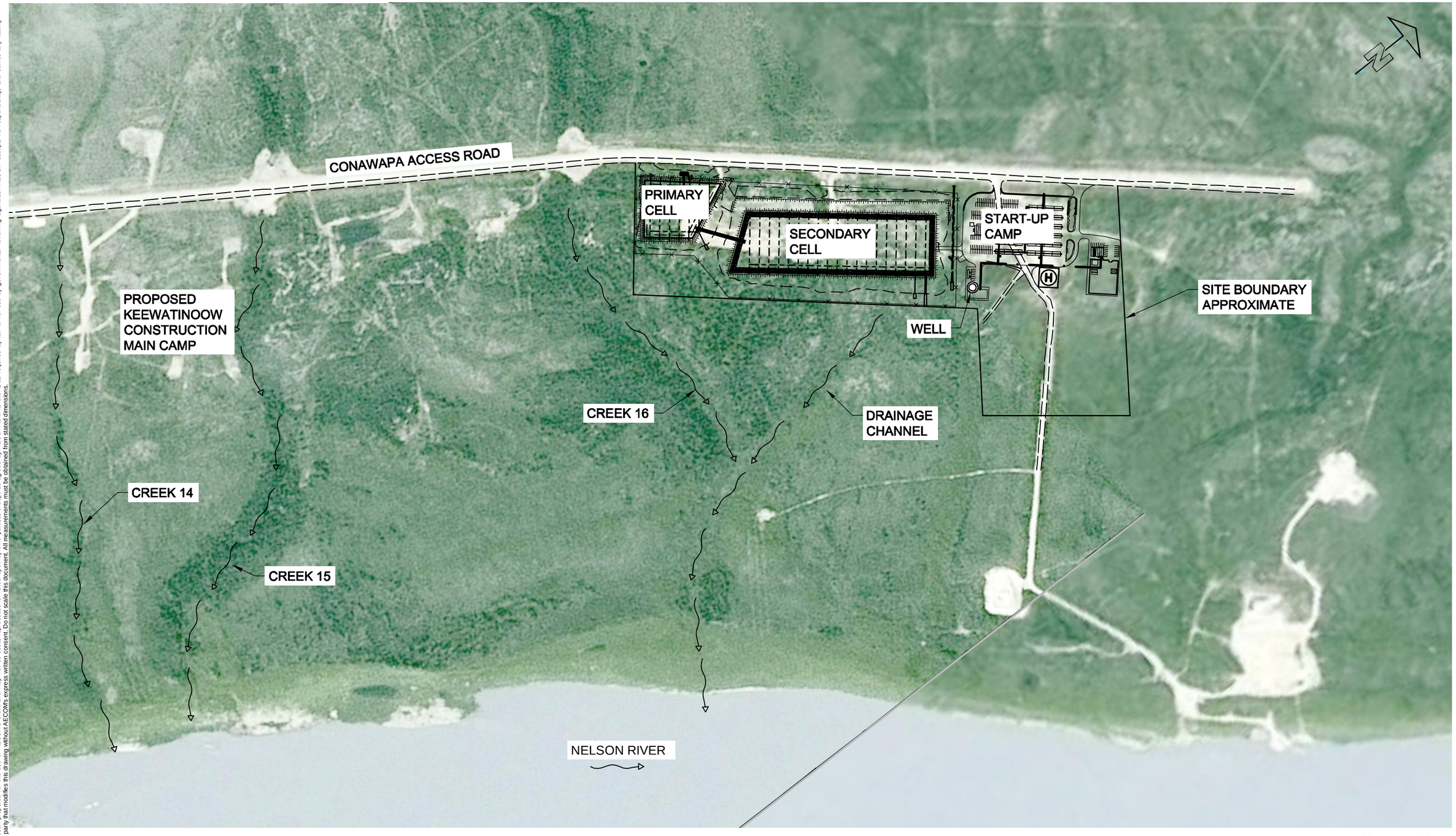

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Manitoba Hydro
Keewatinoow Construction Camp Lagoon & Start-up Camp

AECOM

Site Plan
Figure - 02

KEEWATINOOW CONSTRUCTION START-UP CAMP

KEEWATINOOW CONSTRUCTION CAMP LAGOON SITE

N - 10 - 2

N - 10 - 1

ANTICIPATED BORROW SOURCE

N - 9

N - 8

N - 8

N - 7 Area - I

N - 7 Area - II

N - 7 Area - II

N - 6

N - 5

N

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IMAGE PROVIDED BY: MB HYDRO

LEGEND

QUARRY LEASE LOCATIONS

Manitoba Hydro
Keewatinoow Construction Camp Lagoon & Start-up Camp

AECOM

Quarry Lease Locations
Figure - 03

2.2 Project Schedule

Construction is anticipated to begin in May or June 2012, pending the issue of an Environment Act License. Construction and occupancy of S1 is expected to occur in June 2012, while S2 and wastewater treatment system are expected to be operational by October 2012. Once the primary lagoon cell is operational, wastewater generated by S2 will be conveyed to the new lagoon. The first discharge from the lagoon is expected to occur in September 2013.

2.3 Existing Facilities

Within the proposed project site, facilities at the existing seasonal exploration camp include four (4) groundwater wells, electric power and communications systems, and a helicopter landing area. In addition to these facilities, the Conawapa Access Road connects to Provincial Road (PR) 290 and additional roads to the south. A rail line is also located approximately 3.5 km to the west; however, it has been abandoned and is not usable. The nearest active rail line is a spur line extending east from the Hudson Bay Railway at Bird to the Henday Converter Station approximately 32 km to the south.

2.4 Start-Up Camps

The start-up camp will be constructed in two (2) stages. The existing seasonal exploration camp, which has a capacity of 75 people, will be used as S1 to accommodate workers constructing the wastewater treatment lagoon and collection system. A new all-weather S2 will be constructed immediately southeast of the existing exploration camp.

The site of S1 is a cleared and developed site that has power, communications and existing groundwater wells. S1 will be used until the construction of S2 is nearly complete (anticipated from May 2012 to November 2012). Once S2 is nearly complete, the S1 camp will be decommissioned and the S2 camp will be expanded to include the former S1 camp area. S2 will not be occupied until the Environment Act Licence for the Bipole III Transmission Project has been obtained (anticipated late 2012). S2 will be used to accommodate a maximum of 350 people (anticipated from early 2013 to early 2014) who will construct the main camp and start on the construction of the KCS. Based on the workforce and expected amenities, S2 will have an approximate footprint of 6.9 ha (315 m by 220 m). In total, the start-up camp may be used for approximately 30 months until the construction of the main camp is complete and the start-up camp accommodations are no longer required.

The start-up camp will consist of the following:

- Temporary modular buildings to provide single-status sleeping areas;
- Kitchen/diner/recreation complex;
- Security office and first aid trailer;
- Administration offices;
- Building to house a fire truck and ambulance;
- Helicopter landing area;
- Water treatment plant; and
- Buildings for communications, fire water storage, fuel storage and dispensing facilities, and other miscellaneous storage buildings.

Where possible, the existing facilities and infrastructure of the existing exploration camp will be reused.

Although vegetation at the site of the start-up camp is sparse, some clearing and grubbing of vegetation may be required, clearing activities will avoid critical nesting periods (April 1 – July 31). In order to provide a stable foundation for site facilities, the existing ground surface will be re-graded and compacted with a roller. Where necessary, additional gravel will be laid and compacted to provide a suitable construction surface. To provide access within the start-up camp, access roads will be constructed by compacting the existing ground surface and laying layers of suitable gravel in appropriate areas to provide a traffic wearing surface.

Refer to the drawings in Appendix B of the Functional Design Report (appended as Appendix 1) outlining the details and conceptual layout of the proposed start-up camp.

2.4.1 Water Supply

Water will be sourced from well B291 (one of the four existing groundwater wells on the start-up camp site). If testing indicates that the well water does not meet drinking water quality guidelines, the water will be used for non-consumptive purposes (wash water) and drinking and cooking water will be hauled to the site from the Town of Gillam water treatment plant or Fox Lake water treatment plant.

The volume of groundwater to be used is not expected to exceed 25,000 L/day.

2.4.2 Wastewater Treatment

In order to construct the wastewater treatment lagoon and collection system, it is anticipated that approximately 50 people will be required. Approximately 25 additional people will also be required for general site activities as well as set-up of S2. Wastewater generated prior to the commissioning of the wastewater treatment system will be stored in holding tanks prior to being hauled to the Town of Gillam wastewater facility for treatment. Based on a maximum population of 75 people (capacity of existing exploration camp) and an assumed wastewater generation rate of 240 L/d per capita, approximately 18,000 L of wastewater will be generated on a daily basis during this period. Assuming a sewage hauling truck has a volume of approximately 11 m^3, as a worst case scenario, up to two sewage hauling trips would be required every day on average until the wastewater treatment lagoon is commissioned. On-site storage tanks have the capacity to store approximately one day of generated wastewater under full operation of S1.

Once the wastewater treatment lagoon is commissioned, wastewater will be directed to the lagoon for treatment. Additional information regarding the collection and treatment of generated wastewater can be found in Section 2.5.

2.4.3 Solid Waste Handling

Solid waste will be collected in animal proof garbage containers. Any food refuse will be stored in a secure location to reduce animal presence. Hazardous materials will be managed according to Manitoba Hydro's *Hazardous Material Management Handbook* and regulations pursuant to *The Dangerous Goods Handling and Transportation Act* (Manitoba), which sets out requirements pertaining to the generation, transportation and disposal of hazardous wastes. Pending on an agreement with the Town of Gillam, solid waste will be disposed of at the landfill as required. A recycling and waste management plan will be developed to separate waste streams, optimize recycling and ensure wastes are disposed of properly.

2.4.4 Fuel and Chemical Handling and Storage

All chemical and fuel storage will occur at suitable facilities within the construction camps in accordance with provincial regulations and applicable codes. Diesel and gasoline required for S1 will be stored in a separated double wall fuel storage tank at the vehicle refueling facility at the start-up camp. It is anticipated that the maximum volume of fuel storage will be 10,000 L of gasoline and 10,000 L of diesel.

In addition to the fuel storage at S1, contractors will store fuel in double walled tanks at their respective construction work areas. Each contractor, as well as Manitoba Hydro, is expected to require 1-2 10,000 L tanks of diesel, for a total of 80,000 L of diesel storage required for construction activities.

Alum for the wastewater treatment lagoon can only be stored for one year, therefore it will likely be shipped directly to the lagoon at the time of application. As a result, on-site storage of alum is not expected to be required. However, if alum needs to be stored on site, it will be stored in a heated, dry building at the construction camps, potentially in the water treatment plant or septic truck garage, to prevent the alum solution from freezing. The storage area will be designed in accordance with provincial regulations and applicable codes, and if necessary, a spill containment system will be used around the alum storage totes. No special containment room or ventilation requirements are expected to be required.

2.4.5 Decommissioning

Once construction of S2 is complete, S1 will be decommissioned. As most of the facilities will have been re-used for the construction of the full start-up camp, decommissioning activities are expected to be minimal. However, activities may include the removal of remaining S1 camp buildings and supporting infrastructure, collection and disposal of solid wastes, recyclables and hazardous materials at the Town of Gillam landfill as appropriate. To promote regrowth of natural vegetation, disturbed soils will be reclaimed following the decommissioning of S2.

2.5 Wastewater Treatment Lagoon and Collection System

A series of construction camps will be required to support the construction of the KCS (a two-stage start-up camp, a main camp and mobile camps); however, only the start-up camp is within the scope of this assessment (remaining construction camps are included in the Bipole III Transmission Project assessment). However, as the wastewater treatment lagoon was designed to accommodate the wastewater generated by all three camps, information regarding camp populations, waste generation, etc. is provided.

The wastewater treatment lagoon will be constructed as a temporary measure to handle generated wastewater from the start-up camp as well as the main camp, mobile camps and other construction sites associated with the KCS construction. The lagoon is expected to be utilized for approximately five (5) years during the construction and operation of the main camp and the construction of the KCS. Wastewater treatment during the operation of the KCS will be carried out as described in the Bipole III Transmission Project report and is not considered part of the scope of this assessment.

2.5.1 Design

2.5.1.1 Camp Populations

The estimated total population has been provided in Figure 04**.** To accommodate potential workforce fluctuations, and unforeseen changes, a peak annual population forecast of 750 people will be used for the wastewater lagoon design.

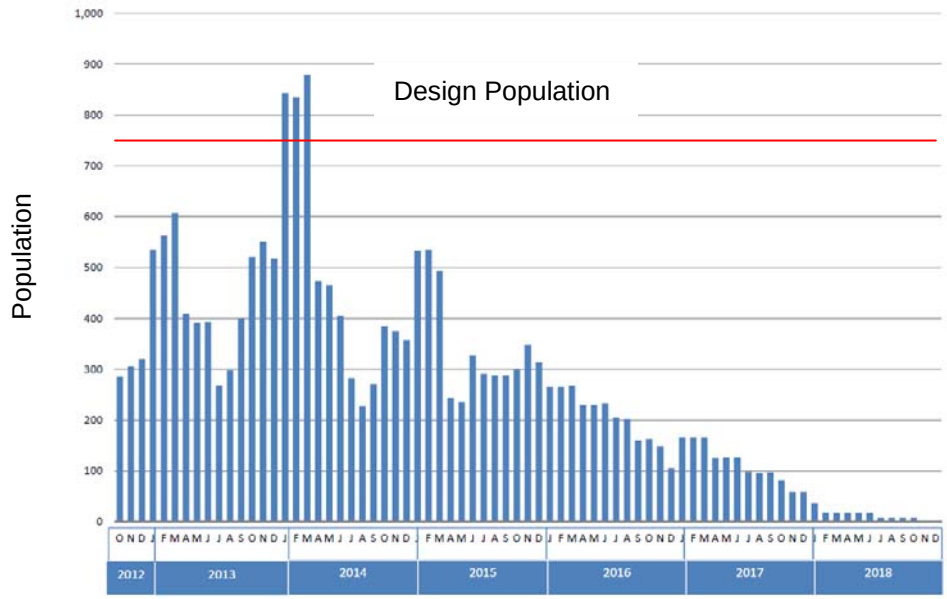

Figure 04 - Anticipated Total Construction Camp Populations

2.5.1.2 Projected Flows and Loads

Average wastewater generated per capita was assumed to be 240 L/day. This design flow has been used in the wastewater treatment design for other Manitoba Hydro northern construction camps as well as northern communities. Wastewater from the following will be directed to the proposed wastewater treatment lagoon:

- Start-up camp;
- Main camp;
- Mobile camps;
- Wastewater holding tanks; and
- Water treatment plant backwash.

A summary of the total design flow generated is noted in Table 1. It should be noted that the population of 750 people includes waste from the main camp, start-up camp, mobile camps and wastewater holding tanks. The wastewater production rate of 240 L per capita per day was used for all sources.

Table 1 - Projected Wastewater Flows

Parameter	Value
Population	750 people
Wastewater Production Rate	240 lpcd
Wastewater Flow	180,000 L/d
Storage Time	290 days
Annual Wastewater Volume	66,000 m^3
Expected Water Consumption	180,000 L/d
WTP Backwash (10% of Treated)	18,000 L/d
Wastewater plus WTP Backwash	198,000 L/d
Annual WTP Backwash Volume	6,600 m^3
Total Annual Wastewater Volume	72,700 m^3

Based on anticipated camp activities (and previous experience at Manitoba Hydro construction camps), the wastewater is characterized as a typical medium-strength wastewater. Data describing the assumed key components in the wastewater is shown in Table 2**.** The maximum camp population which exceeds the design population of 750 is only anticipated to be present during a three-month peak construction period from January to March of 2014.

Table 2 - Anticipated Influent Wastewater Loads at Peak Population

Parameter	Per Capita	Value
Design Population		**750**
Avg. Annual Flow (m^3/d)		180
TP (kg/d)	0.002	1.5
$cBOD_5$ (kg/d)	0.076	57
TSS (kg/d)	0.080	60

To ensure the wastewater treatment lagoon is adequately sized for the fluctuating populations, it will be designed to accommodate the maximum organic and hydraulic wastewater loads for a peak population of 750 people. The actual population in the construction camps during most of the construction period will be lower and the flows are anticipated to be less.

2.5.1.3 Anticipated Effluent Quality

The wastewater treatment lagoon has been designed to treat effluent to meet the effluent discharge limits as outlined in Table 3.

Table 3 - Anticipated Effluent Limits

Parameter	Value
TP	< 1 mg/L
BOD_5	25 mg/L
TSS	25 mg/L (excluding growing algae)
Fecal Coliform	200 / 100mL
Total Coliform	1,500 / 100mL

As well, it is anticipated that at the time of discharge the effluent will contain approximately:

- 15 mg/L ammonia;
- 10 mg/L organic nitrogen;
- 1 mg/L nitrates;
- 25 mg/L total Kjeldahl nitrogen (TKN); and
- pH of 7-9.

Prior to the release of any treated effluent, a sampling program will be implemented to ensure effluent limits as outlined in Table 3 are met.

2.5.1.4 Wastewater Treatment Lagoon Capacity

Based on hydraulic loading calculations, the primary cell is sized to be 105 m x 116 m and the secondary cell is sized to be 105 m x 385 m. With a liquid depth of 1.5 m, the primary cell can hold approximately 18,556 m^3 and the secondary cell can hold approximately 60,315 m^3. The location of the cells is confined by the existing Conawapa Access Road, Nelson River, topography and proposed construction camp locations.

Specifically, the cell locations were selected based on:

- Utilizing as much of the former borrow pit, N-10-2, area as possible for the lagoon (minimal clearing);
- Maximizing the acceptable flat topography in this area;
- Proximity to the proposed start-up camp, northeast of the secondary cell; and
- Proximity to a suitable discharge point for the lagoon effluent.

The secondary cell is designed based on the hydraulic storage required for 750 people with twice a year discharge. Normally 210 days of storage would be provided; however, the storage cell has been increased to provide 290 day storage to ensure adequate storage for when longer storage periods are required, such as during periods of inclement weather (including late or early freeze-up) as well as potential operational upsets. Although the lagoon is designed for twice a year discharge, during lower population phases of construction the lagoon would only be required to discharge once a year.

Due to the existing terrain, location of the construction camps and site topography, the secondary cell will be located approximately 60 m from the primary cell and at a drop in elevation of approximately 8 m.

Drawings of the proposed lagoon cell layout and inter-control structure and piping can be viewed in Appendix B of the Functional Design Report (appended as Appendix 1).

2.5.2 Construction

2.5.2.1 Wastewater Treatment Lagoon

Construction of the wastewater treatment lagoon will be approximately 5 months in duration and is anticipated to start in June 2012, after issue of the Environment Act Licence. The start-up camp, secondary cell and forcemain will be predominantly located in disturbed areas. As a result, clearing activities are expected to be limited to the primary cell, portions of the forcemain, the lift station and ancillary facilities. Minor clearing around the perimeter of the site is also expected to occur. As a result, it was conservatively estimated that approximately 7 ha of the project site will require clearing activities. Clearing activities will avoid critical nesting periods (April 1 – July 31).

A geosynthetic liner will provide containment for the treatment cells. The cells will be double-lined with a 60 mil High-density Polyethylene (HDPE) primary layer, a 40 mil HDPE secondary layer and a geonet separation layer. The liner system will be placed on the interior face of the lagoon cells and keyed into the top of the dykes. The geonet separation layer will be connected to a sump to allow manual monitoring of the liner system. The geosynthetic liner will be installed over a 150 mm thick layer of compacted bedding sand, available in-situ. A 300 mm protective sand layer will be placed over the base area of the primary liner, which would require approximately 6,026 m^3 of sand. The interior surfaces of the dykes will be covered in geotextile followed by a 300 mm thick layer of rip-rap. Protection against uplift will be provided by perforated pipes installed in trenches beneath the liner system which will drain collected liquid into a manhole. Details of the underdrain system can be seen in the drawings located in Appendix B of the Functional Design Report (appended as Appendix 1).

The exterior and interior dykes will have a 4:1 slope and rip-rap will be installed on the dyke slopes to protect against erosion. Approximately 7,000 m^3 of rip-rap with an average size of 100 mm will be required for the interior of the dykes. The granular material currently present in the lagoon area of the site is anticipated to provide a suitable foundation for the proposed dykes. Existing soils sourced from the excavation of the lagoon cells will be used when possible to construct the dyke structures. Design details for the proposed lagoon are included in the drawings in Appendix B of the Functional Design Report (appended as Appendix 1).

Perimeter ditching will be incorporated around the lagoon to collect and direct surface runoff away from the lagoon dykes and eventually into the Nelson River, as shown in Appendix B of the Functional Design Report (appended as Appendix 1). These ditches will be lined with geotextile and rip-rap to prevent erosion. Additional rip-rap (approximately 2,500 m^3) will be installed on the exterior of the cut slope locations for additional protection from erosion. A half culvert will also be placed in the natural drainage ditch on the north side of the secondary cell to direct surface runoff away from the dyke structure.

2.5.2.2 Control Structure

An inter-cell control structure will be constructed with isolation valves between the primary and secondary cell to hydraulically accommodate the elevation difference. The control structure is anticipated to be precast concrete and will control the flow from the primary to the secondary cell. The control structure is anticipated to be installed approximately 4.6 m below ground surface to prevent freezing. There will be a control weir situated at an elevation above the floor of the control structure. All interconnecting piping between both cells and the control structure will be 300 mm HDPE pipe.

2.5.2.3 Outfall

The outfall for the lagoon will be located near the northeast corner of the secondary cell. The outfall will consist of a 250 mm diameter HDPE pipeline that will drain the secondary cell into Creek 16 via existing natural drainage

channels and a valve system. The outfall pipeline is approximately 30 m in length and will empty onto a 5 m by 25 m rip-rap spillway, which will direct effluent into the natural drainage channel. Approximately 13 m of the natural drainage channel (from the spillway to the site boundary) will be lined with a layer of geotextile material and rip-rap to reduce erosion potential through energy dissipation. The outfall will be sized to drain the secondary cell within a one week period, however with valves, the flow rate will be restricted to allow a "trickle" flow and a three week discharge period.

2.5.2.4 Lift Station and Forcemain

The wastewater generated at the start-up camp will be collected in a series of on–site manholes which will flow by gravity into an on-site lift station located on the west edge of the camp. The wastewater will be pumped to the primary cell of the wastewater treatment lagoon through approximately 800 m of 100 mm HDPE pre-insulated pipe. Cleanouts will be installed as well as air release chambers / valves, and drains as necessary. The forcemain will be heat traced and installed in the eastern ditch along the Conawapa Access Road.

The lift station is anticipated to be a 1.2 m diameter precast concrete manhole, with 1 m of active depth. It will operate as a duplex pump system (one duty and one standby). Preliminary sizing of the submersible pumps indicates that two 10 Horsepower low flow, high lift pumps will be required.

The lift station will be a subsurface structure with no building or superstructure on top. Pump controls will be mounted above grade in weather proof enclosures. There will be both visual and audio alarms in the event of high/low water level conditions. In order to prevent heaving, the concrete manhole will consist of frost straps as well as ballast to prevent flotation in the event of high groundwater.

Refer to Appendix B of the Functional Design Report (appended as Appendix 1) for lift station drawing details.

2.5.2.5 Truck Dump

Sewage will be hauled to the proposed wastewater treatment lagoon from the mobile camps and construction work areas. Based on an average wastewater generation rate of 240 L/day/person, and an average mobile camp population of 167 people, approximately 40,000 L (40 m^3) of wastewater will be hauled to the primary cell on a daily basis. Assuming a typical sewage hauling truck can hold 11 m^3 of wastewater, four sewage hauling trips per day, on average, will be required while the mobile camps are in operation.

A truck dump will be located on the west side of the primary cell. It will consist of a 5 m x 18 m concrete splash pad that will be accessible from the Conawapa Access Road. A 3 m wide concrete swale will direct the sewage into the lagoon. The lagoon fence will transition from the toe of slope to the top of slope in this area. A gate will be constructed with steel bars for the lower half which will allow sewage to pass through permitting dumping without requiring the gate to be opened.

2.5.2.6 Access Roads

The top surface of the lagoon dykes will be compacted to provide access to and around the wastewater treatment lagoon for maintenance activities. Additional access roads to the wastewater treatment lagoon will be constructed by compacting the existing ground surfaces and/or placing compacted granular materials in areas unsuitable for vehicle access. Any materials required for the access roads will be obtained from an approved borrow source.

2.5.2.7 Fencing

A chain link fence will be located at the toe of the dyke on both the primary cell and secondary cell. These fences will provide security against wildlife and potential vandalism as well as provide a measure of safety for people.

2.5.2.8 Winter Lagoon Storage

Based on the construction schedule and anticipated license approval for the Bipole III Transmission Project, it is expected that the lagoon will be constructed but not in use for at least a portion of the winter of 2012/2013. To prevent material movement, frost upheaval, etc. during this period, the primary and secondary cells will be filled with untreated groundwater. For the primary cell, approximately 18,500 m^3 of groundwater will be used to fill the cell, while for the secondary cell, approximately 22,700 m^3 of groundwater will be used to fill the cell to a depth of 0.6 m.

2.5.3 Operation

2.5.3.1 Phosphorus Removal – Alum Dosing

Two methods of phosphorus reduction were examined closely for the Project, including alum dosing and the use of wetlands. The option of alum dosing was chosen for its simplicity and due to the temporary nature of this lagoon.

Phosphorus removal (to below 1 mg/L) will be achieved by dosing with aluminum sulphate commonly known as alum. The precipitation method for phosphorus removal involves spraying concentrated alum onto the wastewater in the secondary cell and mixing the wastewater with a motor boat in a grid like pattern. The phosphorus combines with the alum forming a floc that precipitates and settles to the bottom of the cell contributing to the sludge bed. The chemical dosing application occurs approximately two weeks prior to lagoon discharge in order to allow for adequate settling of the floc. Effluent grab samples will be taken prior to discharging the cell to ensure that the Environment Act Licence limits are met. This procedure is a reliable method for phosphorus removal and is currently being used in numerous wastewater treatment lagoons in Manitoba. As a secondary benefit, alum application also aids in reducing suspended solids.

The dosage rate required is a function of the required phosphorus removal, as the concentration of phosphorus decreases the efficiency of the metal salt decreases. Alum dose rates typically vary from 50 mg/L to 175 mg/L; based on a dose rate of 100 mg/L, approximately 6,000 kg of alum would be required annually. The operator will adjust the alum dosage to ensure compliance with effluent guidelines for phosphorus content.

As alum will only be required 1-2 times per year and has an active life of approximately one (1) year, alum is not expected to be stored at the site, only shipped as required. However, if necessary, alum will be stored in a dry, heated building at the start-up camp, or main camp as applicable, in accordance with applicable regulations. If necessary, a secondary containment system will be provided to reduce potential environmental effects in the event of a spill, however no special containment room or ventilation requirements are expected to be required.

2.5.3.2 Operator Requirements

Facultative lagoon operators are required to be classified as a Class 1 Operator. The operator would be required to exercise valves and perform regular inspections of the forcemain, lift stations, the inter-cell overflow manhole and outfall. Aquatic plants and rodents must also be removed as they can damage the cell liner or cause structural damage to the dyke itself.

The operator would be responsible for the application of alum prior to discharge along with sampling of the effluent and understanding the results of the laboratory analysis in order to operate the system as required.

Personal protective equipment (PPE) will be required for all operators during alum dosing; including Tyvek suits, facemasks, goggles and gloves. A first aid kit, complete with fresh water will also be nearby at all times. Once all spraying is complete, all pumps, tanks, boat and motor and PPE will need to be flushed with clean water, as per standard Manitoba Hydro procedures. To recover the wash water, clean-up activities will occur at the truck dump, with the wash water being sent into the primary cell.

2.5.3.3 Discharge

Effluent will not be discharged between the 1st day of November of any year and the 15th day of June the following year. The proposed wastewater treatment lagoon effluent will be discharged through a 30 m outfall onto a 25 m long spillway. The effluent will then flow along approximately 500 m of a natural drainage channel, of which the first 13 m (approximate distance from the spillway to the site boundary) will be covered in geotextile and rip-rap for energy dispersion, before combining with Creek 16 and then will flow approximately 500 m within Creek 16 before entering into the Nelson River, as illustrated in Figure 05. By discharging into the drainage channel and then Creek 16, the effluent will cool to ambient temperatures prior to reaching the river. Figure 02 shows the location of the lagoon outfall and the approximate drainage path via Creek 16 to the Nelson River.

The lagoon design is based on a 290 day storage time to accommodate a population of 750 with up to two discharges per year. During non-peak periods the average population will be below the design population of 750, and only one annual discharge may be required. Both cells are designed for liquid depths of 1.5 m.

To control the discharge rate, a “trickle” process will be employed, which will cause the discharge to occur over approximately three weeks. Based on a design flow discharge of 59,813 m^3 (290 days of storage), the flow rate from the lagoon would be limited to approximately 0.033 m^3/s (2,850 m^3/day). If discharge were to occur once a year, the discharge would occur in the fall. If two discharges are required within the same year, a spring discharge event would discharge approximately 59,813 m^3 at a flow rate of approximately 0.033 m^3/s, while a fall discharge event would discharge approximately 15,500 m^3 (75 days of storage) of treated wastewater over a three week period (0.0009 m^3/s or 736 m^3/day).

2.5.3.4 Sludge Disposal

Due to the short-term use of the wastewater treatment lagoons (approximately 5 years), removal of accumulated sludge is not expected to be required during operation of the lagoon.

2.5.4 Decommissioning

Decommissioning of the wastewater treatment lagoon and collection system is expected to occur in 2019/2020, once the construction of the KCS is complete. Decommissioning activities will include dewatering and disposing of the sludge remaining in the cells, removing and stockpiling the rip-rap and sand bedding for future use, removing the interconnection pipeline and control structure between the two cells as well as the outfall pipe, lift station and forcemain. Backfilling of the lagoon cells, levelling of the dykes and re-vegetation will also occur during decommissioning.

Sewage sludge may be in a solid, semi-solid or liquid form. It typically consists of approximately 90-99% water and an accumulation of settled solids. Sludge may contain significant amounts of nitrogen and phosphorus and to a

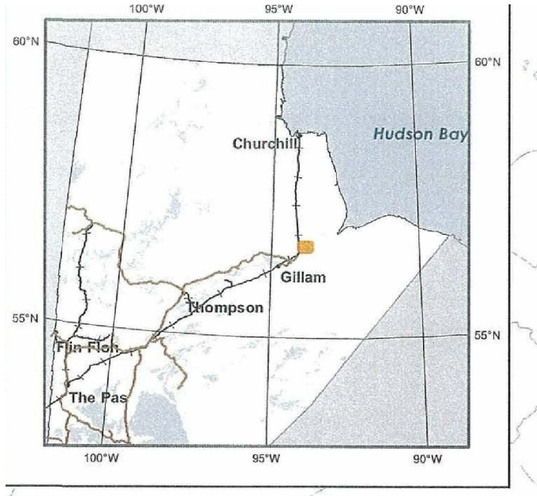

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IMAGE PROVIDED BY: MB HYDRO

Manitoba Hydro
Keewatinoow Construction Camp Lagoon & Start-up Camp

AECOM

Local Waterways
Figure - 05

lesser degree some quantities of metals such as zinc and copper. The sludge will be tested to ensure it is stable and has the characteristics required in order to be accepted at the receiving licensed landfill.

If required, the sludge will be dewatered using Geo Bags. With the Geo Bag method, lagoon sludge will be pumped directly into a Geo Bag which retains the solids while allowing water to pass through small openings in the bag. Over approximately a 6 month period, the retained material will dewater into the lagoon. Once the sludge has sufficiently dewatered, the bags will be cut open and the sludge will be transported to the landfill by truck. The water collected in the lagoon during the dewatering process will be discharged if it meets applicable licence criteria. If the water does not meet applicable licence criteria, it will be pumped out and trucked to another applicable, licensed wastewater lagoon for further treatment.

Once the sludge is removed from the lagoon, the interconnection pipeline, control structure and outfall pipe will be removed. The synthetic liners will also be removed and may be taken to either a landfill or if possible, taken to a recycling facility. Additionally, all fencing and facilities associated with the truck dump will be removed. All salvageable materials will be re-used for future Manitoba Hydro projects with non-salvageable materials disposed of in an appropriate licensed waste disposal facility (i.e. Town of Gillam landfill). All excavated areas (including borrow sources and lagoon cells) and constructed ditches will be backfilled with available fill material and the dykes will be leveled. The lagoon site, borrow sources, lift station and forcemain route will be re-graded to match the surrounding terrain to maintain natural drainage patterns. Stockpiled soils on disturbed areas will be reclaimed to allow for regrowth of native vegetation, or other re-vegetation activities as required.

2.5.5 Chemical and Fuel Storage

All chemical and fuel storage will occur at suitable facilities within the construction camps following applicable regulations and codes. As alum for the wastewater treatment lagoon will likely be shipped directly to the lagoon at the time of application, storage of alum is not expected to be required. However, if alum is stored, it will be stored in a heated, dry building at the construction camps, potentially in the water treatment plant or septic truck garage, following appropriate regulations. If necessary, a spill containment system will be used around the alum storage totes, however no special containment room or ventilation requirements are expected to be required.

2.5.6 Maintenance Activities

Maintenance activities will be required during operation of the start-up camp as well as the wastewater treatment system as generally outlined below.

Maintenance of S1 will include:

- Maintaining internal access roads;
- Maintaining buildings; and
- Ensuring all emergency response equipment is functional.

Maintenance of the wastewater treatment lagoon and collection system will include:

- Maintaining fence and gate;
- Maintaining the lift station;
- Maintaining valves;
- Maintaining even grass cover on dykes, and mowing so that growth is less than 0.3 m in height;
- Removing all reeds, rushes and trees within the lagoon and on the dykes to below the low water line;
- Maintaining the discharge route and pipeline to allow proper drainage;
- Maintaining a program to prevent and remove burrowing animals;
- Maintaining the access road into the lagoon area; and

- Visually inspecting the control structure and weir between the cells.

2.5.7 Borrow Source

It is expected that all materials, such as sand and gravel, will be sourced from the site (borrow pit N-10-2). During construction, approximately 6,026 m^3 of sand and 9,500 m^3 of rip-rap will be required for the construction of the wastewater treatment lagoon. Additional borrow materials may also be required for the start-up camp to provide a suitable foundation for the building structures. Based on the size of the start-up camp approximately 3,500 m^3 of material may be required. Where additional materials are required for rip-rap, approved borrow sources in the area surrounding the site will be used. Based on available materials, borrow pit N-8 south of the site is likely to be used as an additional source for materials. As borrow pit N-8 is located adjacent to the Conawapa Access Road, minimal clearing activities and road development (gravel compaction) are expected to be required for access to the borrow pit. Manitoba Hydro is currently in the process of obtaining a quarry lease for this borrow pit, along with several additional borrow pits along the Conawapa Access Road, as illustrated in Figure 03. If necessary, Manitoba Hydro will complete the appropriate applications to develop any additional borrow pits near the site to obtain the required borrow materials.

2.5.8 Project Alternatives

2.5.8.1 Construction Camps

Accommodations are required for people working on the construction of the KCS. To provide accommodations, two options were evaluated. The first involved housing in the Town of Gillam, the second involved the development of construction camps near the KCS site. In order to reduce emissions and energy/fuel costs associated with travel and to reduce potential disruptions in the event staff could not travel to site due to inclement weather conditions and/or traffic accidents, the development of construction camps near the KCS site was selected as the better accommodation option.

2.5.8.2 Wastewater Treatment

Three (3) alternative technologies (lagoon, aerated lagoon and mechanical treatment) were evaluated for the treatment of wastewater generated at the construction camps. The lagoon option was selected due to its minimal power requirements and the lower level of operator certification required.

Lagoon Location

Once the treatment option was selected, three (3) options for the placement and operation of the lagoon were reviewed. The first option involved the construction of a three-cell lagoon on the west side of the main camp. With this option, up to 2 years would be required to construct the lagoon due to the presence of permafrost. While the lagoon was being constructed, wastewater generated at the start-up camp would need to be stored and hauled for disposal off-site. This option would also include clearing large amounts of existing forested land.

The second option was similar to the first with the exception that two (2) existing borrow pits south of the start-up camp would be converted into temporary storage cells while the lagoon was being constructed on the west side of the main camp. As with the first option, wastewater generated at the start-up camp would still need to be hauled off-site for disposal, however the wastewater would only be hauled off-site for a couple of months while the storage cells were being constructed. Once the storage cells were ready, the generated wastewater would be stored in the storage cells until the lagoon was completed.

As part of the third option, construction of the lagoon could start prior to the Bipole III Transmission Project, which would mean that the volume of wastewater hauled off-site would be smaller as only people constructing the lagoon would be present. In this scenario, it was also decided to construct the lagoon for the maximum construction workforce, 750 people, and situate it in the location of existing borrow pits. By locating the lagoon in the existing borrow pits, less earthworks would be required, which would reduce construction time and the resulting length of time that wastewater would be hauled off-site.

The third option was selected due to the lower amount of wastewater requiring off-site disposal as well as the lower expected presence of permafrost as a result of existing borrow pit development.

Phosphorous Removal

As previously mentioned, two methods of phosphorous removal were examined, wetland treatment and alum dosing. The alum dosing option was selected due to its simplicity, temporary requirement of its use (approximately 5 years) and its quick set-up time (unlike the two years required for the wetland).

3. Assessment Approach

The environmental assessment considers effects to the environment as a result of the following activities:

- Construction, operation and decommissioning of the Keewatinoow construction camp wastewater treatment lagoon and collection system;
- Construction, operation and decommissioning of S1; and
- Construction of S2.

The information pertaining to the existing environment presented in the following sections was collected as part of the field surveys conducted for the proposed Bipole III Transmission Project.

3.1 Geographic Boundaries

The following are the spatial boundaries defined for this report. However, where specifically noted, these boundaries may be adjusted to suit the valued ecosystem component affected.

- The project site includes any land that will be disturbed by project activities.

- The project area includes any area, up to 1,000 m beyond the project site, which could be disturbed by project effects. This includes effects during construction, such as noise, vehicle emissions, traffic, etc.

- The project regional boundary includes any area beyond the project area that may be affected by the construction, operation or decommissioning activities of the Project.

3.2 Temporal Boundaries

The assessment considered the period from start of construction to decommissioning of the wastewater treatment lagoon and collection system. This period is anticipated to be 2012 – 2020. The temporal boundaries of the assessment were divided into the construction, operation and decommissioning phases as outlined below.

3.2.1 Construction

The start of the construction phase is dependent on the issuance of the Environment Act Licence, which is anticipated by May 2012. The following activity timelines are associated with the construction phase:

- Construction of S1 – May/June 2012
- Construction of S2 – May/June 2012 to October 2012
- Construction of wastewater treatment lagoon and collection system – May/June 2012 to October 2012

3.2.2 Operation

The operational timeframe of the project is different for each component as outlined below:

- Operation of S1 – May/June 2012 to October 2012
- Operation of wastewater treatment lagoon and collection system – October 2012 to 2019

S2 is not included within the above timeframe as its operation was included as part of the Bipole III Transmission Project, and is not considered within the scope of the Project.

3.2.3 Decommissioning

Based on the operational timeframe of the project components, decommissioning of the components will also vary as outlined below:

- Decommissioning of S1 – summer 2013
- Decommissioning of wastewater treatment system –2019/2020

3.3 Environmental Components

This environmental assessment considered the existing environment without the Project as the baseline condition. The amount of detail and effort in analysing the various environmental components was proportional to their potential to be affected by the Project. The environmental components were organized into the following sections:

- Physical Environment – Air Quality, Climate, Physiography and Landscape, Soils, Surface Water Regime and Quality and Groundwater;
- Terrestrial Environment – Vegetation, Wildlife and Protected Species;
- Aquatic Resources and Habitat;
- Socio-Economic Environment – Property Ownership and Land Use, Infrastructure and Services and Heritage Resources.

3.4 Project/Environment Interaction

The Project-environment interaction matrix in Table 4 identifies the work and activities associated with the Project that may affect the environment. Predicted changes to the environment caused by the Project were assessed against existing conditions.

Table 4: Project-Environment Interaction															
Project Phases / Components	**Environmental Components**														
	Physical							**Terrestrial and Aquatic**			**Socio-Economic**				
	Air Quality	Noise	Climate	Geology	Soil	Surface Water Quality	Groundwater	Vegetation	Wildlife	Fish and Fish Habitat	Land and Resource Use	Transportation	Recreation and Tourism	Heritage Resources	
Construction															
Site Preparation - Clearing and Grubbing	•	•	•	•	•	•		•	•	•	•	•	•	•	
Lagoon, Lift Station, Forcemain, Truck Dump and Associated Facilities	•	•	•	•	•	•	•		•	•	•	•	•	•	
Water Supply	•	•	•				•					•			
Wastewater Treatment	•	•	•									•			
Solid Waste Handling	•	•	•		•	•	•					•			
Fuel and Chemical Handling Storage	•	•	•		•	•	•	•		•		•			
Winter Lagoon Storage							•								
Operation															
Lagoon Use	•	•					•		•			•			
Lagoon Discharge	•				•	•				•					
Maintenance Activities	•	•			•	•		•	•	•		•			
Decommissioning															
Sludge Dewatering	•				•							•			
Discharge	•				•	•				•		•			
Rehabilitation of Site	•	•	•		•	•		•	•	•	•	•	•		

3.5 Mitigation Measures

Mitigation measures are presented in association with potential effects identified and may be supplemented with additional measures in the Environmental Protection Plan (EnvPP) to be developed for the Project.

3.6 Significance of Residual Adverse Effects

Following application of mitigation measures, any residual adverse effects were identified for determination of their significance. The characterization related to all phases of the Project–construction, operation and decommissioning (when included in the scope of the Project). The assessment approach considered the nature and magnitude of any residual effect along with its temporal characteristics and spatial boundaries. If the effects were significant, the characterization would then include the likelihood of potential effects occurring and any associated uncertainty with the prediction of the effect. The factors and definitions used to assess environmental effects are outlined in Table 5.

Table 5 - Factors and Definitions to Assess Environmental Effects and Determine Significance

Factor	Definition
Magnitude:	**Small:** • Unlikely to be detectable or measurable, or below established thresholds of acceptable change, or • Within range of natural variability, or • Minimal impairment of ecosystem component's function
	Moderate: • Effect could be detectable within normal range of variation of a well-designed monitoring program, or • Marginally beyond guidelines, or • Marginally beyond range of natural variability, or • Marginally beyond minimal impairment of ecosystem, or component's function
	Large: • Readily detectable without a monitoring program, or • Well beyond guidelines, or • Well beyond range of natural variability, or • Well beyond minimal impairment of ecosystem component's function
Geographic Extent	**Site:** • A small portion of local area
	Local: • Beyond the site and within the local area
	Regional: • Beyond the local study area and within the regional study area.
Duration	**Short-term:** • Generally within the construction period, or • Within one generation or recovery cycle
	Medium-term: • Transition period during the operations phase, or • Within one or two generations or recovery cycles
	Long-term:

	• Long term during the operations phase or permanent, or • Two or more generations or recovery cycles

The combination of three of the factors (magnitude, geographic extent, duration) used to determine significance of any residual effect is outlined in Table 6.

Table 6 - Combination of Factors to Determine Significance

Analysis Criteria			Combination Significant? – Yes/No
Magnitude	Geographic Extent	Duration	
Large	**Regional**	Long-term	Yes
		Medium-term	Yes
		Short-term	Yes
	Local	Long-term	Yes
		Medium-term	Yes
		Short-term	No
	Site	Long-term	Yes
		Medium-term	No
		Short-term	No
Moderate	**Regional**	Long-term	Yes
		Medium-term	No
		Short-term	No
	Local	Long-term	No
		Medium-term	No
		Short-term	No
	Site	Long-term	No
		Medium-term	No
		Short-term	No
Small	**Regional**	Long-term	No
		Medium-term	No
		Short-term	No
	Local	Long-term	No
		Medium-term	No
		Short-term	No
	Site	Long-term	No
		Medium-term	No
		Short-term	No

4. Existing Environmental Setting

4.1 Project Setting

The project site is located approximately 65 km northeast of the Town of Gillam, Manitoba and 32 km downstream of the Limestone Generating Station. The project site is approximately 800 m northwest of the Nelson River and immediately east of the Conawapa Access Road. Appendix 2 includes photographs of the project site.

4.2 Physical Environment

The project site is located within the Winisk River Lowland Ecodistrict of the Hudson Bay Lowland Ecoregion within the Hudson Plains Ecozone (Smith *et al*. 1998).

4.2.1 Air Quality

In Manitoba, air quality issues tend to be local in nature and primarily relate to odour and other pollutants released from specific local sources or activities (i.e. industry, motor vehicles and forest fires). Outdoor air quality is generally good (Manitoba Conservation 2010).

The Project is located in the boreal forest region of northern Manitoba, approximately 65 km northeast of the Town of Gillam and approximately 322 km northeast of the City of Thompson. There is no ambient air quality data for the project area or Gillam. An air quality monitoring station is operated at Thompson; however, air quality data for Thompson can be influenced by the emissions resulting from the operation of one of the largest point source emitters in the province, the Vale Inco Smelter.

4.2.1.1 Greenhouse Gases

In 2008, Manitoba emitted approximately 21.9 million tonnes of greenhouse gases (GHGs), approximately 3% of the total GHG emissions in Canada. Approximately 12.8 million tonnes was emitted from the energy sector and 7.6 million tonnes was emitted by the agriculture sector. Within the energy sector, approximately 7.3 million tonnes was emitted by transportation activities, of which approximately 5.1 million tonnes was emitted by road transportation (Environment Canada 2010b).

4.2.2 Climate

The project area is located within the Hudson Plains ecozone. Climatically, this ecozone has a cold continental climate where summers are cool and short while winters are very cold and long. Average annual temperatures range from -4°C to -1°C while annual precipitation ranges from 400 mm to 800 mm. Approximately one-third to one half of the precipitation falls as snow (Smith et al, 1998).

The nearest climate station with a long record period is Environment Canada's Gillam A meteorological station. Long term data is also available at Thompson and at Churchill. Since Gillam A is the nearest station, it is relied upon as indicative of climatic conditions at the Keewatinoow site. Table 7 shows the monthly temperature and precipitation and Table 8 shows the most frequent wind direction and average wind speed over the 1971-2000 normal period. Table 9 shows other relevant weather parameters for the Gillam A meteorological station.

Table 7 - Mean Monthly Temperatures and Precipitation Normals Gillam A (1971-2000)

Latitude 56°21'N, Longitude 94°42'W, Elevation 145.1 m

Month	Temperature (°C)	Precipitation (mm)
January	-25.8	17.5
February	-22	21.2
March	-15.1	20.3
April	-4.7	23.2
May	4.4	44.2
June	11.4	53.9
July	15.3	81.8
August	13.9	77.2
September	7	55
October	-0.4	40.9
November	-12.1	37.5
December	-22.5	26.7
Annual	-4.2	499.4

Source:

1) Canadian Climate Normals or Averages (Environment Canada 2011).

Table 8 - Mean Monthly Wind Speed and Direction Normals Gillam A (1971-2000)

Latitude 56°21'N, Longitude 94°42'W, Elevation 145.1 m

Month	Wind Speed (km/h)	Most Frequent Direction
January	14.8	W
February	14	W
March	14	NE
April	15.1	NE
May	15.4	NE
June	15.8	NE
July	15.1	NE
August	15.7	NW
September	17.4	NW
October	17.8	NW
November	16.4	NW
December	14.0	W
Annual	15.5	NE

Source:

2) Canadian Climate Normals or Averages (Environment Canada 2011).

Table 9 - Gillam A Extremes

Latitude 56°21'N, Longitude 94°42'W, Elevation 145.1 m

Parameter	Value and Date
Extreme Maximum Temperature (°C)	36.8 (June 29, 2002)
Extreme Minimum Temperature (°C)	-46.1 (January 21, 1975)
Extreme Daily Rainfall (mm)	64.4 (July 8, 2000)
Extreme Daily Snowfall (cm)	36.6 (May 3, 1988)
Extreme Maximum Hourly Wind Speed (km/h)	83 (September 27, 1981)
Extreme Maximum Wind Gust Speed/Direction (km/h)	107/NW (July 22, 1991)
Extreme Wind Chill	-61.1 (January 16, 1982)

Source:

3) Canadian Climate Normals or Averages (Environment Canada 2011).

4.2.3 Physiography and Landscape

4.2.3.1 Topography

The Hudson Bay Lowland Ecoregion is mostly flat with low relief and a gently northward slope causing a change in topography from 150 m above sea level (masl) to 30 masl. Relief in this ecoregion is characterized by post-glacial marine submergence and isostatic rebound of the land surface (Smith *et al*. 1998).

The topography of the project site varies from approximately 90 masl along the Conawapa Access Road to approximately 50 masl near the east side of the main camp, with the elevation adjacent to the Nelson River dropping down to approximately 30 masl (Natural Resources Canada 2010).

A topographic survey of the proposed lagoon site indicated that the site elevation ranges from approximately 90 masl on the west side of the lagoon near the Conawapa access road to approximately 75 masl on the east side of the lagoon.

4.2.3.2 Geology

The project area is underlain by the Hudson Bay Basin, which is a large sedimentary basin that is composed of flat, low relief Paleozoic limestone bedrock (Smith *et al.* 1998). Within the project area, the bedrock was formed during the Ordovician period of the Paleozoic era. (Manitoba Hydro 2011).

4.2.4 Soils

The soils of the Winisk River Lowland Ecodistrict are predominantly Organic Cryosols and deep Mesisols and Fibrisols, underlain by clayey and silty glaciolacustrine and marine sediments. Areas of mineral soils are dominantly well to imperfectly-drained Eluviated Eutric Brunisols. Agriculture and forestry are largely prevented by the severe climate, the poor drainage and slow heat conductance of the organic soils. Use of the mineral soils for agriculture and forestry is also restricted due to the poor water and nutrient retention properties. Permafrost is present throughout the ecoregion; however it is discontinuous and typically found with organic deposits (Smith *et al.* 1998).

The soils in the vicinity of the project site are mostly well-drained, medium-textured, mineral Brunisolic soils, with minor inclusions of poorly to very poorly-drained, permafrost-affected Organic soils (Manitoba Hydro 2011).

Between September 14 and September 27, 2011 a preliminary geotechnical investigation was completed at the proposed lagoon site. Based on a review of the geotechnical drill logs, the soil in the area of the proposed lagoon generally consists of a surficial layer of peat up to 0.3 m deep. A layer of sand, approximately 0.5 m to 5.7 m thick, was encountered under the peat in most of the test holes. In one of the test holes, a 2.0 m thick layer of gravel was encountered under the peat. The sand, peat or gravel was typically underlain by a layer of silt to auger refusal at a maximum drilled depth of 9.64 m below the ground surface. The silt had variable amounts of clay, gravel and sand. In three of the test holes, permafrost was found until auger refusal, ranging from 2.1 to 4.7 m below the ground surface.

4.2.5 Surface Water

4.2.5.1 Surface Water Regime

The project area falls within the Lower Nelson River sub-basin of the Nelson River drainage basin. The Lower Nelson River sub-basin extends northeast from Split Lake to Hudson Bay, and includes the Nelson River mainstem and Split Lake, as well as numerous headwater lakes and tributaries. The eastern portion of the Lower Nelson River sub-basin contains a number of small to medium sized tributaries while the western portion of the sub-basin is characterized by typical boreal lakes and rivers (Manitoba Hydro 2011).

The project site is located in the vicinity of several watercourses including the Nelson River, Tiny Creek, Goose Creek, Creek 14, Creek 15, Creek 16, Creek 18 and a few unnamed creeks. The proposed lagoon will discharge to the Nelson River via Creek 16.

Historic flow data for the Nelson River was only available at the Kettle Generating Station (05UF006) and the Long Spruce Generating Station (05UF007), approximately 64 km and 48 km, respectively, upstream of the project site. Monthly mean discharge rates at these stations are presented in Table 10.

Table 10 - Historic Monthly Mean Discharge Rates for the Nelson River Upstream of the Project Site

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Mean
Monthly Mean Discharge (m^3/s) at Kettle River Generating Station; 1987-2010													
	3,320	3,300	3,180	2,980	3,240	3,380	3,520	3,540	3,380	3,380	3,330	3,270	3,280
Monthly Mean Discharge (m^3/s) at Long Spruce River Generating Station; 1987-2010													
	3,330	3,310	3,180	2,990	3,280	3,390	3,500	3,540	3,390	3,400	3,340	3,280	3,290

Source:

1) Environment Canada 2010a

In addition to the flow data provided for the Nelson River, measured historical discharge rates were obtained for Creek 16, as outlined in Table 11.

Table 11- Historic Flow Rates for Creek 16

Month	Date	Flow Rate (m^3/s)
May	27/1992	0.28
	27/1995	0.05
	15/2005	0.01
	4/2006	Not Meterable
	15/2007	0.06
	26/2008	0.05
June	12/2005	0.00
	6/2007	0.01
July	6/2005	0.00
	15/2006	Not Meterable
	3/2007	0.02
	2/2008	0.02
August	12/2005	0.01
	11/2006	Not Meterable
	1/2007	0.00
	29/2007	0.01
	8/2008	0.00
September	5/2004	0.01
	12/2005	0.02
	26/2006	Not Meterable
	15/2008	0.00
October	16/2009	0.02
Spring (May-June)		0.00 (min)
		0.28 (max)
Fall (September – October)		0.00 (min)
		0.02 (max)

Source:

1) Derived from the Keewatinoow Construction Camp Waste Water: Screening of Sewage Effluent Discharge Memorandum (North/South Consultants Inc. 2012).

The summary report of Creek 16 completed by North/South Consultants Inc. can be found in Appendix 3.

4.2.5.2 Surface Water Quality

Limited information regarding the water quality of the nearest surrounding watercourses was available, with no information available for Creek 16. However, as Creek 16 is similar in size, location and main function as Creek 14 (North/South Consultants Inc, 2012); the water quality of these two creeks is expected to be similar for comparison purposes. A summary of the measured water quality in Creek 14 during the open-water season of 2004 is presented in Table 12.

Table 12 - Summary of Measured Water Quality in the 2004 Open-Water Season

	Ammonia (mg/L-N)	Nitrate/Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	TP (mg/L)	TSS (mg/L)	pH
Creek 14							
Mean	0.004	0.010	0.5	0.510	0.007	<2	7.73
Minimum	0.003	<0.005	0.4	0.408	0.003	<2	7.61
Maximum	0.005	0.021	0.6	0.603	0.011	2	7.93
SD	0.001	0.008	0.1	0.08	0.004	-	0.15
n	4	4	4	4	4	4	4

Source:

1) Derived from the Bipole III Transmission Project - Aquatic Environment Technical Report (North/South Consultants Inc. 2011).

4.2.6 Groundwater

The project area is located within the Hudson Bay Basin, which is composed of primarily Paleozoic carbonates. The bedrock units of the Hudson Bay Basin gently slope towards the northeast.

A chain of granular deposits were previously explored along the Conawapa Access Road. Sand and gravel within these deposits were found more than 10 m below the ground surface, and were separated from the carbonate aquifer by a thick layer of till. However, no information on groundwater quality within any shallow or perched aquifers was available during previous investigations (Stantec Inc. 2011).

Four standpipe piezometers were installed during the geotechnical investigation completed in September 2011 at the proposed lagoon site. Water levels were recorded on September 19th, September 29th, October 7th and/or November 16th, 2011. Groundwater levels fluctuated between the monitoring events, with groundwater levels ranging from 3.9 m below the ground surface to 0.15 m above the ground surface in September and from 0.44 m to 7.73 m below the ground surface in November. In October, only one well was monitored, which had a groundwater elevation of 0.51 m below the ground surface. Groundwater conditions, however, can vary significantly throughout the year.

A search using the 2009 Manitoba Conservation groundwater well database (GWDRILL) was completed to determine the registered wells within a 1.6 km radius of the proposed project site. Although groundwater wells are known to exist at the existing exploration camp (start-up camp site), no registered wells were found within the database for the searched area (Manitoba Water Stewardship, Groundwater Management Section 2009).

A useable groundwater aquifer is located within the carbonate bedrock in the vicinity of the site. Based on investigations previously completed in this area, this aquifer is expected to serve as the main source of groundwater for the construction camps and future operation of the KCS. The bedrock aquifer is highly permeable and it is connected to the Nelson River and overlain by approximately 60 m of overburden till layer with hydraulic conductivities that range from 10^{-4} m/s to 10^{-6} m/s. Measured piezometric levels for the aquifer were found at a few meters above the bedrock surface with transmissivity values ranging from 12,000 USG/day/ft to 37,000 USG/day/ft. Based on a pump test withdrawal rate of approximately 2,500,000 L/d (28.5 L/s), the drawdown was expected to be approximately 9 m at the supply well and approximately 2 m at a distance of 150 m from the supply well, with a potential measurable drawdown up to 2 km from the supply well (Stantec Inc. 2011). A 24-hr pump test was also performed in 1989 by Crippen Acres Limited and Wardrop Engineering Inc. (1989) to assess the resulting drawdown. Based on a pump test withdrawal rate of 31.5 L/s, the radius of drawdown was estimated to be

approximately 150 m, with a drawdown of approximately 14 m experienced in the immediate vicinity of the supply well. At the time, the permeability of the aquifer was measured to be $4x10^{-3}$ cm/s ($4x10^{-5}$ m/s).

As summarized in the Bipole III Transmission Project – Groundwater Technical Report (Stantec Inc. 2011), a groundwater investigation was previously completed by KGS ACRES, upon which a production well was placed in use for 72 hrs with the water analyzed for typical parameters. Although the test met most of the Health Canada Guidelines for Drinking Water Quality, the turbidity values and trihalomethane formation potential were above the acceptable levels. As the carbonate aquifer is connected to the Nelson River, there is a concern that use of the production well could cause river water to be drawn into the well; however this was not observed during the 72 hr test.

As part of the 1989 winter exploration program, groundwater samples were obtained for analysis and the results were compared to samples collected from two locations in 1988. During the 24-hr pump test, grey clay particles were noticed within the discharge water and were thought to have come from joints and bedding planes in the aquifer. A hydrogen sulfide odour was also noted, but its source was unknown. Based on the comparison of data, the samples obtained in 1989 exceeded applicable guidelines for hardness, chloride and iron, while the 1988 samples exceeded applicable guidelines for total hardness and iron (Crippen Acres Limited and Wardrop Engineering Inc. 1989).

4.3 Terrestrial Environment

4.3.1 Vegetation

The native vegetation of the Hudson Bay Lowland Ecoregion reflects the transition between the tundra to the north and the boreal forests to the south. Vegetation in the ecoregion generally includes open areas of low black spruce, dwarf birch, Labrador tea, lichen and moss. In areas of drier mineral sites, vegetation is more closed and supports black spruce, white spruce, paper birch, bearberry, bog cranberry, evergreen species, lichen and moss. In bog areas, vegetation typically includes low black spruce, Labrador tea, blueberry, bog rosemary, cloudberry, sphagnum moss and lichen, with fens supporting a cover of sedge, brown mosses, swamp birch and stunted tamarack (Smith *et al.* 1998).

Within the project area, there is a wide variety of vegetation species present. Some common vegetation species include black spruce, jack pine, tamarack, trembling aspen, common juniper, dwarf birch, willow, goldenrod, fireweed, reindeer lichen, Schreber's moss, peat moss, Labrador tea and sedge. During field investigations conducted for the Bipole III Transmission Project, snow willow was found in the northern electrode site and the construction power station site of the KCS (Szwaluk Environmental Consulting *et al.* 2011). The snow willow, also known as rock willow, is considered to be uncommon throughout the province therefore has been ranked by the Manitoba Conservation Data Centre as S3. However, it is not protected by the Manitoba *Endangered Species Act* or the federal *Species at Risk Act*.

On January 18, 2012, AECOM conducted a site visit. Based on observations, the site was sparsely vegetated in the area of the start-up camp and secondary cell with more vegetation noticed in the area of the primary cell. Although the site was covered by a layer of snow, tree species including white spruce, willow and tamarack were visible along with some small shrubs and grasses.

Fires, occurring naturally or not, have the potential to affect the vegetation composition, including life cycles, patchiness and regeneration. From 1928 to 2010, three reported fires have occurred within the ecoregion, with two fires (1976 and 1994) reported to have occurred around the proposed main camp (Manitoba Hydro 2011).

4.3.2 Wildlife

Wildlife in the Hudson Bay Lowland ecoregion generally includes woodland caribou, moose, snowshoe hare, spruce grouse, osprey, and various waterfowl including ducks, geese, swans, and other birds. Polar bears from the coast may also utilize habitat along the creeks and rivers as denning sites (Smith *et al.* 1998).

Within the area of the start-up camp and the KCS, habitats for American martin and moose are present. Based on documented home ranges, there is a potential for wolverine to be present. In terms of caribou, these areas are outside of the northern portion of the boreal woodland caribou range, however there is habitat that has been occupied by coastal (Pen Island and Cape Churchill) and barren-ground (Beverley-Qamanirijuaq) caribou. There is also a potential for migratory caribou to pass through the area. Various other species, including elk, are not expected to be present in the project area based on the documented extent of their ranges. Additionally, no beaver habitat was present within these areas (Manitoba Hydro 2011).

Within the Hudson Plain Ecozone, 161 bird species were observed during a bird community assessment completed for the Bipole III Transmission Project. Within the area of the KCS two (2) species of waterfowl and other waterbirds, six (6) species of colonial waterbirds, one (1) species of woodpecker, and 41 species of songbirds and other birds were identified. While within the project area, two (2) species of waterfowl and other waterbirds, two (2) species of colonial waterbirds and 28 species of songbirds and other birds were identified. Along the AC Collector Lines and Construction Power Lines, which would run from north of the start-up camp to the Keewatinoow Ground Electrode Site, two (2) species of waterfowl and other birds, four (4) species of colonial waterbirds, one (1) species of woodpecker and 38 species of songbirds and other birds were identified. Based on the bird community assessment, several species, such as Alder Flycatcher, Yellow Warbler and Swamp Sparrow are expected to occur frequently. Important species that may occur within the project area include the Sandhill Crane, as well as two (2) Federally listed species at risk (Olive-sided Flycatcher and Rusty Blackbird) (Manitoba Hydro 2011).

Three amphibians (wood frog, boreal chorus frog and northern leopard frog) have reported distribution ranges that may extend into the Hudson Plain Ecozone. Wetlands within the project area have the potential to provide suitable habitat to both northern leopard frogs and wood frogs. No documented reptiles are expected to occur within the project area due to a lack of suitable habitat (Manitoba Hydro 2011).

Terrestrial invertebrates located within the Hudson Plain Ecozone are generally biting insects, including black flies, horse flies, deer flies and mosquitoes. No terrestrial invertebrate habitat was identified to be at-risk or of-concern in the project area (Manitoba Hydro 2011).

On January 18, 2012, AECOM conducted a site visit. While at the site, no incidental sitings of fauna species or nests were observed; however, tracks of several species, including rabbits and deer, were visible.

4.3.3 Protected Species

To determine the potential species at risk that may be in the project area, the Manitoba Conservation Data Centre, Occurrence of Species by Ecoregion for the Hudson Bay Lowland Ecoregion was examined (Manitoba Conservation Data Centre 2011 (accessed)). The species listed for the Ecoregion were then cross referenced with the Manitoba *Endangered Species Act* (Manitoba Conservation, Wildlife and Ecosystem Protection 2011 (accessed)) and Schedule 1 of the Federal *Species at Risk Act* (Government of Canada 2011) to determine the listed rare or sensitive species that may occur in the project area. Species distribution maps available from the Manitoba Conservation Wildlife and Ecosystem Branch (2011 (accessed)) and the Species at Risk Public Registry (Government of Canada 2011) were also used, where possible, to determine listed species that may occur in the

project area. The search results indicated potential for seven (7) listed species to occur in the general project area as shown in Table 13.

Table 13 - Federally and Provincially Listed Species that May Occur in the Project Area

Species	Federal SARA Species Schedule 1 Status[1]	Manitoba *Endangered Species Act* Status[2]	Environmental Considerations
Common Nighthawk *Chordeiles minor*	Threatened	Not Listed	• Found throughout Manitoba, except in the high north.[3] • Habitat includes dunes, beaches, harvested forests, burnt-over areas, logged areas, rocky outcrops and barrens, grasslands, pastures, beat bogs, marshes, lakeshores and river banks.[1] • Generally arrive in mid to late May and leave in mid August to September.[3]
Olive-sided Flycatcher *Contopus cooperi*	Threatened	Not listed	• Typically found in areas of bogs, wet areas, open areas and recently burned stands.[3] • Spring migration generally occurs in the latter half of May.[3]
Rusty Blackbird *Euphagus carolinus*	Special Concern	Not Listed	• Typically found around the shores of wetlands, including slow moving streams, bogs, marshes, swamps, beaver ponds and pasture edges.[1] • Breeding range extends throughout most of Canada, however more commonly found north of the 55th parallel.[3] • Returns to breeding areas by early April and migrates south in late July to September. [3]
Yellow Rail *Coturnicops noveboracensis*	Special Concern	Not listed	• Generally found in marshes with little to no standing water, damp fields and meadows, floodplains, bogs, and upper levels of estuarine and salt marshes.[1] • Within Manitoba, they are typically present from late April to mid September.[3]
Grizzly Bear *Ursus arctos*	Extirpated	Extirpated	• Considered to be extirpated in Manitoba, but has been observed in Manitoba.[3] • Can be found from sea level to high-elevation alpine environments.[1] • Can occupy a diversity of habitats including temperate coastal rain forests, semi-desert arctic tundra, boreal forests and subalpine forests.[1]
Polar Bear *Ursus maritimus*	Special Concern	Threatened	• Common along the coast of Hudson Bay.[3] • Dens can be found south of the coastal region in frozen earth or peat.[1]
Northern Leopard Frog *Lithobates pipiens*	Special Concern	Not Listed	• Widely distributed in Manitoba, typically further south.[3] • Require well-oxygenated bodies of water for overwintering and slow moving waters for breeding.[1] • In the summer, found in moist upland meadows and native prairie, riparian areas and ponds.[1]

Sources:

1 Species at Risk Public Registry (Government of Canada 2011).

2 Species Listed under the Manitoba *Endangered Species Act* (Manitoba Conservation, Wildlife and Ecosystem Protection 2011 (accessed)).
3 Bipole III Transmission Project Environmental Impact Statement (Manitoba Hydro 2011).

Based on assessments completed as part of the Bipole III Transmission Project (Manitoba Hydro 2011), the following protected species are known to occur within the project area:

- Olive-sided Flycatcher – generally found associated with boreal forest bogs, wet areas and burnt stands.
- Rusty Blackbird – generally found in bogs, fens and riparian areas.
- Northern Leopard Frog – suitable wetland habitat identified in project area.

4.4 Aquatic Resources and Habitat

North/South Consultants Inc. (2011 and 2012) completed an assessment of all stream crossings for the collector and construction power lines and the northern and southern ground electrode lines. Within the assessment, stream morphology, flow regime, channel profile, substrate, riparian environment, cover types and habitat type were noted where possible. Table 14 summarizes aquatic information for some of the streams in the vicinity of the start-up camp and KCS site. Figure 05 illustrates the locations of the streams in relation to the project site.

Table 14 - Summary of Stream Crossing Information

	Flow Regime	Wetted Width/ Channel Width (m)	Fish Habitat Present	Fish Habitat Classification	Fish Present
Nelson River	Perennial	858.7 / 858.7	Yes	Important	Burbot, Goldeye, Lake Cisco, Lake Chub, Lake Sturgeon, Lake Whitefish, Longnose Sucker, Mooneye, Northern Pike, Sauger, Walleye, White Sucker, Yellow Perch, Brook Trout, Freshwater Drum, Rainbow Smelt
Creek 16	Ephemeral	- / 3 m	Yes	Marginal	Unknown.
Creek 15	Perennial	- / -	Yes	Importance	Brook Stickleback, Fathead Minnow, Longnose Sucker, White Sucker, Brook Trout, Suckers, Slimy Sculpin, Longnose Dace, Pearl Dace, Finescale Dace, Burbot.
Creek 14	Intermittent	0.84 / 1.12	Yes	Marginal	None in 2011.
Unnamed Tributary of Nelson River (south of Main Camp subdivision)	Ephemeral	- / -	Yes	Marginal	N/A
Goose Creek	Perennial	13 / 13	Yes	Important	Burbot, Fathead Minnow, Sculpins (Mottled and Slimy), Pearl Dace, Longnose Dace, White Sucker, Longnose Sucker, Brook Trout, Brook Stickleback,

					Finescale Dace,
Tiny Creek	Perennial	10 / 10	Yes	Marginal	Brook Trout, Brook Stickleback, Sculpins (Mottled and Slimy), Longnose Dace, Finescale Dace, Pearl Dace

Source:

1) Derived from the Bipole III Transmission Project - Aquatic Environment Technical Report (North/South Consultants Inc. 2011).
2) Derived from the Keewatinoow Construction Camp Waste Water: Screening of Sewage Effluent Discharge Memorandum (North/South Consultants Inc. 2012).

There are several fish bearing water courses, including Tiny Creek, Goose Creek, Creek 15, Creek 18 and Nelson River, and several non-fish bearing water courses, including Creek 14 and Creek 16, within the vicinity of the project area, as illustrated Figure 05.

Creek 15 and the Nelson River, located south and east of the project site, provide important habitat for aquatic species. Creek 15, located south of the wastewater treatment lagoon, is characterized by cascade/scour pools and riffle/scour pools in the lower portion of the creek and by bog/wetland habitat in the upper portion of the creek with groundwater upwelling downstream of the Conawapa Access Road. Creek 15 provides suitable nursery habitat for brook trout. The Nelson River, located approximately 800 m east of the project site, drains into the Hudson Bay, and provides spawning, rearing, feeding and overwintering habitat for a variety of species. Creek 16, Creek 14 and an unnamed tributary of the Nelson River have marginal fish habitat and are unlikely to directly support fish species (Manitoba Hydro 2011, North/South Consultants Inc. 2012).

North of the start-up camp, Creek 18 and several unnamed creeks provide marginal fish habitat. Where fish are present, species are typically limited to brook stickleback and fathead minnow (Manitoba Hydro 2011).

Goose Creek, which is south of the project site and north of the KCS site, is characterized by riffle/scour pool habitat and groundwater upwelling. It is an area of important fish habitat, along with Tiny Creek, which is located south of the KCS site (Manitoba Hydro 2011).

Based on known distribution ranges, the only invasive aquatic species that may be present in the project area is rainbow smelt, which is known to be located within the Nelson River. In terms of species of concern, only lake sturgeon is expected to be found within the project area (within the Nelson River) (Manitoba Hydro 2011). Lake Sturgeon has been designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as “endangered” in the Nelson River and is a candidate for possible listing under the *Species at Risk Act* (SARA).

4.5 Socio-Economic Environment

The nearest communities to the project site include the Town of Gillam (approximately 65 km southwest of the project site, on the south side of the Nelson River) and the Fox Lake Cree Nation based out of Bird, Manitoba (approximately 26 km southwest of the project site, on the north side of the Nelson River). In 2006, the Town of Gillam had a reported population of 1,209 people, of which 580 indicated they had an Aboriginal identity, and the Fox Lake Cree Nation had a reported population of 103 people. The total population of the Town of Gillam in 2006 was up slightly (2.6%) while the total population of the Fox Lake Cree Nation in 2006 was down (28.5%) from the populations reported in 2001. In 2006, the Town of Gillam had a total potential labour force of 855 people, 610 of which were reportedly employed (MMM Group Limited 2011b).

The Town of Gillam is the main operating and maintenance centre for Manitoba Hydro’s Nelson River facilities and transmission lines in the surrounding area. As a result, the majority of the population consists of Manitoba Hydro employees and their families (Manitoba Hydro 2011).

The project site is located within the jurisdiction of the Burntwood Regional Health Authority, with the closest hospital located in the Town of Gillam. Additional services offered in the Town of Gillam include an RCMP Detachment, a fire department, ambulance services, potable water, a public landfill and a Manitoba Hydro landfill as well as a school from nursery through grade 12, two hotels, two restaurants and a recreation centre. Services offered in the Fox Lake First Nation include potable water, a K-8 school, First Nation constables and a health office (MMM Group Limited 2011b, Manitoba Hydro 2011).

The project area is located within the Limestone Trapping Area. Within this trapping area, there are several registered traplines (RTLs); however, the project area is located in only one (1) of the RTLs (#5). Based on available maps, RTL #5 covers an area of at least 50,000 ha. From 1996 to 2008, the most popular trapped species in RTL #5 included marten, beaver, muskrat, white fox and red fox, while the least popular species included Ermine, silver fox, wolf and otter. Species not caught within RTL #5, but within the Limestone Trapping Area included coyote, fisher, squirrel and wolverine (Joro Consultants Inc. 2011).

In addition to trapping, hunting also occurs in the project area. The project area is located within Game Hunting Area (GHA) 2 and Game Bird Hunting Zone (GBHZ) 1, which regulate hunting seasons based on species, location and hunting method. Typically, hunting seasons run from September through December, although some species, including ptarmigan and wild turkey, have hunting seasons outside of this period (Manitoba Hydro 2011).

The project area is located within Forest Management Unit (FMU) 76, which is a non-commercial forest zone. Although Manitoba Conservation and Water Stewardship administrate resource use in the area, it does not manage forestry activities and no forestry inventory exists (Manitoba Hydro 2011). Based on the Bipole III Transmission Project Forestry Technical Report, approximately 52% of FMU 76 is non-forested (consisting mostly of wetlands), 39% consists of coniferous species and 9% consists of mixed wood and tall shrub species. Timber use within FMU 76 is divided into three (3) categories with personal timber use accounting for approximately 147 m^3 of annual timber utilization, First Nation timber use accounting for approximately 34 m^3 of annual timber utilization and an estimated 26 m^3 of timber is used as First Nation fuelwood (Plus4 Consulting Inc. *et al.* 2011).

The Nelson River basin is an important part of the Manitoba commercial fishing industry. Waterways within the Nelson River basin near the project area that can support commercial fishing quotas include Split Lake (approximately 135 km southwest) and Assean Lake (approximately 170 km southwest). Species with quotas and restrictions from these lakes include walleye, goldeye, sauger, whitefish and/or northern pike. In addition to commercial fishing, the general project area is also used for sport fishing. Although the project area and surrounding areas are not readily accessible by road, the waterways are accessed by fly-in lodges and outfitters. Domestic fishing by local First Nation communities also occurs in the general project area, with targeted species including lake whitefish, walleye, northern pike and lake sturgeon. As of 2009, the nearest active bait-fish blocks (where licensed commercial bait fishermen collect, buy and sell bait fish) to the project area were located in Wekusko Lake (approximately 430 km southwest), Reed Lake (approximately 470 km southwest) and Cormorant Lake (approximately 510 km southwest) (North/South Consultants Inc. 2011).

Wild rice generally grows in shallow, sheltered waterways that have good water flow. The highest concentration of licensed wild rice harvesting occurs between the 53rd and 56th parallels. The nearest licensed commercial wild rice harvesting waterways include Wekusko Lake (approximately 430 km southwest), Hargrave Lake (approximately 440 km southwest), Dyce Lake (approximately 460 km southwest), North Moose Lake (approximately 470 km southwest), South Moose Lake (approximately 470 km southwest), Reed Lake (approximately 470 km southwest), Dolomite Lake (approximately 490 km southwest) and Cormorant Lake (approximately 510 km southwest). (North/South Consultants Inc. 2011).

4.5.1 Land Use

The project area is situated on Provincial Crown Land and is located within the Fox Lake Resource Management Area, the northeastern portion of the Fox Lake Community Interest Zone (CIZ), the southern portion of the Churchill Wildlife Management Area (WMA) and the municipal boundaries for the Town of Gillam. Based on the Bipole III Transmission Project Lands of Special Interest and TLE Lands Technical Report, the project area is not located within any designated Area of Special Interest or within a Power Licence Area (Dave Wotton Consulting 2011).

The Fox Lake CIZ extends approximately 30 km from the reserve boundaries in order to protect the land from development until the First Nation has completed its Treaty Land Entitlement (TLE) land selection process. Although the KCS is located on a TLE parcel, the start-up camp and lagoon site are not on a TLE parcel.

The Churchill WMA is important for Polar Bear denning and caribou as well as wildlife viewing and research. The Churchill WMA generally consists of open spruce with tundra ponds, marshes, fens and bogs. While there are plans to increase protection of lands within the Churchill WMA in the future, the project site will continue to be outside the WMA (MMM Group Limited 2011a).

As the project area is located within the municipal boundaries of the Town of Gillam, the development of the project area is subject to the Town of Gillam's development plan (Local Government District (LGD) of Gillam Development Plan, By-Law No. 258) and zoning by-law (LGD of Gillam Zoning By-Law No. 335). Based on these by-laws, the project area is located in an area designated and zoned as limited development (LD), which identifies the land as yet to be selected for urban use for a variety of factors, including physical unsuitability and inaccessibility. Under the LD zoning classification, public utilities, public works and public services are permitted uses (MMM Group Limited 2011a).

The nearest national park to the project site is Wapusk National Park of Canada, located approximately 45 km to the north-northeast while the nearest provincial park to the project site is Numaykoos Lake Provincial Park, located approximately 140 km to the northwest (Province of Manitoba 2007).

4.5.2 Transportation

The main mode of transportation to the project site is by road. Vehicular access is provided via the Conawapa Access Road, which connects to PR 290 at the Henday Converter Station approximately 28 km south of the project site. PR 290 then connects to PR 280 just east of Stephens Lake and travels to the Town of Gillam and the City of Thompson. Table 15 summarizes the recorded 2009 annual average daily traffic (AADT) volumes for PR 290 and PR 280.

Table 15 - 2009 Annual Average Daily Traffic Volumes in Vicinity of Project Area

Provincial Road	Location	AADT Volume
PR 290	East of Sundance Creek	150
	West of Sundance Creek	50
PR 280	Southwest of PR 290, south of Nelson River	170
	East of Radisson Converter Station	210
	East of Gillam	290
	Northwest of PR 290, north of Nelson River	70
	South of the TCN Reserve Access	160
	North of PR 391, north of Thompson	190

Source:

1) Derived from the Bipole III Transmission Project Environmental Impact Statement (Manitoba Hydro 2011).

In addition to the AADT volumes, the collision rate along PR 290 and a portion of PR 280 was determined. Based on data available from 1994 to 2006, PR 290 experienced an average of 0.9 collisions/yr, which is equivalent to a collision rate of 0.6 collisions per million vehicle-kilometres of travel (MVKT). During this same period, there was an average of 2.5 collisions/yr, equivalent to 1.4 MVKT, on the portion of PR 280 running south of its junction with PR 290 to Gillam (Manitoba Hydro 2011).

Helicopter landing pads are also located in the project area as a means of site access. The nearest airport and/or aerodrome is located in the Town of Gillam, approximately 68 km southwest of the project site. The Gillam Airport supports 12 different airlines, and has charter and cargo services to Thompson, Flin Flon, The Pas and other northern locations, as well as scheduled service to Winnipeg and Thompson (Manitoba Hydro 2011).

The nearest operational rail line for the project site ends at the Henday Converter Station, approximately 28 km to the south. This rail line is a spur line off of the main rail line running between Churchill and Winnipeg. In central and northern Manitoba, this main rail line is owned and operated by Hudson Bay Railway, along with a few additional smaller rail lines. Rail traffic along the Hudson Bay Railway rail lines consists of approximately 17,000 to 19,000 cars loads/yr with approximately 6,000 to 7,000 car loads of wheat/grain transported to the Port of Churchill. For the next couple of years, car loads of wheat/grain to the Port of Churchill are expected to increase to approximately 9,000 car loads/yr. The highest volume of train traffic typically occurs between August and November during wheat/grain transport (Manitoba Hydro 2011).

4.6 Heritage Resources

In order to assess the heritage resource potential of the proposed project site, Northern Lights Heritage Services Inc. (2012) completed a review of heritage resource impact assessments (HRIAs) in the area. Based on information provided from these previous assessments, one archaeological site, HeKk-1, is known to be located in proximity to the site, approximately 1.2 km northeast. Investigations completed at this archaeological site have had mixed results with artefacts not always identified. However, no heritage resources have been discovered within the project site. The summary report completed by Northern Lights Heritage Services Inc. can be found in Appendix 4.

5. Potential Environmental Effects and Mitigation

5.1 Introduction

This chapter identifies the interactions between the Project and the environment. The potential environmental effects are identified and, where required, general mitigation measures are discussed and identified for the physical, biological and socio-economic components of the environment. Where potential residual environmental effects are anticipated after the application of the mitigation measures, the significance of the residual environmental effects has been determined. A summary of these assessments is outlined in Table 16. Refer to Section 3 for a description on the approach to the environmental assessment.

The potential for project interactions with environmental components and subsequent interactions with social components was analyzed by superimposing project elements onto existing natural conditions and applying standard mitigation measures. An underlying assumption of this method is that the Project will be constructed with due care for safety and environmental matters, using current and reasonable construction practices.

5.2 Physical Environment

5.2.1 Air Quality

5.2.1.1 Construction and Decommissioning

Activities that have the potential to generate emissions of Particulate Matter (PM), greenhouse gases (GHGs), nitrogen oxides (NO_x), sulphur dioxide (SO_2) and carbon monoxide (CO) and odour include the following:

- Combustion of fuel in diesel and gasoline engines in construction equipment and vehicles, generators and light plants;
- Potential burning of scrub and brush;
- Dust generated from clearing and grubbing of vegetation, excavating, compacting, grading, material and equipment placement/removal and vehicle and equipment movement; and
- Odour generated during the removal of sludge from the wastewater treatment lagoon.

During construction and decommissioning, approximately 10-15 pieces of equipment will be used at the site on a daily basis in addition to trucks used to haul materials, wastewater and/or solid waste to/from the site and a number of staff/shuttle vehicles used to travel within the project area as well as to the Town of Gillam (largest residential community within 100 km of the project site). Although the majority of the emissions will be generated within the project site, negative emission effects (reduction in air quality) may occur in the surrounding project area.

Odours may be generated during the decommissioning of the proposed lagoon, particularly the removal of sludge. Sludge will be dried in or adjacent to the lagoon using Geo Bags. These bags will be filled with sludge and allowed to dewater before removing the sludge from the bags and transporting the dewatered sludge to the Town of Gillam landfill. It is anticipated that the lagoon sludge removal will occur as soon as practical in 2019/2020. To reduce odour generation, the Geo Bags will be filled in the fall or before spring thaw to reduce odour generation.

The potential for dust to affect vegetative species is summarized in its relevant sections.

5.2.1.2 Operation

The following activities associated with the operation of the Project have the potential to affect air quality:

- Dust generated from traffic on gravel access roads;
- Combustion of fuel in diesel and gasoline engines in construction equipment and vehicles, generators and light plants;
- Dust generated from vehicle and equipment movement; and
- Odours may be generated by the lagoon during the operation phase; however, as the lagoon will be aerobic and methane generation is not anticipated, the level of odour is anticipated to be minimal through the year with a potential peak during spring thaw.

There is potential for airborne dust and particulate matter generation during the operational phase of the Project due to traffic on gravel access roads. During operation, traffic is expected to include material delivery trucks (approximately 3 trucks/week for the delivery of groceries, fuels and miscellaneous supplies to the start-up camp and 2 trucks/year for the delivery of alum for the wastewater treatment system), maintenance vehicles (approximately 1 vehicle/day), solid waste trucks (approximately 3 trucks/week), wastewater disposal trucks (approximately 2 trucks/day) as well as staff/shuttle vehicles travelling to/from the site (approximately 13 vehicles/day as a worst case scenario, including travel at the site and approximately 2 trips to/from the Town of Gillam).

There is potential for air quality effects due to vehicle and equipment emissions during the operation phase. For the wastewater treatment lagoon, vehicle and equipment emissions will generally be limited to a few staff vehicles, the operation of a motor boat to mix the alum, maintenance activities and delivery of materials to the site (anticipated to be a maximum of two truckloads of alum per year). For the start-up camp, emissions would generally be limited to staff travel and material delivery (including food supplies, chemical supplies and fuel). During operation, these activities may account for approximately 3 trucks/week for material delivery at the start-up camp, 2 trucks/yr for material delivery of alum for the wastewater treatment system, 1 vehicle/day for maintenance, 3 trucks/week for solid waste disposal, wastewater disposal trucks (approximately 2 trucks/day) and up to 13 vehicles/day for staff transport (worst case scenario, including travel at the site as well as approximately 2 trips to/from the Town of Gillam).

Odours may be generated by the lagoon during the operation phase, however as the lagoon will be aerobic and methane generation is not anticipated, the level of odour is anticipated to be minimal through the year with a potential peak during spring thaw.

The potential for dust to affect vegetative species will be discussed later in the report within the flora, fauna sections.

5.2.1.3 Mitigation Measures

The following measures have been incorporated into project design/siting:

- Distance to nearest residential communities (approximately 26 km and 65 km);
- Aerobic lagoon which reduces the generation of odourous gases; and
- Lagoon designed to meet organic loading requirements from Manitoba Conservation and Water Stewardship.

Mitigation measures include the following:

- Material stockpile heights will be limited and covered if required;

- Disturbed/exposed areas will be kept to a minimum with re-vegetation occurring as soon as practical where required;
- If required, dust suppression activities, such as spraying roads and material stockpiles with water or the proper application of other dust palliatives/agents, will be completed to limit the amount of airbourne dust;
- Speed limits will be set appropriately for road conditions and proximity to populated areas;
- Vehicles and equipment/machinery will be properly maintained;
- Vehicle idling will be kept to a minimum; and
- To reduce odour generation, Geo Bags will be filled in the fall or before spring thaw to reduce odour generation.

5.2.1.4 Residual Effects after Mitigation

Residual effects on local air quality are anticipated during construction, operation and decommissioning. The residual effects related to air quality after the implementation of mitigation and natural dispersion are considered to be small in magnitude, local in geographic extent, short-term in duration, moderate in frequency, reversible and moderate in uncertainty and are considered to be not significant.

5.2.2 Noise

5.2.2.1 Construction and Decommissioning

Noise will be generated to varying degrees during construction and decommissioning associated with the following activities:

- Heavy truck traffic used to transport materials and equipment;
- Operation of equipment used for construction activities; and
- Other traffic associated with construction.

During construction and decommissioning, approximately 10-15 pieces of equipment will be used at the site on a daily basis in addition to trucks used to haul materials, wastewater and/or solid waste to/from the site and a number of staff/shuttle vehicles used to travel within the project area as well as to the Town of Gillam (largest residential community within 100 km of the project site).

The potential for noise effects to affect human receptors and wildlife is discussed in their relevant sections.

5.2.2.2 Operation

Noise will be generated to varying degrees during operation associated with the following activities:

- Traffic associated with operation; and
- Maintenance activities and the use of a motor boat to mix the alum in the wastewater treatment lagoon.

Noise is expected to arise from the transport to/from the site of solid waste, wastewater, fuel, food supplies and chemicals as well as from various maintenance activities and use of a motor boat to mix the alum at the wastewater treatment lagoon. The anticipated level of noise during operation is expected to be less than during construction and decommissioning, however will be above existing ambient levels intermittently throughout the 1 to 5 year operation of the Project.

The potential for noise effects to affect wildlife species will be discussed later in the report within the flora and fauna sections.

5.2.2.3 Mitigation Measures

Potential noise effects will be mitigated with the implementation of the following measures:

- Vehicles and equipment will be properly maintained; and
- Hearing protection will be provided to workers as required.

5.2.2.4 Residual Effects after Mitigation

Residual effects to noise from the Project are anticipated. The anticipated level of noise during operation is expected to be less than during construction and decommissioning, however will be above existing ambient levels intermittently throughout the 1 to 5 year operation of the Project. The effects are moderate in magnitude, local in geographic extent, short-term in duration, moderate in frequency, reversible, and low in uncertainty and are considered to be not significant.

5.2.3 Climate

Climate, especially weather patterns, has the potential to affect the Project. The effects of climate/weather on the Project will be discussed in Section 7.

5.2.3.1 Construction and Decommissioning

Greenhouse gas (GHG) emissions (carbon dioxide and nitrous oxides) will be produced by combustion engines, including staff vehicles, transport vehicles and construction equipment, during construction and decommissioning of the various phases of the Project. The generation of GHGs has the potential to contribute to long-term negative climate change effects. As climate change cannot effectively be measured on a small scale, the generation of GHGs from the Project are predicted relative to the generation of GHGs in Manitoba (project region).

During construction and decommissioning, approximately 10-15 pieces of equipment will be used at the site on a daily basis in addition to trucks used to haul materials, wastewater and/or solid waste to/from the site and a number of staff/shuttle vehicles used to travel within the project area as well as to the Town of Gillam. Although the total GHG emissions is undefined, based on the number of vehicles and/or equipment anticipated to be used during the construction and decommissioning of the Project, the amount of GHGs emitted is expected to be negligible in comparison to the amount of GHGs emitted by the province as a whole (approximately 21.9 million tonnes in 2008). Greenhouse gas emissions are expected to be produced continuously throughout the working hours of the construction and decommissioning phase; however their generation would negligibly contribute to long term negative climate change effects.

5.2.3.2 Operation

Wastewater treatment can generate methane and nitrous oxide; potent GHGs. The proposed primary and secondary lagoon cells will be 1.5 m deep. According to the Intergovernmental Panel on Climate Change (IPCC), lagoons less than 1 m in depth generally provide aerobic conditions and negligible quantities of methane are generated, while lagoons deeper than 2-3 m however can produce significant amounts of methane. Additionally,

aerobic shallow ponds and anaerobic lagoons are unlikely sources of nitrous oxides (Intergovernmental Panel on Climate Change 2006). As the lagoons will be less than 2 m in depth, significant amounts methane and nitrous oxide emissions are not anticipated.

Further, an examination of Environment Canada's 2009 reported facility emissions found that no lagoons in Manitoba report GHG emissions. As such it is not anticipated that lagoons are a significant emitter of GHGs as no facilities currently meet the annual 50,000 tonnes of carbon dioxide equivalent reporting threshold (Environment Canada 2010c).

In addition to the wastewater treatment lagoon, GHGs (such as carbon dioxide, methane and nitrous oxide) may also be generated from the transport of materials and solid waste to/from the site (approximately 6 trucks/week for the delivery of groceries, fuels and miscellaneous supplies and the disposal of solid waste for the start-up camp and 2 trucks/year for the delivery of alum for the wastewater treatment system), transport of wastewater generated from the start-up camp prior to operation of the lagoon (approximately 2 trucks/day) as well as staff vehicles (at most 13 vehicles per day, including travel at the site as well as approximately 2 trips to/from the Town of Gillam) and maintenance activities (approximately 1 vehicle/day). Based on approximate average fuel economy, standard emission factors and trip distances of approximately 150 km round-trip to/from the Town of Gillam, approximately 3 tonnes of $CO_{2\ equivalent}$ was estimated to be generated by vehicle travel during the operation of the Project.

5.2.3.3 Mitigation Measures

To reduce GHG emissions, the following mitigation measures will be implemented:

- Vehicles and equipment will be properly maintained;
- Vehicle and equipment idling will be kept to a minimum; and
- Where several staff are travelling between the site and the Town of Gillam, car pools or shuttle vehicles will be used where possible.

5.2.3.4 Residual Effects after Mitigation

The amount of GHGs emitted during the construction, operation and decommissioning of the Project is expected to be negligible in comparison to the amount of GHGs emitted by the province as a whole (21.9 million tonnes in 2008). As a result, potential residual effects are not expected.

5.2.4 Geology

5.2.4.1 Construction

During construction activities, borrow materials, including approximately 6,026 m^3 of sand and 9,500 m^3 of rip-rap will be required for the construction of the wastewater treatment lagoon. Additional borrow materials may also be required for the start-up camp to provide a suitable foundation for the building structures. Based on the size of the start-up camp, approximately 3,500 m^3 of material may be required. Although these materials will be sourced from an approved borrow source or from within the project site, their removal has the potential to negatively affect geological landforms as the material will be permanently removed. This potential effect may occur within the project site as well as the surrounding project area, depending on location of the borrow source, but will only occur once.

5.2.4.2 Operation and Decommissioning

The operation and decommissioning activities of the proposed Project are not anticipated to affect the project site, area or regional geology as project activities will be generally limited to the surficial soil environment.

5.2.4.3 Mitigation Measures

To minimize the potential effect, the following mitigation measures will be implemented:

- Existing, approved borrow sources will be utilized where possible;
- Overburden soils will be stockpiled separately from required materials in order to reuse the overburden materials during borrow source reclamation activities; and
- Borrow sources will be reclaimed, where possible, as per the *Mine Closure Regulation, Manitoba Regulation M.R. 67/99*, including backfilling the borrow source where feasible, grading slopes to match existing terrain and re-vegetation of disturbed surfaces.

5.2.4.4 Residual Effects after Mitigation

With the implementation of the above mitigation measures and the likely volume of geological materials in the project area, the potential residual effect is anticipated to be moderate in magnitude, site related to geographic extent, long-term in duration and considered to be not significant.

5.2.5 Soil

5.2.5.1 Construction and Decommissioning

Clearing to develop work areas will result in removal and changes to soils including loss due to erosion, mixing and compaction, permafrost degradation and potential soil contamination as a result of accidental spills.

Soil Erosion

During construction and decommissioning, there is a potential for effects to soils (soil loss) due to erosion from wind and precipitation/runoff. Conditions favourable for erosion have the potential to occur during clearing and grubbing, excavation work, stockpiling, dyke construction and movement of equipment on the site. The Project will cause disturbance to approximately 18 ha of land out of the 33 ha within the approximate site boundary, including approximately 6.3 ha for the start-up camp, 6 ha for the lagoon and 3.7 ha for the forcemain, lift station and other incidental activities. However, at least 9 ha out of the approximate 18 ha of the project site to be disturbed has historically been highly disturbed (existing and other exploration camps over the last 20 years and borrow pits), with up to approximately 2 ha of additional area partially disturbed (adjacent to access road right-of-way or cleared of large vegetation). Erosion of soil and material stockpiles due to wind has the potential to cause subsequent effects on air quality (dust and particulate matter), while erosion due to precipitation/runoff has the potential to cause subsequent effects on surface water quality and potentially on downstream fish habitat. Based on existing site conditions, including surficial sandy soils and southeasterly flowing drainage channels and creeks, erosion has the potential to occur at the project site with potential effects observed in the surrounding project area.

A final discharge of the water remaining following sludge dewatering may occur during decommissioning of the lagoon. The amount of water remaining is expected to be small due to the small volume of sludge expected to be

generated during the operation of the lagoon, however, with the discharge, there is a potential to cause erosion within the drainage channel and Creek 16.

Soil Compaction and Mixing

Equipment movement, material placement, site preparation and compaction and structure placement at the site has the potential to cause soil compaction and mix soil horizons which may reduce available air and water storage and change soil structure. Soil compaction also has subsequent potential to change surface drainage patterns and reduce flora growth.

Permafrost Degradation

Permafrost is found discontinuously in the project site and surrounding project area and may be encountered during construction and decommissioning activities. Construction and decommissioning activities, such as clearing and grubbing, vehicle and equipment movement and excavating, can result in either the thawing of existing permafrost or the creation of additional permafrost. Subsequent effects of disturbing the permafrost may include increasing erosion, changing drainage patterns and changing soil stability. In order to maintain soil stability, if permafrost is encountered in critical areas, such as within the lagoon structure or forcemain route, the permafrost will be removed and replaced with suitable natural materials. As a result, if permafrost is encountered and replaced, the effect could be considered long term.

Soil Contamination

If improperly stored or disposed of (such as burying or openly releasing), wastes such as used oils, rags, drums, miscellaneous garbage and wastewater can contribute contaminants (such as hydrocarbons and metals) to the soil, negatively affecting the quality of the soil at the project site. If the soil quality is reduced, subsequent effects on groundwater quality and flora growth may occur. Additionally, if fresh concrete and/or concrete wash water (considered deleterious substances) are released and migrate through/across the soil into a fish bearing waterway, the pH of the water can rise with potential effects to surface water quality and subsequently fish and/or fish habitat.

5.2.5.2 Operation

Soil Erosion

During operation of the Project, the lagoon will be discharged at least once a year, with a potential for a second discharge each year depending on the wastewater generation rates from the construction camps. During discharge, there is a potential for erosion of the soil within the drainage channel and Creek 16 to occur.

In addition, due to local drainage pathways, erosion of the northern portion of the dyke structure may occur as a result of runoff, including periods of heavy precipitation events and spring melt. If the dyke structure erodes, there is a potential to create slope stability issues and, in extreme cases, decrease the stability of the lagoon dykes and increase the potential for lagoon failure.

Soil Contamination

If improperly stored or disposed of (such as burying or openly releasing), wastes such as used oils, rags, drums, miscellaneous garbage and wastewater can contribute contaminants (such as hydrocarbons and metals) to the soil, negatively affecting the quality of the soil at the project site

5.2.5.3 Mitigation Measures

Mitigation measures include the following:

Soil Erosion

- An EnvPP and erosion and sediment control plan (ESCP) will be developed for the Project outlining practices that should be adopted during project activities;
- Where possible, a 30 m setback distance from waterways will be established and marked to reduce clearing near the waterways (Manitoba Hydro 2011);
- Rip-rap, or other suitable erosion protection, will be installed along cut slopes and dyke slopes as well as at the lagoon discharge point to protect soils and dispense energy of runoff and discharge;
- A half culvert will be placed within the drainage ditch north of the lagoon cells to direct runoff away from the dyke structure;
- Discharge from the lagoon will be set to a "trickle" flow, with discharge occurring over a three week period; and
- Topsoil and other organic soils will be stockpiled separately for use in decommissioning activities.

Soil Compaction and Mixing

- Material stockpile height will be limited and covered if required;
- Material stockpiles will be located away from drainage areas;
- Disturbed/exposed areas will be kept to a minimum with re-vegetation occurring as soon as practical where required;
- Limiting vehicle and equipment movements to designated pathways within and around work areas;
- Reducing work activities in wet areas or during periods of extensive precipitation/runoff; and
- Repairing compacted areas as necessary, including appropriate grading and re-vegetation.

Permafrost Degradation

- Limiting vehicle and equipment movements to designated pathways within and around work areas;
- Disturbed/exposed areas will be kept to a minimum with re-vegetation occurring as soon as practical where required;
- Maintaining natural drainage pathways to prevent permafrost from melting; and
- Majority of equipment added to the site will be on the surface with excavation kept minimal, including the use of utilidors instead of buried utilities.

Soil Contamination

- Wastes, including wastewater, will be properly stored within the start-up camp and taken off-site for disposal at approved facilities;
- Concrete and concrete wash water will be appropriately disposed of via deposit to a shallow pit excavated to contain the waste concrete and allow surface infiltration of the wash water. The pit will be located on-site at least 100 m away from a drainage course to ensure that waste water does not migrate to surface water. Concrete will be removed for appropriate disposal or reuse on a regular basis.
- Waste will be removed from the site on a regular basis and, if required, remedial measures will be completed to remove contaminated materials;
- The site will be inspected at least every couple days for loose waste and debris in order to maintain a clean project site; and

- An emergency response plan will be developed for the Project and will include spill response procedures to minimize effects to soil.

5.2.5.4 Residual Effects after Mitigation

Soil Erosion

With the implementation of applicable mitigation measures, the potential residual effects to soil erosion are anticipated to be small in magnitude, site related to geographic extent, short-term in duration and considered to be not significant.

Soil Compaction and Mixing

With the implementation of applicable mitigation measures, the potential residual effects to soil compaction are anticipated to be small in magnitude, site related to geographic extent, short-term in duration and considered to be not significant.

Permafrost Degradation

With the implementation of applicable mitigation measures, the potential residual effects to permafrost degradation are anticipated to be moderate in magnitude, site related to geographic extent, long-term in duration and considered to be not significant.

Soil Contamination

With the implementation of applicable mitigation measures, the potential residual effects to soil contamination are anticipated to be small in magnitude, site related to geographic extent, short-term in duration and considered to be not significant.

5.2.6 Water Quality

5.2.6.1 Construction and Decommissioning

As part of the decommissioning of the lagoon, water remaining from sludge dewatering will be discharged into the drainage channel and eventually into Creek 16 and the Nelson River. Although the effluent may not meet all the parameter limits within the Manitoba Water Quality Standards, Objectives and Guidelines (MWQSOGs), the effluent will not be discharged from the lagoon until it meets applicable water quality limits outlined in the Environment Act Licence.

Surface water quality may be reduced as a result of contaminant release from the improper storage and disposal (such as depositing into waterways or drainage channels) of wastes generated during construction and decommissioning of the Project.

Sediment and Turbidity

As described in Section 5.2.5, wind and precipitation/runoff have the potential to cause soil erosion during various construction and decommissioning activities, including clearing and grubbing, excavation work, material stockpiling, dyke construction and equipment/vehicle movement. Soil erosion has the potential to cause subsequent effects to surface water quality and downstream aquatic resources as a result of sediment accumulation and turbidity.

Potential waterways within, and in close proximity to, the site that may be affected include the drainage channel (north of the secondary cell), Creek 16 (south of the primary cell) and an unnamed waterway (south of start-up camp). Based on existing site conditions, including surficial sandy soils and southeasterly flowing waterways, sedimentation and turbidity increases have the potential to occur within the project site and downstream project area.

5.2.6.2 Operation

During the operation phase, the lagoon is expected to be discharged 1-2 times per year, depending on the workforce within the construction camps, at a rate of approximately 0.033 m^3/s or less. At the expected discharge rate, the effluent is expected to make up the majority of the flow within the drainage channel and Creek 16, which is typically very low (ranging from 0-0.28 m^3/s in the spring and 0-0.02 m^3/s in the fall) (North/South Consultants Inc. 2012). However, the effluent discharge rate is significantly less (0.001%) than that of the Nelson River (3,300 m^3/s) and would negligibly contribute flow to the Nelson River. Comparing the anticipated effluent quality with the MWQSOGs, there is a possibility for concentrations of total suspended solids, total phosphorous and ammonia to exceed the MWQSOG values within Creek 16 itself (North/South Consultants Inc. 2012), however due to the intermittent nature of the flow within Creek 16, the MWQSOGs are not appropriate for direct comparison with the effluent concentrations.

Surface water quality may be reduced as a result of contaminant release from the improper storage and disposal (such as depositing into waterways or drainage channels) of wastes generated during operation of the Project.

Sediment and Turbidity

Soil erosion, and subsequently sediment accumulation and turbidity increases, may occur as a result discharge of the lagoon following sludge dewatering. Waterways that have the potential to be affected include the drainage channel and Creek 16 and the Nelson River. Based on the expected small volume of water to be discharged, the discharge rate is expected to be less than the discharge rate during operation (0.033 m^3/s) and would drain openly into Creek 16 via the drainage channel.

Suspended sediments within the effluent have the potential to increase sediments within the discharge route (drainage channel, Creek 16 and Nelson River). However, as the lagoon is designed to remove the suspended sediments from the wastewater and the lagoon will not be discharged until the concentration of suspended sediments is below the Environment Act Licence limit, no effects to the discharge route waterways as a result sediment within the effluent are anticipated to occur.

Additionally, as described in Section 5.2.5.2, runoff has the potential to erode the dyke structure. Eroded dyke materials have the potential to be transported into the natural drainage pathway and eventually into Creek 16 and the Nelson River, potentially increasing the sediment and turbidity of the waterways.

5.2.6.3 Mitigation Measures

To mitigate potential effects on surface water quality, the following mitigation measures will be implemented:

- Mitigation measures noted above for soil erosion also mitigate effects on total suspended solids;
- Handling of all hazardous materials on site will be in accordance with the EnvPP and all federal and provincial standards and protocols;
- Refuelling and equipment maintenance activities will occur at least 100 m away from a water body or conducted in a manner to prevent release of deleterious substances to a water body;

- Emergency response plans, procedures and equipment to address accidental oil, fuel, or hazardous waste spills will be in place to minimize effects should an accidental spill occur;
- Effluent will be sampled and tested for compliance with Environment Act Licence prior to discharge;
- If the effluent meets applicable quality limits, it will be discharged at a maximum rate of 0.033 m^3/s into the drainage channel; and
- If the effluent does not meet applicable quality limits, it will be stored until it meets applicable quality limits or trucked to another approved wastewater treatment facility for further treatment.

5.2.6.4 Residual Effects after Mitigation

With the implementation of the above mitigation measures, the potential residual effect to water quality in the Nelson River is anticipated to be small in magnitude, local in geographic extent, short-term in duration and considered to be not significant.

5.2.7 Groundwater

5.2.7.1 Construction, Operation and Decommissioning

Groundwater Drawdown

During construction, operation and decommissioning of the Project, groundwater levels in the local aquifer have the potential to be drawn down as a result of groundwater use.

The groundwater pumping rate for domestic purposes is expected to be approximately 0.23 L/s, therefore the drawdown effects are anticipated to be limited to the immediate area of the well on the project site with comparatively negligible drawdown resulting.

In addition to the groundwater used for domestic purposes, approximately 41,200 m^3 of groundwater may be withdrawn for the winter storage of the wastewater treatment lagoon to prevent material movement and frost upheaval.

Groundwater Quality

Groundwater quality has the potential to be affected as a result of contaminants released from accidental spills and improper storage and disposal (such as burying or openly releasing) of wastes generated at the site.

During the operation of the proposed lagoon, there is potential for groundwater quality effects (reduced quality) due to leaks of pipelines and/or the lagoon cells. If leaks are identified, Manitoba Hydro will investigate the source with the intent to repair any problems as well as to provide monitoring and investigations to confirm that the surrounding land/groundwater has not been contaminated and no risk to human health exists as a result.

Although potential effects are based on the type and quantity of contaminant released and the hydraulic conductivity of the soil, the amount of overburden above the drinking water groundwater aquifer (60-80 m) will reduce the potential for any contamination to migrate into the planned drinking water source through the soil. However, as the surficial soil consists of sand, silt, clay and till, some migration of contaminants may occur within the near-surface groundwater. As a result, potential negative effects on near-surface groundwater would be limited to rare occurrences of inappropriate waste disposal, be contained to the project site but have a potential to migrate into the immediately surrounding project area and may occur over the short to moderate-term. The potential effect is anticipated to be negligible in magnitude.

5.2.7.2 Mitigation Measures

Mitigation measures stated below will be implemented to reduce the potential effect on groundwater.

Groundwater Drawdown

- Groundwater well usage will be designed to reduce the potential of drawing surface water from the Nelson River into the aquifer; and
- Groundwater will be withdrawn at a sustainable rate to minimize groundwater drawdown.

Groundwater Quality

- The forcemain will be pressure tested prior to operation;
- The proposed lagoon cells will be double lined with a geosynthetic liner to protect groundwater resources. There will also be a sump connected to the interstitial layer between the liners to allow manual monitoring of the primary liner;
- The lagoon cells will be equipped with a dewatering/degassing system which will drain to a common manhole. The liquid collected in the manhole can be tested if there is suspicion the lagoon cells are leaking; and
- If leaks are identified, Manitoba Hydro will investigate the source. The investigation will be conducted with the intent to repair any problems as well as to provide monitoring and investigations to confirm that the surrounding land/groundwater has not been contaminated and no risk to human health exists as a result.

5.2.7.3 Residual Effects after Mitigation

Groundwater Drawdown

Drawdown of the groundwater level is likely to occur; especially during the filling of the lagoon. The potential residual effect to groundwater drawdown is expected to be moderate in magnitude, local in geographic extent, short-term in duration and is considered to be not significant.

Groundwater Quality

Taking into account the application of proposed mitigation, residual effects to groundwater quality as a result of the Project are not anticipated.

5.3 Terrestrial Environment

5.3.1 Vegetation

5.3.1.1 Construction, Operation and Decommissioning

Terrestrial vegetation located within the project site will be affected by clearing and preparation activities. The Project will have a footprint of approximately 18 ha, of which 11 ha has been previously cleared. It is therefore estimated that 7 ha will be cleared as a result of project activities. There was only one species of conservation concern found in the project area, the snow willow which is ranked S3 provincially.

Activities associated with the Project have the potential to adversely affect terrestrial vegetation including:

- Temporary reduction and change in vegetation diversity;
- Modification of existing landscape;
- Increased abundance of non-native (including invasive and noxious) plant species;
- Alteration of native vegetation; and
- Dust deposition on vegetation.

5.3.1.2 Mitigation Measures

To mitigate potential effects on vegetation, the following mitigation measures will be implemented:

- Vehicle and equipment movements will be limited to designated pathways within and around work areas;
- If required, dust suppression activities, such as spraying roads and material stockpiles with water or the proper application of other dust palliatives/agents, will be completed;
- Disturbed surfaces will be kept to a minimum with re-vegetation occurring, or natural succession encouraged, as soon as practical where required during construction and as part of decommissioning activities;
- A 30 m riparian vegetation buffer will be maintained adjacent to watercourses to the extent practicable;
- All equipment will be washed prior to working in the project area to reduce the spread of non-native species; and
- A re-vegetation and rehabilitation plan will be implemented for terrestrial sites that are disturbed or lost. Native plant species will be used for re-vegetation and rehabilitation of disturbed areas with increased erosion potential or where vegetation has been completely removed.

5.3.1.3 Residual Effects after Mitigation

Residual effects to vegetation include temporary reduction in vegetation in the project area. It should be noted that based on field investigations and background studies completed during the assessment of the Bipole III Transmission Project, the habitat at the site is not considered to be unique as it is similar to habitat in the surrounding project area (approximately 730 ha).

The residual effects to vegetation after mitigation are considered to be small in magnitude, site related to geographic extent, medium-term in duration and considered to not be significant.

5.3.2 Wildlife

5.3.2.1 Construction, Operation and Decommissioning

Potential impacts to wildlife include loss of habitat and sensory disturbance due to construction activities which may result in short-term avoidance of the area. As well, there is the potential for increased mortality due to human-wildlife encounters. During the operation phase of the Project, burrowing animals have the potential to burrow into the side of the lagoon dykes, potentially causing stability issues, leaks due to lagoon liner damage and tripping hazards. As a result, any burrowing animals will need to be excluded or removed from the lagoon area. Increased bird mortality for bird species occupying habitats within the Project area may result from nest damage if clearing is done during the nesting and rearing season.

5.3.2.2 Mitigation Measures

To mitigate potential effects on wildlife, the following mitigation measures will be implemented:

- Clearing activities will avoid critical nesting periods (generally April 1-July 31);
- An EnvPP will be developed for the Project outlining practices that should be adopted during project activities to reduce the potential of wildlife interactions;
- Chain link fence will be placed around the lagoon to reduce animal access; and
- If required, animals will be trapped in accordance with applicable management practice guidelines.

5.3.2.3 Residual Effects after Mitigation

There is a small potential for residual effects on mammals from project activities. However, the residual effects are considered to be small in magnitude, local in geographic extent, short-term in duration and are considered to not be significant.

5.4 Aquatic Resources and Habitat

5.4.1 Fish and Fish Habitat

5.4.1.1 Construction, Operation and Decommissioning

Changes in water quality from construction, operation and decommissioning activities may potentially affect fish and fish habitat.

The proposed wastewater treatment lagoon effluent will be discharged through a 30 m outfall onto a 25 m long spillway. The effluent will then flow along approximately 500 m of a natural drainage channel, of which the first 13 m (approximate distance from the spillway to the site boundary) will be covered in geotextile and rip-rap for energy dispersion, before combining with Creek 16 and will then flow approximately 500 m within Creek 16 before entering into the Nelson River. By discharging into the drainage channel and then Creek 16, the effluent will cool to ambient temperatures prior to reaching the river. Effluent will not be discharged between the 1st day of November of any year and the 15th day of June the following year.

5.4.1.2 Mitigation Measures

The mitigation measures designed and employed to avoid/minimize project effects on water quality apply to fish and fish habitat.

5.4.1.3 Residual Effects after Mitigation

There will be a small volume of treated wastewater discharged to Creek 16; however, this will be quickly assimilated within the Nelson River due to difference in flow rates (0.033 m^3/s vs 3,300 m^3/s). Creek 16 is considered to be an ephemeral, non-fish bearing waterway with marginal fish habitat while the Nelson River is considered to be a perennial, fish bearing waterway with important fish habitat. Due to the marginal fish habitat within Creek 16, the small volume of water anticipated to be discharged and the distance to the Nelson River (approximately 1,000 m via the discharge route) residual effects on fish or fish habitat are expected to be small in magnitude, local in geographic extent, short-term in duration and considered to be not significant.

5.5 Socio-Economic Environment

5.5.1 Land and Resource Use

5.5.1.1 Construction, Operation and Decommissioning

The Project will alter the land use of the project site from a sparsely/partially vegetated, disturbed borrow pit and camp site to an area temporarily used for wastewater treatment and accommodations. The project site is located within the Fox Lake Resource Management Area and members of the Fox Lake Cree Nation may use the land within and surrounding the project site for resources, including hunting, fishing and harvesting of important plants and plant communities. The potential loss of these resources at the project site as a result of project activities is considered a negative effect.

The project site and surrounding area are not used for commercial forestry, commercial fishing, or wild rice harvesting. As a result, no effects to these activities are expected to occur as a result of the Project. There is a potential to affect commercial hunting as the project site is located within a registered trapline area (RTL #5). However, the project site is relatively small in nature in relation to RTL #5 (approximately 0.03%).

5.5.1.2 Mitigation Measures

To reduce potential effects on land and resource use in the project site, the following mitigation measures will be implemented:

- Manitoba Hydro will acquire the property rights for the project site;
- Manitoba Hydro will maintain discussions with First Nations in the area;
- Staff will not be allowed to harvest resources at the site;
- An access management plan will be developed in conjunction with the Fox Lake Cree Nation as a means to allow resource users access to the project area;
- Disturbed areas will be restored to existing conditions and re-vegetated to promote natural regrowth;
- Manitoba Hydro will maintain discussions with the registered trapline holders and notify them of construction and decommissioning schedules and if trapping equipment needs to be moved; and
- Compensation will be paid to registered trapline holders, as required, during construction as per Manitoba Hydro's Trappers' Notification/Compensation Policy (Manitoba Hydro 2011).

5.5.1.3 Residual Effects after Mitigation

The potential residual effects to land and resource use, after the implementation of mitigation, is considered to be small in magnitude, site related to geographic extent, short-term in duration and considered to not be significant.

5.5.2 Transportation

5.5.2.1 Construction, Operation and Decommissioning

During project activities, transportation may be affected as a result of transport of materials, wastes and staff to/from the site. Some of the materials, such as sand and rip-rap will be sourced from the project site and surrounding area with travel likely restricted to the Conawapa Access Road and potentially PR 290. The transport of wastes and staff will mostly occur between the project site and the Town of Gillam, increasing traffic along the Conawapa Access Road, PR 290 and PR 280. There is also a potential that staff will need to be flown into the Town of Gillam, potentially increasing air traffic, however the Gillam airport is expected to have sufficient capacity to handle extra

traffic. The transport of the remaining materials, such as mobile trailers, pumps, etc. may be a combination of rail (up to the Henday Converter Station) and truck transport. As a result, traffic along the provincial highways between the site and Winnipeg, including the Conawapa Access Road, PR 290 and PR 280, may experience an increase in traffic volumes due to material delivery.

5.5.2.2 Mitigation Measures

To mitigate potential transportation effects, the following mitigation measures will be applied as appropriate:

- Manitoba Hydro will consult with appropriate agencies and government authorities (Manitoba Infrastructure and Transportation, Hudson Bay Railway, Town of Gillam) and will comply with all relevant government regulations and by-laws;
- Manitoba Hydro, in discussion with the Fox Lake Cree Nation, will develop a monitoring plan for vehicle movement;
- In the event that local roads are damaged due to the increased traffic, Manitoba Hydro will maintain and repair the Conawapa Access Road and will work in conjunction with Manitoba Infrastructure and Transportation (and other appropriate authorities as applicable) to maintain and repair other local roads including PR 290 and PR 280;
- Manitoba Hydro will notify appropriate stakeholders in the area;
- A shuttle to transport staff between the site and the Town of Gillam will be provided to reduce staff vehicles on the site and traffic volumes on local roads;
- Staff will be encouraged to stay at the site and not travel to the Town of Gillam;
- Signage will be posted along the Conawapa Access Road warning of road issues;
- Vehicle and equipment operators will be properly trained and hold valid driver's licences as appropriate;
- Staff will be reminded of safe-driving habits; and
- Manitoba Hydro will charter aircrafts to transport larger volumes of staff to the Town of Gillam as required.

5.5.2.3 Residual Effects after Mitigation

Traffic will increase as a result of project activities, with traffic volumes along the Conawapa Access Road, PR 290 and PR 280 being the most affected. However, the volume of traffic along the roads is expected to remain within the design capacity of each of the affected roads. As a result of the increased traffic volumes, there is a potential to cause congestion and delays on the local roads (Conawapa Access Road, PR 290 and PR 280). These negative effects would likely occur intermittently throughout the construction, operation and decommissioning phases within the project area.

The potential residual effect of congestion and delays is expected to be small in magnitude, regional in geographic extent, short-term in duration and considered to be not significant.

5.5.3 Recreation and Tourism

Recreational activities within the project site and surrounding area are limited due to its remote location. As no outfitters, lodges, campgrounds or parks are located within the project site and surrounding area and the only access road to the site is privately owned by Manitoba Hydro, no effects to recreation and tourism are anticipated to occur as a result of the Project.

5.6 Heritage Resources

5.6.1 Construction and Decommissioning

Assessments completed by Northern Lights Heritage Services Inc. (2011 and 2012) did not locate any heritage resources or heritage sites within the area of the site. However, construction and decommissioning activities have the potential to disturb undiscovered archaeological sites.

5.6.2 Operation

During the operational phase of the proposed Project, no additional ground disturbance is expected to occur.

5.6.3 Mitigation Measures

To mitigate potential effects on heritage resources the following mitigation measures will be implemented:

- If artefacts, historical features or skeletal remains are encountered during construction, work activities will stop immediately around the affected area with the find reported to the site supervisor. A qualified archaeologist may be required to investigate and assess the find prior to the continuation of work; and
- If human skeletal remains are encountered during construction activities, the find will be immediately reported to the site supervisor, Manitoba Hydro and the RCMP.

5.6.4 Residual Effects after Mitigation

With the implementation of mitigation, residual effects to heritage resources are not anticipated.

Table 16: Summary of Potential Environmental Effects		
Potential Environmental Effect	**Mitigation**	**Assessment**
Air Quality		
	• Material stockpile heights will be limited and covered if required; • Disturbed/exposed areas will be kept to a minimum with re-vegetation occurring as soon as practical where required; • If required, dust suppression activities, such as spraying roads and material stockpiles with water or the proper application of other dust palliatives/agents, will be completed to limit the amount of airbourne dust; • Speed limits will be set appropriately for road conditions and proximity to populated areas; • Vehicles and equipment/machinery will be properly maintained; • Vehicle idling will be kept to a minimum; and • To reduce odour generation, Geo Bags will be filled in the fall or before spring thaw to reduce odour generation.	Direction - Negative Magnitude - Small Geographic Extent - Local Duration - Short-term Overall - Not Significant
Noise		
	• Vehicles and equipment will be properly maintained; and • Hearing protection will be provided to workers as required.	Direction - Negative Magnitude - Moderate Geographic Extent - Local Duration - Short-term Overall - Not Significant
Climate		
Greenhouse Gas Emissions	• Vehicles and equipment will be properly maintained; • Vehicle and equipment idling will be kept to a minimum; and • Where several staff are travelling between the site and the Town of Gillam, car pools or shuttle vehicles will be used where possible.	Direction - N/A Magnitude - N/A Geographic Extent - N/A Duration - N/A Overall - N/A

Table 16: Summary of Potential Environmental Effects		
Potential Environmental Effect	**Mitigation**	**Assessment**
Geology		
Removal of Borrow Materials	• Existing, approved borrow sources will be utilized where possible; • Overburden soils will be stockpiled separately from required materials in order to reuse the overburden materials during borrow source reclamation activities; and • Borrow sources will be reclaimed, where possible, as per the *Mine Closure Regulation, Manitoba Regulation M.R. 67/99*, including backfilling the borrow source where feasible, grading slopes to match existing terrain and re-vegetation of disturbed surfaces.	Direction - Negative Magnitude - Moderate Geographic Extent - Site Duration - Long-term Overall - Not Significant
Soil		
Soil Erosion	• An environmental protection plan and erosion and sediment control plan (ESCP) will be developed for the project outlining practices that should be adopted during project activities; • Where possible, a 30 m setback distance from waterways will be established and marked to reduce clearing near the waterways (Manitoba Hydro 2011); • Rip-rap, or other suitable erosion protection, will be installed along cut slopes and dyke slopes as well as at the lagoon discharge point to protect soils and dispense energy of runoff and discharge; • A half culvert will be placed within the drainage ditch north of the lagoon cells to direct runoff away from the dyke structure; • Discharge from the lagoon will be set to a “trickle” flow, with discharge occurring over a three week period; and • Topsoil and other organic soils will be stockpiled separately for use in decommissioning activities.	Direction - Negative Magnitude - Small Geographic Extent - Site Duration - Short-term Overall - Not Significant

Table 16: Summary of Potential Environmental Effects		
Potential Environmental Effect	**Mitigation**	**Assessment**
Soil		
Soil Compaction and Mixing	• Material stockpile height will be limited and covered if required; • Material stockpiles will be located away from drainage areas; • Disturbed/exposed areas will be kept to a minimum with re-vegetation occurring as soon as practical where required; • Limiting vehicle and equipment movements to designated pathways within and around work areas; • Reducing work activities in wet areas or during periods of extensive precipitation/runoff; and • Repairing compacted areas as necessary, including appropriate grading and re-vegetation.	Direction - Negative Magnitude - Small Geographic Extent - Site Duration - Short-term Overall - Not Significant
Permafrost Degradation	• Limiting vehicle and equipment movements to designated pathways within and around work areas; • Disturbed/exposed areas will be kept to a minimum with re-vegetation occurring as soon as practical where required; • Maintaining natural drainage pathways to prevent permafrost from melting; and • Majority of equipment added to the site will be on the surface with excavation kept minimal, including the use of utilidors instead of buried utilities.	Direction - Negative Magnitude - Moderate Geographic Extent - Site Duration - Long-term Overall - Not Significant

Table 16: Summary of Potential Environmental Effects		
Potential Environmental Effect	**Mitigation**	**Assessment**
Soil		
Soil Contamination	• Wastes, including wastewater, will be properly stored within the start-up camp and taken off-site for disposal at approved facilities; • Concrete and concrete wash water will be appropriately disposed of via deposit to a shallow pit excavated to contain the waste concrete and allow surface infiltration of the wash water. The pit will be located on-site at least 100 m away from a drainage course to ensure that waste water does not migrate to surface water. Concrete will be removed for appropriate disposal or reuse on a regular basis; • Waste will be removed from the site on a regular basis and, if required, remedial measures will be completed to remove contaminated materials; • The site will be inspected at least every couple days for loose waste and debris in order to maintain a clean project site; and • An emergency response plan will be developed for the project and will include spill response procedures to minimize effects to soil.	Direction - Negative Magnitude - Small Geographic Extent - Site Duration - Short-term Overall - Not Significant

Table 16: Summary of Potential Environmental Effects		
Potential Environmental Effect	**Mitigation**	**Assessment**
Water Quality		
Sediment and Turbidity	• Mitigation measures noted above for soil erosion also mitigate effects on total suspended solids; • Handling of all hazardous materials on site will be in accordance with the environmental protection plan and all federal and provincial standards and protocols; • Refuelling and equipment maintenance activities will occur at least 100 m away from a water body or conducted in a manner to prevent release of deleterious substances to a water body; • Emergency response plans, procedures and equipment to address accidental oil, fuel, or hazardous waste spills will be in place to minimize effects should an accidental spill occur; • Effluent will be sampled and tested for compliance with Environment Act Licence prior to discharge; • If the effluent meets applicable quality limits, it will be discharged at a maximum rate of 0.033 m^3/s into the drainage channel; and • If the effluent does not meet applicable quality limits, it will be stored until it meets applicable quality limits or trucked to another approved wastewater treatment facility for further treatment.	Direction - Negative Magnitude - Small Geographic Extent - Local Duration - Short-term Overall - Not Significant
Groundwater		
Groundwater Drawdown	• Groundwater well usage will be designed to reduce the potential of drawing surface water from the Nelson River into the aquifer; and • Groundwater will be withdrawn at a sustainable rate to minimize groundwater drawdown.	Direction - Negative Magnitude - Moderate Geographic Extent - Local Duration - Short-term Overall - Not Significant

Table 16: Summary of Potential Environmental Effects		
Potential Environmental Effect	**Mitigation**	**Assessment**
Groundwater		
Groundwater Quality	• The forcemain will be pressure tested prior to operation; • The proposed lagoon cells will be double lined with a geosynthetic liner to protect groundwater resources. There will also be a sump connected to the interstitial layer between the liners to allow manual monitoring of the primary liner; • The lagoon cells will be equipped with a dewatering/degassing system which will drain to a common manhole. The liquid collected in the manhole can be tested if there is suspicion the lagoon cells are leaking; and • If leaks are identified, Manitoba Hydro will investigate the source. The investigation will be conducted with the intent to repair any problems as well as to provide monitoring and investigations to confirm that the surrounding land/groundwater has not been contaminated and no risk to human health exists as a result.	Direction - N/A Magnitude - N/A Geographic Extent - N/A Duration - N/A Overall - N/A
Vegetation		
	• Vehicle and equipment movements will be limited to designated pathways within and around work areas; • If required, dust suppression activities, such as spraying roads and material stockpiles with water or the proper application of other dust palliatives/agents, will be completed; • Disturbed surfaces will be kept to a minimum with re-vegetation occurring, or natural succession encouraged, as soon as practical where required during construction and as part of decommissioning activities. • A 30 m riparian vegetation buffer will be maintained adjacent to watercourses to the extent practicable; • All equipment will be washed prior to working in the project area to reduce the spread of non-native species; and • A re-vegetation and rehabilitation plan will be implemented for terrestrial sites that are disturbed or lost. Native plant species will be used for re-vegetation and rehabilitation of disturbed areas with increased erosion potential or where vegetation has been completely removed.	Direction - Negative Magnitude - Small Geographic Extent - Site Duration - Medium-term Overall - Not Significant

Table 16: Summary of Potential Environmental Effects		
Potential Environmental Effect	**Mitigation**	**Assessment**
Wildlife		
	• Clearing activities will avoid critical nesting periods (generally April 1-July 31); • An environmental protection plan will be developed for the project outlining practices that should be adopted during project activities to reduce the potential of wildlife interactions; • Chain link fence will be placed around the lagoon to reduce animal access; and • If required, animals will be trapped in accordance with applicable management practice guidelines.	Direction - Negative Magnitude - Small Geographic Extent - Local Duration - Short-term Overall - Not Significant
Fish and Fish Habitat		
	• The mitigation measures designed and employed to avoid/minimize project effects on water quality apply to fish and fish habitat.	Direction - Negative Magnitude - Small Geographic Extent - Local Duration - Short-term Overall - Not Significant
Land and Resource Use		
	• Manitoba Hydro will acquire the property rights for the project site; • Manitoba Hydro will maintain discussions with First Nations in the area; • Staff will not be allowed to harvest resources at the site; • An access management plan will be developed in conjunction with the Fox Lake Cree Nation as a means to allow resource users access to the project area; • Disturbed areas will be restored to existing conditions and re-vegetated to promote natural regrowth; • Manitoba Hydro will maintain discussions with the registered trapline holders and notify them of construction and decommissioning schedules and if trapping equipment needs to be moved; and • Compensation will be paid to registered trapline holders, as required, during construction as per Manitoba Hydro's Trappers' Notification/Compensation Policy (Manitoba Hydro 2011).	Direction - Negative Magnitude - Small Geographic Extent - Site Duration - Short-term Overall - Not Significant

Table 16: Summary of Potential Environmental Effects		
Potential Environmental Effect	**Mitigation**	**Assessment**
Transportation		
	• Manitoba Hydro will consult with appropriate agencies and government authorities (Manitoba Infrastructure and Transportation, Hudson Bay Railway, Town of Gillam) and will comply with all relevant government regulations and by-laws; • Manitoba Hydro, in discussion with the Fox Lake Cree Nation, will develop a monitoring plan for vehicle movement; • In the event that local roads are damaged due to the increased traffic, Manitoba Hydro will maintain and repair the Conawapa Access Road and will work in conjunction with Manitoba Infrastructure and Transportation (and other appropriate authorities as applicable) to maintain and repair other local roads including PR 290 and PR 280; • Manitoba Hydro will notify appropriate stakeholders in the area; • A shuttle to transport staff between the site and the Town of Gillam will be provided to reduce staff vehicles on the Site and traffic volumes on local roads; • Staff will be encouraged to stay at the site and not travel to the Town of Gillam; • Signage will be posted along the Conawapa Access Road warning of road issues; • Vehicle and equipment operators will be properly trained and hold valid driver's licences as appropriate; • Staff will be reminded of safe-driving habits; and • Manitoba Hydro will charter aircrafts to transport larger volumes of staff to the Town of Gillam as required.	Direction - Negative Magnitude - Small Geographic Extent - Regional Duration - Short-term Overall - Not Significant
Recreation and Tourism		
	• No mitigation proposed.	Direction - N/A Magnitude - N/A Geographic Extent - N/A Duration - N/A Overall - N/A

Table 16: Summary of Potential Environmental Effects		
Potential Environmental Effect	**Mitigation**	**Assessment**
Heritage Resources		
	• If artefacts, historical features or skeletal remains are encountered during construction, work activities will stop immediately around the affected area with the find reported to the site supervisor. A qualified archaeologist may be required to investigate and assess the find prior to the continuation of work. • If human skeletal remains are encountered during construction activities, the find will be immediately reported to the site supervisor, Manitoba Hydro and the RCMP.	Direction - N/A Magnitude - N/A Geographic Extent - N/A Duration - N/A Overall - N/A

6. Accidents and Malfunctions

To prevent accidents and malfunctions, construction, operation and decommissioning activities will be conducted in accordance with all regulatory requirements. The following sections provide additional details on precautionary measures that are proposed to prevent or mitigate accidents and malfunctions. Worker protection in Manitoba is provided through standards, procedures and training legislated under the *Workplace Safety and Health Act*. All practices performed at the site will be carried out in accordance with the *Workplace Safety and Health Act* to minimize health and safety effects.

6.1 Fire

During construction, operation and decommissioning activities, there exists the potential for fires at the site that involve mechanical/electrical equipment, fuels, treatment chemicals, human-related occurrences, such as improper disposal of cigarette butts, and natural occurrences due to dry weather that could be fuelled by stockpiles of cleared vegetation. The use of alum within the wastewater treatment system and chlorine within the water treatment system do not typically present fire or explosion hazards and as such do not present a potential fire risk during the operation phase. Effects related to fires include, but are not limited to, forest fire risk (vegetation and wildlife habitat loss), vegetation composition, including life cycles, patchiness and regeneration, harm to on-site personnel and equipment and the potential release of contaminants and hazardous materials into the environment (potential to affect soil, air, groundwater quality and surface water quality with potential subsequent effects on downstream fish and fish habitat).

All precautions necessary must be taken to prevent fire hazards at the site, including, but not limited to:

- All flammable waste will be removed on a regular basis and disposed of at an appropriate disposal site;
- Appropriate fire extinguisher(s) will be available on the site during all phases of the Project. Such equipment will comply with and be maintained to, the manufacturers' standards;
- A separate water storage area will be provided for use and distribution in the event of a fire at the site;
- All on-site fire prevention/response equipment, including the fire truck, will be checked on a routine basis, in accordance with local fire safety regulations, to confirm the equipment is in proper working order at all times;
- Greasy or oily rags or materials subject to spontaneous combustion will be deposited and stored in appropriate receptacles away from surface water. This material will be removed from the site on a regular basis and be disposed of at an appropriate waste disposal facility;
- In periods of high forest fire risk, idling of vehicles will be reduced. Further, vehicles will be restricted to designated roads/trails to reduce potential fire ignition risk;
- All chemicals and fuels will be stored in appropriate facilities (designed in compliance with regulatory requirements) at the start-up camp, or main camp as applicable, to reduce the potential for accidental ignition;
- Cleared vegetation will be piled, burned or disposed of as specified in Manitoba Conservation and Water Stewardship work permits. If vegetation is burned, all fires will be completely extinguished and monitored to ensure there are no hot spots (Manitoba Hydro 2011); and
- Smoking will only be allowed in designed areas that contain appropriate receptacles for disposal of cigarette butts.

6.2 Spills

During construction, operation and decommissioning activities, there is potential for environmental effects due to fuel and chemical spills and/or leaks. Accidents (including transportation accidents) could also result in the accidental

release of alum, chlorine, hazardous materials and/or equipment/vehicle fluids and fuels or dewatered sludge if being transported for disposal. A number of potential environmental concerns are also associated with the accidental release of chemicals and fuels resulting from improper storage and handling procedures. As a result of spills, effects on soils, vegetation, groundwater quality, surface water quality and subsequently fish and fish habitat as well as degradation of air quality and a direct threat to human health and safety are possibilities.

To prevent spills from occurring during project activities, the following procedures will be employed:

- All potentially hazardous products (if required on-site) will be stored in a pre-designated, safe and secure product storage area(s) in accordance with applicable legislation at the start-up camp, or lagoon as applicable;
- Storage sites will be inspected periodically for compliance with requirements.
- Any used oils or other hazardous liquids will be collected and disposed of according to provincial requirements;
- Service and minor repairs of equipment performed on-site will be performed by trained personnel in appropriate areas;
- Vehicles and equipment will be maintained to minimize leaks. Regular inspections of hydraulic and fuel systems on equipment/machinery will be completed on a routine basis. When detected, leaks will be repaired immediately by trained personnel;
- Refuelling and equipment maintenance activities will occur at least 100 m away from a waterbody or conducted in a manner to prevent release of deleterious substances to a waterbody;
- Fuel transfers, including from tanker to storage tank and storage tank to equipment, will be attended at all times;
- Standard environmental management practices will be adhered to in order to minimize the risk of accidental spills and adverse effects;
- An Emergency Preparedness and Spill Response Plan will be developed by Manitoba Hydro and will contain procedures for dealing with a spill, including:
    - Reporting the spill to Manitoba Hydro, Manitoba Conservation and Water Stewardship and Environment Canada as appropriate.
    - Taking immediate measures with a spill kit or suitable alternative to prevent migration of the spilled material. Recovery measures will also be implemented as necessary in consultation with the appropriate provincial authorities.
    - If required, undertaking a remediation program with contaminated material appropriately managed (in accordance with federal and provincial regulations).
- On-site construction staff will be trained in how to deal with spills and clean-up procedures, including knowledge of how to properly deploy site spill kit materials; which will be readily accessible at the site at all times; and
- Concrete and concrete wash water will be appropriately disposed of via one of the two following options:
    - Waste concrete and concrete wash water will be disposed of via deposit to a shallow pit excavated to contain the waste concrete and allow surface infiltration of the wash water. The pit will be located on-site at least 100 m away from a drainage course to ensure that waste water does not migrate to surface water. Concrete will be removed for appropriate disposal or reuse on a regular basis.
    - Waste concrete and concrete wash water will be disposed of at the lagoon via the truck dump area. The amount of wash water will be negligible compared to the lagoon volume (approximately 20 trucks each with approximately 50 L of water (1,000 L)). By disposing of the wash water within the lagoon, sufficient treatment will be ensured before the waste water is released to the downstream water ways.

Implementing the above mitigation measures, in addition to mitigation measures described within the Bipole III Transmission Project (Manitoba Hydro 2011), would likely result in negligible residual effects that are considered not significant.

6.3 Dyke Failure

During the operation phase of the wastewater treatment lagoon, inadequate dyke design and construction could result in dyke failure and subsequent release of raw, partially treated or treated effluent to the environment. Environmental effects could include erosion, surface and groundwater quality effects, flora and fauna habitat loss, fish and fish habitat effects and human health and safety effects. To prevent lagoon dyke failure, the dykes will be geotechnically designed, by a registered professional engineer, to contain the liquid load. The internal dykes of the lagoons will be lined with rip-rap to protect the dykes from erosive wave action. A perimeter drainage ditch will prevent the dykes from being weakened from standing water in the fill and a natural drainage channel north of the secondary cell will be reinforced with a half culvert and rip-rap to prevent erosion of the dyke structure. Regular inspection of dyke integrity will also be conducted by Manitoba Hydro personnel. In the event that deficiencies are identified, appropriate repairs will be undertaken as soon as possible. With the described mitigation measures in place, the likelihood of a dyke failure is anticipated to be negligible.

6.4 Pipeline and Pump Malfunction

To prevent pipeline and pump failure, new pipelines and pumps will be tested prior to operation to identify any potential issues, including any pipeline leaks. Regular inspection of the pumps and accessible pipelines will be conducted by Manitoba Hydro personnel. Pipelines used for the forcemain will be suitable for cold weather climates and/or insulated/heat traced to prevent cracking and/or failure due to freezing. The proposed outfall pipeline has a low potential for leaks as it will be a gravity pipeline. Further, in the event of a leak of this pipeline any leaks would be of treated effluent therefore minimizing potential environmental impacts. Although the effluent will be discharged to a natural drain, the effluent is expected to flow through the natural drain into Creek 16 then into the Nelson River. In the event that the effluent does not follow the defined drainage channel, the effluent would already be treated, minimizing potential environmental impacts. In the event of an identified pipeline or pump failure, the location of the failure will be identified, the pipeline or pump will be repaired and/or replaced, and if required, appropriate remediation measures will be undertaken.

6.5 Liner Failure

The proposed lagoon design will be double lined with a geosynthetic liner and an interstitial monitoring sump to protect groundwater resources as leaks in the liner have the potential to cause groundwater impacts. During the construction process, liner joints will be welded and tested through a quality assurance program in accordance with manufacturer specifications. The new lagoon will also include a dewatering/degassing system installed below the liner. The dewatering/degassing system will collect any groundwater that rises to the level of the system to avoid pressure on the liner. The dewatering/degassing system and interstitial sumps will drain to a manhole that will discharge to the perimeter ditch. Manitoba Hydro will have the ability to test the water quality in the manhole to identify leaks. If leaks are identified during facility operation or if contamination is identified during the groundwater monitoring program, Manitoba Hydro will notify Manitoba Conservation and Water Stewardship and investigate the source of the leak/contamination. The investigation will be conducted with the intent to identify appropriate mitigation measures as well as to provide monitoring and investigations to confirm that the surrounding land/groundwater has not been contaminated and no risk to human health exists as a result.

6.6 Transportation Accidents

Transportation accidents can result in the release to the environment of vehicle fluids (such as diesel, oils etc.) and the material the vehicles were transporting (such as dewatered sludge). Effects related to spills can include air, soil, surface water and groundwater quality impacts with potential for subsequent effects on flora, fauna, aquatic resources and human health. In the event of a transportation accident resulting in a spill, appropriate remediation measures will be coordinated with Manitoba Conservation and Water Stewardship and undertaken in accordance with the nature of the spilled material.

7. Effects of the Environment on the Project

7.1 Severe Weather

Severe weather conditions including high winds, heavy precipitation and storm events have the potential to affect the Project during construction, operation and decommissioning activities. During construction and decommissioning, severe weather conditions have the potential to affect various activities including material placement/compaction, grading and re-vegetation efforts. High winds may result in erosion of disturbed surfaces and material stockpiles as well as generate dust from these sources and the gravel access road during construction, operation and decommissioning. High winds also have the potential to create waves in the lagoon cells and subsequent potential to erode the interior surfaces of the dyke structure. Heavy precipitation could result in erosion and runoff flooding of the project site and surrounding areas during construction and decommissioning, while during operation, heavy precipitation could result in unpredicted water volumes which may require pumping for a longer duration or at a higher rate from the secondary cell, or the storage of additional water within the lagoon, which may result in an increase in discharge volume.

To mitigate extreme weather conditions, the following procedures will be employed as necessary:

- During construction and decommissioning, site supervisors will be cognizant of weather conditions;
- Construction, operation and decommissioning activities will occur at the appropriate time of the year and/or when the climate is favourable to do so;
- Disturbed/exposed areas will be kept to a minimum with re-vegetation/regrowth occurring as soon as practical where required;
- Material stockpile height will be limited and protected from extreme weather events as required;
- If required, dust suppression activities, such as spraying roads and material stockpiles with water or the proper application of other dust palliatives/agents, will be completed;
- Construction of temporary drainage and water diversion measures as appropriate, including the installation of silt fences and/or other erosion control measures to minimize erosion and sediment transport;
- Use of erosion control measures throughout the construction, operation and decommissioning phases of the Project;
- Rip-rap, or other suitable erosion protection, will be installed along cut slopes and dyke slopes to prevent erosion effects; and
- A stop-work policy will be in place to prevent workers from being exposed to extreme weather as necessary.

With the implementation of the above mitigation measures, the potential residual effects are anticipated to be negligible and not significant.

7.2 Flood

Based on topographic information, the elevation of the site ranges from 90 masl to 75 masl with the ground elevation adjacent to the Nelson River (approximately 800 m east) approximately 30 masl. Although the elevation of the waterways surrounding the site, including Creek 16, are unknown, they are expected to be several meters lower than the site elevation based on visual observations. Based on the elevation differences, flooding is not expected to affect the proposed Project.

7.3 Drought

In cases of drought, flows in Creek 16 may be reduced, causing a decrease in water quality, with potential effects (including reduced water quality and a reduction of the assimilative capacity) occurring in the downstream Nelson River. However, in the event of a drought, the amount of water within the lagoon would be reduced by evaporation, which would result in a lower discharge volume and subsequently providing better capacity for wastewater treatment. Additionally, depending on the population generating wastewater during a drought, there is a potential that wastewater could be held for a longer period within the lagoon to provide additional treatment prior to discharge. As the flow rate within the Nelson River is significantly higher than the discharge rate (approximately 3,300 m^3/s compared to 0.033 m^3/s), a reduction of the flow rate within the Nelson River is unlikely to result in a change in the water quality or assimilative capacity in respect to the lagoon discharge. As effluent would not be allowed to be released until appropriate water quality limits and any Environment Act Licence restrictions are met, potential effects as a result of lower flows in Creek 16 and the Nelson River are expected to be negligible and not significant.

7.4 Seismic Activity

The proposed Project is located in a region of Manitoba that has been assessed as an area of relatively low seismic hazard (Natural Resources Canada 2011). Seismic activity is not expected to affect the proposed Project.

8. Monitoring and Follow-Up

An EnvPP will be developed for the Project to mitigate, manage and monitor potential environmental effects during project activities. As well, the EnvPP will be used to verify predictions made in this EAP. If unexpected effects are detected during monitoring, the protection program defines the process for determining what measures will be taken to mitigate them.

During the operation phase of the Project, monitoring of effluent quality will be conducted in accordance with Environment Act Licence requirements to minimize the potential for surface water quality impacts.

9. Public Consultation

Public consultation is an integral part of the environmental assessment process. It provides the opportunity for interested stakeholders to receive information from project planners and, in return, it allows the proponents to gain input about public concerns. Public consultation can also provide an opportunity to actively involve stakeholders in the early stages of a project which, in turn, delivers a sense of transparency in the assessment and planning process.

In the case of the proposed Project, specific formal public consultation was not undertaken as an extensive public and First Nation consultation program was carried out as part of the Bipole III Transmission Project's environmental assessment, which included a series of regional and community open houses, stakeholder meetings, aboriginal traditional knowledge workshops and newsletters. Discussions between Manitoba Hydro, Fox Lake Cree Nation and Tataskweyak Cree Nation have been ongoing since 2009 as a result of various historic settlement and implementation agreements. During the consultation process, information regarding the KCS and associated projects were discussed. Discussions with Fox Lake Cree Nation and Tataskweyak Cree Nation are expected to continue throughout the Project as a result of ongoing discussions with the overall Bipole III Transmission Project. As a result, additional public consultation specific to the Project is not anticipated to be warranted.

10. Conclusion

Based on the design of the Project and the implementation of mitigation measures identified in this environmental assessment, no significant negative environmental impacts are anticipated to occur as a result of the Keewatinoow Construction Camp Lagoon and Start-up Camp.

11. References

Crippen Acres Limited and Wardrop Engineering Inc. 1989. Conawapa Generating Station 1989 Winter Exploration Program Pump Test Results Memorandum. June 7, 1989. Winnipeg, Manitoba.

Dave Wotton Consulting. 2011. Bipole III Transmission Project – Lands of Special Interest and TLE Lands Technical Report. November 2011. [Available online at: http://www.hydro.mb.ca/projects/bipoleIII/eis_technical_download.shtml].

Environment Canada. 2011. Canadian Climate Normals or Averages (1971-2000) – Churchill Airport. Government of Canada Website: http://www.climate.weatheroffice.ec.gc (accessed December 15, 2011; last modified November 16, 2011).

Environment Canada. 2010a. Hydrometric Data. Water Survey of Canada, Environment Canada Website: http://www.wsc.ec.gc.ca/applications/H2O/index-eng.cfm (accessed December 15, 2011; last modified April 30, 2010).

Environment Canada. 2010b. National Inventory Report 1990-2008 – Part 3: Greenhouse Gas Sources and Sinks in Canada. [Available online at: http://www.ec.gc.ca/Publications/492D914C-2EAB-47AB-A045-C62B2CDACC29/NationalInventoryReport19902008GreenhouseGasSourcesAndSinksInCanadaPart3.pdf].

Environment Canada. 2010b. Reported Facility Greenhouse Gas Data - Key Data Tables: 2009. [Available online at: http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=8044859A-1].

Government of Canada. 2011. Species at Risk Public Registry. Government of Canada Website: www.sararegistry.gc.ca (accessed December 15, 2011; last modified March 23, 2011).

Intergovernmental Panel on Climate Change. 2006. 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Prepared by the National Greenhouse Gas Inventories Program, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: Institute for Global Environmental Strategies, Hayama, Japan.

Joro Consultants Inc. 2011. Bipole III Transmission Project – Resource Use Technical Report. November 2011. [Available online at: http://www.hydro.mb.ca/projects/bipoleIII/eis_technical_download.shtml].

Manitoba Conservation Data Centre. 2011 (accessed). Occurrence of Species by Ecoregion – Hudson Bay Lowland. Manitoba Conservation Website: http://www.gov.mb.ca/conservation/cdc/ecoreg/hblowland.html (accessed December 8, 2011).

Manitoba Conservation, Wildlife and Ecosystem Protection. 2011 (accessed). Species at Risk – Species Listed Under the *Manitoba Endangered Species Act*. Manitoba Conservation Website: http://www.gov.mb.ca/conservation/wildlife/sar/sarlist.html (accessed December 8, 2011).

Manitoba Hydro. 2011. Bipole III Transmission Project Environmental Impact Statement. Submitted December 1, 2011. [Available online: http://www.hydro.mb.ca/projects/bipoleIII/eis.shtml].

Manitoba Water Stewardship, Groundwater Management Section. 2009. GWDRILL May 2009 CD Rom. Government of Manitoba, Winnipeg, Manitoba.

MMM Group Limited. 2011a. Bipole III Transmission Project – Land Use Technical Report. November 2011. [Available online at: http://www.hydro.mb.ca/projects/bipoleIII/eis_technical_download.shtml].

MMM Group Limited. 2011b. Bipole III Transmission Project – Socio-Economic Baseline Report. November 2011. [Available online at: http://www.hydro.mb.ca/projects/bipoleIII/eis_technical_download.shtml].

Natural Resources Canada. 2011. 2010 National Building Code of Canada – Seismic Hazard Maps. [Available online at: http://earthquakescanada.nrcan.gc.ca/hazard-alea/zoning/NBCC2010maps-eng.ph; accessed January 22, 2012; last modified October 25, 2011].

Natural Resources Canada. 2010. The Atlas of Canada – Toporama: Topographic Maps. Natural Resources Canada Website: http://atlas.nrcan.gc.ca/site/english/maps/topo/map (accessed December 20, 2011; last modified February 4, 2010).

North/South Consultants Inc. 2012. Keeatinoow Construction Camp Waste Water: Screening of Sewage Effluent Discharge Memorandum. February 2012.

North/South Consultants Inc. 2011. Bipole III Transmission Project – Aquatic Environment Technical Report. November 2011. [Available online at: http://www.hydro.mb.ca/projects/bipoleIII/eis_technical_download.shtml].

Northern Lights Heritage Services Inc. 2012. Keewatinoow Converter Station – Lagoons: Field Work Summary Report of Archaeological Investigations within the Vicinity of the Proposed Lagoons. January 2012.

Plus4 Consulting Inc., Maskwa Ecological Consulting Inc., and Ed East Consulting. 2011. Bipole III Transmission Project – Forestry Technical Report. November 2011. [Available online at: http://www.hydro.mb.ca/projects/bipoleIII/eis_technical_download.shtml].

Province of Manitoba. 2007. Official Highway Map 2007-2008. Manitoba, Canada.

Smith, R.E., H. Veldhuis, G.F. Mills, R.G. Eilers, W.R. Fraser, and G.W. Lelyk. 1998. Terrestrial Ecozones, Ecoregions, and Ecodistricts, An Ecological Stratification of Manitoba's Natural Landscapes. Technical Bulletin 98-9E. Land Resource Unit, Brandon Research Centre, Research Branch, Agriculture and Agri-Food Canada, Winnipeg, Manitoba.

Stantec Inc. 2011. Bipole III Transmission Project – Groundwater Technical Report. November 2011. [Available online at: http://www.hydro.mb.ca/projects/bipoleIII/eis_technical_download.shtml].

Szwaluk Environmental Consulting Ltd., Calyx Consulting and MMM Group Limited. 2011. Bipole III Transmission Project – Terrestrial Ecosystem and Vegetation Technical Report. November 2011. [Available online at: http://www.hydro.mb.ca/projects/bipoleIII/eis_technical_download.shtml].

Appendix 1

Functional Design Report

Appendix 2

Site Photographs

Appendix 3

Keewatinoow Construction Camp Waste Water: Screening of Sewage Effluent Discharge (North/South Consultants Inc.)

Appendix 4

Keewatinoow Converter Station – Lagoons Report (Northern Lights Heritage Services Inc.)