April 2016

BERGER PEAT MOSS LTD.

Technical Proposal for the Big River Peat Harvest Project

Submitted to:
Ministry of Environment
Environmental Assessment Branch
3211 Albert Street, 4th Floor
Regina, SK S4S 5W6

REPORT

Report Number: 1547160 P001 T003

Berger

Golder Associates

Ministry of Environment
Environmental Assessment Branch
Saskatchewan Ministry of Environment
3211 Albert Street, 4th Floor
Regina, SK S4S 5W6

Saint-Modeste, April 13th 2016

RE: Authorization to submit documents for Berger Peat Moss Ltd.

To whom this may concern,

Berger Peat Moss Ltd. has retained Golder Associates Ltd. to provide assistance as Berger proceeds through it in the environmental assessment process. Consequently Golder is authorized to represent Berger in the submission of the Technical Proposal and subsequent communications about the project.

Regards,

ORIGINAL SIGNED BY

Alexandre Brisson
Director – Resource and Special Projects

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Executive Summary

Berger Peat Moss Ltd. (Berger) is proposing to harvest the Big River bog (the Project) located approximately 65 kilometres (km) north of Big River, Saskatchewan. The projected harvest area is 532 hectares (ha) contained within a 1,441 ha lease area. Berger has prepared a Technical Proposal for the Project to assist the Saskatchewan Ministry of Environment (MOE) Environmental Assessment Branch in determining if the proposed Project is considered a development under the Saskatchewan *Environmental Assessment Act*. If the Project is considered a development, Berger will be required to complete an Environmental Impact Assessment.

After more than 50 years of development, Berger has become a leader in the production of value-added horticultural mixes and currently harvests 17 peat bogs in Quebec, New Brunswick, Manitoba, and Minnesota, and has 8 factories in Canada and the United States of America (USA). Their mission is to harvest and process sphagnum peat moss in a responsible way, in order to offer a range of high quality products and services, designed for the needs of horticultural customers located in international markets. Berger's investment in Saskatchewan for the Project will generate incremental tax revenues for all levels of government, contribute to the regional and local economies through direct procurement, as well as indirect investment in other business activities (e.g., fuel, vehicles, equipment, building materials), and create local employment opportunities.

The Project includes all aspects that relate to the construction (i.e., site preparation), operation and maintenance, and closure of the Project. Site preparation will include activities such as grading, vegetation clearing and mulching, stockpiling cleared trees from the Project site for use in the construction of internal bog roads, and construction of a parking lot and equipment storage area. After the site has been prepared, sedimentation ponds, drainage ditches, internal bog roads, and other support infrastructure will be constructed for operations and maintenance. Harvesting operations include clearing/mulching of the surface vegetation layer, construction of field ditches, field preparation (i.e., profiling and harrowing), peat harvesting and stockpiling, and transportation to a packaging facility. To limit the initial Project footprint, one area of the bog is harvested at a time, as compared to opening up the entire bog at once. As harvesting nears completion in one harvest area, another will be established, which would include extending field ditches and internal bog roads as necessary. A detailed Closure and Reclamation Plan will be developed for the Big River bog based on the site-specific conditions (e.g., topography, hydrology, and peat chemistry), the surrounding habitat, and the reclamation goals for the Project. Project closure includes decommissioning of site infrastructure.

The Big River bog is located immediately east of secondary Highway 922 and there is an existing access road into the lease area; as such, construction of a new access road will not be required. Upgrades (e.g., clearing of vegetation, surface leveling) to portions of the existing road will be required to allow vehicles and equipment to safely access the site. Internal bog roads are required to connect the staging area to the active harvesting area and to navigate between the harvesting areas. The controlled drainage plan developed for the site allows surface water to be directed off-site, and subsequently, lower the water table within the peat bog. Sedimentation ponds will be constructed prior to the construction of field drainage ditches or the main drainage ditch. The sedimentation pond will have an outlet ditch that releases discharge into a natural buffer/filtration area before releasing into the surrounding environment. Following the completion of the sedimentation ponds, the main drainage ditch will be excavated around the perimeter of the harvest area. Stockpiling areas are necessary until the harvested peat is transported to the processing and packaging facility. Stockpiling areas will be located adjacent to the internal bog

roads and will be profiled similar to the harvesting fields to enhance water runoff. Supporting infrastructure for the Project will include an office/lunch room facility, portable chemical toilet (cleaned/serviced regularly), an equipment repair and maintenance garage (constructed from steel shipping containers), a generator facility and a concrete containment pad for above ground storage tanks.

Berger will complete reclamation activities by incorporating experience gained from successful reclamation of other sites and following the reclamation practices that are standard in the industry. Progressive reclamation will occur over the Project's operational life, where possible. Once a peat field has been harvested to its final depth, reclamation activities for the field will be completed to meet the reclamation goals for the site as established in the Closure and Reclamation Plan.

A description of the environment was completed and includes desktop screening information on physiography, climate, air and noise, hydrology, aquatic resources, vegetation, wildlife, heritage resources and socio-economics. Based on these findings, Project interactions were identified and mitigation was developed. The approach included the identification of potential environmental interactions and linked them to Project components and activities that can affect the biophysical and socio-economic environments. Mitigation measures will be incorporated to limit potential effects to the environment from Project activities. Key mitigation measures will include limiting the amount of area disturbed, drainage management, applying progressive harvesting and reclamation, and monitoring. Environmental monitoring programs are designed to measure the actual effects of the Project, test predictions and effectiveness of mitigation, and identify unanticipated effects. Monitoring and follow-up programs will be developed by Berger to comply with regulatory requirements, permits, and corporate commitments. Monitoring during construction, operations and closure activities are carried out through an Environmental Management System.

Berger recognises the importance of meaningful engagement with stakeholders to identify local issues that may be related to or have an effect on the proposed Project. Berger is in the process of developing an engagement plan for the Project which will include stakeholder mapping and risk analysis, public engagement, First Nations and Métis Community engagement and regulatory engagement.

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APPENDICES

APPENDIX A
Heritage Conservation Branch Screening Letter

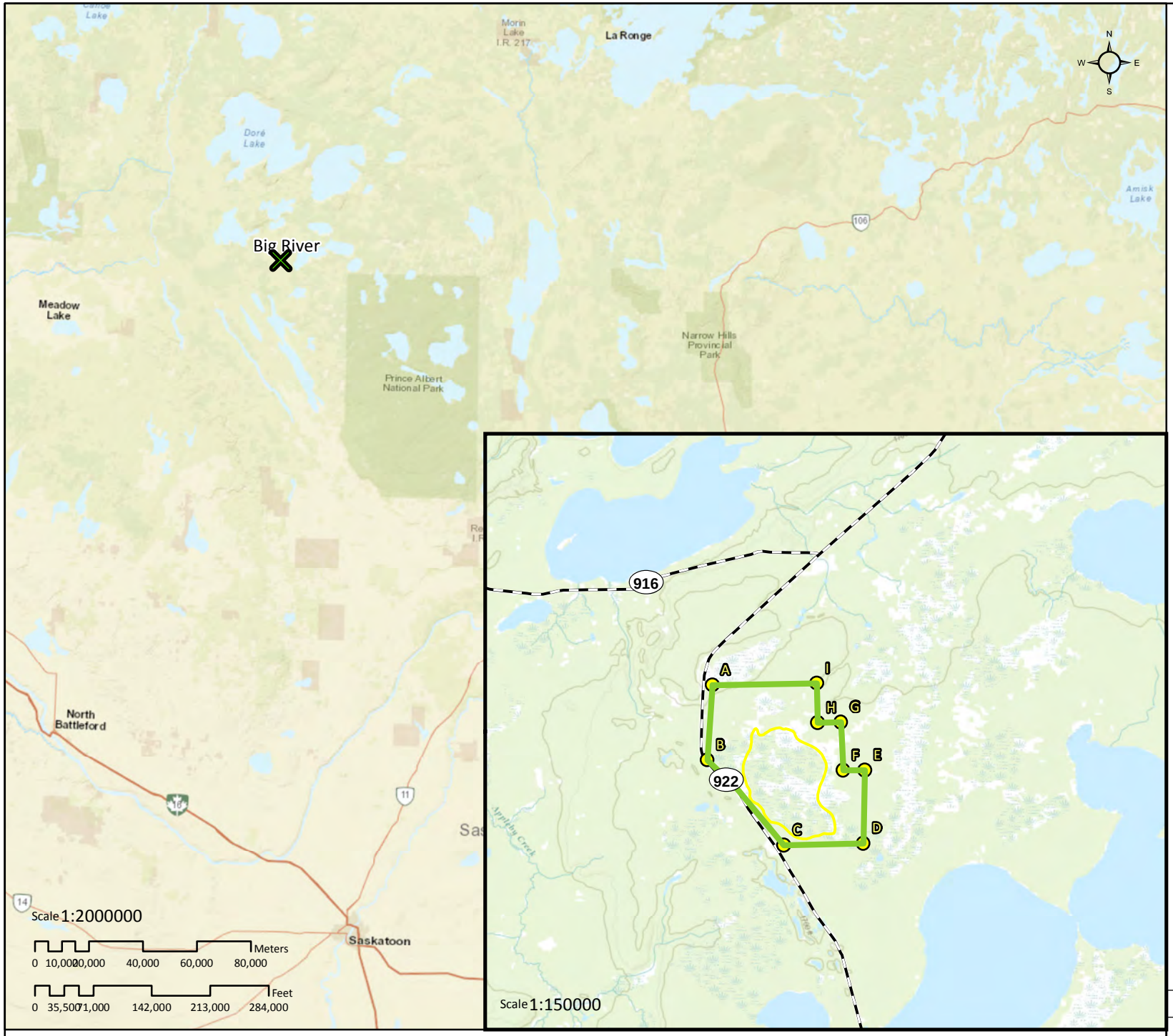
1.0 INTRODUCTION

1.1 Project Overview

Berger Peat Moss Ltd. (Berger) is proposing to harvest the Big River bog (the Project) located approximately 65 kilometres (km) north of Big River, Saskatchewan (Figure 1). The Project will assist Berger with meeting the horticultural market's actual demands. The projected harvest area is 532 hectares (ha) contained within a 1,441 ha lease area (Figure 2). The first phase of the Project includes site preparation (i.e., grading, vegetation clearing, mulching), stockpiling trees cleared from the Project site for use in the construction of internal bog roads, and construction of a parking lot and equipment storage area. An existing road is located adjacent to the western lease boundary that will be used for the main access to the site. Upgrades to the existing road will be completed during the first phase of the Project to improve vehicle and equipment access. The second phase of the Project includes the construction of sedimentation ponds, drainage ditches, and internal bog roads for the first section of the bog to be harvested, and other support infrastructure (e.g., site office). Harvesting operations include clearing/mulching of the surface vegetation layer, construction of field ditches, field preparation (i.e., profiling and harrowing), peat harvesting and stockpiling, and transportation to a packaging facility. To limit the initial Project footprint, one area of the bog is harvested at a time, rather than opening up the entire bog at once. As harvesting nears completion in one area, another will be established which would include extending field ditches and internal bog roads as necessary. The final phase of the Project will be closure, which includes decommissioning of infrastructure and reclamation of the disturbance area.

1.2 Project Proponent

Berger was founded at Saint-Modeste by Mr. Alcide Berger and Ms. Huguette Théberge in 1963, and the company is now managed by a third generation of Berger's family members. After more than 50 years of development, the company has become a leader in the production of value-added horticultural substrates and currently harvests 17 peat bogs in Quebec, New Brunswick, Manitoba, and Minnesota, and has 8 factories in Canada and the United States of America (USA). Berger employs more than 350 people in Canada and the USA and contributes to the economic well-being of many local communities. Berger sells horticultural mixes primarily to professional greenhouse growers and producers in Canada, the USA, Mexico, Central and Southern America, Asia, and Europe.



Site Boundaries

- Proposed Lease
- Harvestable Area

Localisation

Coordinates

A: 361465.1115 E ; 6034592.1363 N
B: 361331.2384 E ; 6032510.8758 N
C: 363454.7808 E ; 6030147.6359 N
D: 365659.3737 E ; 6030201.4565 N
E: 365697.4399 E ; 6032230.0633 N
F: 365104.4695 E ; 6032226.7132 N
G: 365044.9322 E ; 6033568.4873 N
H: 364391.4755 E ; 6033549.0985 N
I: 364367.0911 E ; 6034638.0094 N

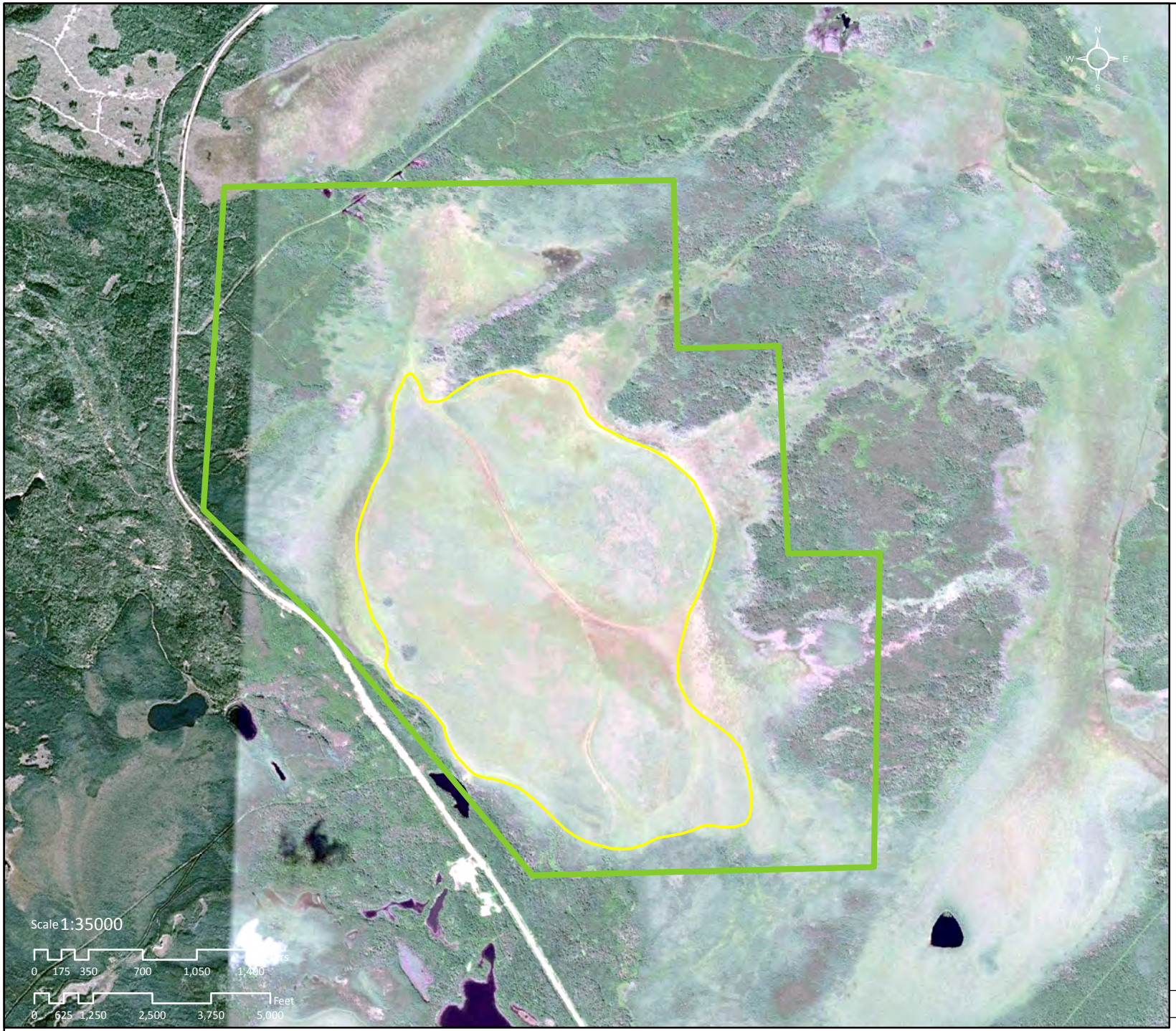
Infrastructures

- Road

Berger

CARTOGRAPHER	Pierre-Olivier Sauvageau
DATE	2016/04/13
PROJECTION	NAD 1983 CSRS UTM Zone 13N
SOURCES	Berger (2016) ESRI (2016) Basemap

Figure 1 - General Location of the Big River Bog |



Site Boundaries	Area (ha)
Proposed Lease	1 441 ha
Projected Harvestable Area	532 ha

Berger

CARTOGRAPHER	Pierre-Olivier Sauvageau
DATE	2016/04/13
PROJECTION	NAD 1983 CSRS UTM Zone 13N
SOURCES	Berger (2016) Google Earth (2013) Basemap

Figure 2 - Proposed Harvestable Area Within the Big River Bog |

The mission of Berger is to harvest and process sphagnum peat moss in a responsible way, in order to offer a range of high quality products and services, designed for the needs of horticultural customers located in international markets. Berger is a member of the Canadian Sphagnum Peat Moss Association (CSPMA), Association des Producteurs de Tourbe Horticole du Québec (APTHQ) and Association des Producteurs de Tourbe du Nouveau-Brunswick (APTNB). Berger is committed to reducing the effect on the local environment and in the stewardship of natural resources. Berger's reputation for quality and consistency is a trademark and Berger's products and management processes are backed by several certifications, including the following.

- **Veriflora®** - Responsibly Managed Peatland is an agricultural sustainability certification and eco-labeling program recognized as the gold-standard in the floriculture and horticulture industries. The program is administered by SCS Global Services, a global third-party certifier of environmental, sustainable, and agricultural product quality claims.
- **International Standards Organization (ISO) 9001** specifies requirements for a quality management system when an organization:

  a) needs to demonstrate its ability to consistently provide products and services that meet customer and applicable statutory and regulatory requirements, and

  b) aims to enhance customer satisfaction through the effective application of the system, including processes for improvement of the system and the assurance of conformity to customer and applicable statutory and regulatory requirements.

- **Organic Materials Review Institute (OMRI)** provides an independent review of products so that producers know which products are appropriate for organic operations.

For more than 20 years Berger has been involved in scientific research related to peatland ecology and peatland reclamation. In particular, Berger has invested and worked closely with the Peatland Ecology Research Group (PERG) in Laval University, the INRS (Institut National de Recherche Scientifique) at McGill University, the IRDA (Institut de Recherche et Développement en Agro-Environnement), Brandon University (Manitoba), University of Waterloo (Ontario) and Bangor University (UK).

Members of Berger's Management Team include:

- Mr. Claudin Berger, Board's Co-President;
- Mr. Régis Berger, Board's Co-President;
- Ms. Valérie Berger, Co-Chief Executive Officer;
- Ms. Mélissa Berger, Co-Chief Executive Officer; and
- Mr. Alexandre Brisson, Resource and Special Project Director.

The proponent of the Project is:

Berger Peat Moss Ltd.
121, 1er Rang, Saint-Modeste
Quebec G0L 3W0
Telephone: 1 418 862-4462
Toll-free: 1 800 463-5582
Fax: 1 418 867-3929
Website: www.berger.ca

Contact information for the Project is:

Alexandre Brisson, Resource and Special Project Director
121 1er Rang, Saint-Modeste
Quebec G0L 3W0
Telephone: 418 862-4462 Extension 1169
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1.3 Need for and Benefits of the Project

Berger has grown exponentially since its founding in St-Modeste and the rapid growth of the company is linked to the increase need of sphagnum peat for the production of their horticultural mixes. Believing that how you grow matters as much as what you grow Berger works with its horticultural customers to improve both their crops and their businesses. Increased sales in the western markets of the USA and Canada requires that Berger establish new harvesting sites in the central and western provinces, which will reduce transportation costs and Berger's carbon footprint.

Berger's investment in Saskatchewan for this Project will result in additional revenue for the province from peat harvesting, increased spending in the vicinity of the Project (e.g., fuel, vehicles, equipment, building materials), and new employment opportunities for local communities.

2.0 PROJECT DESCRIPTION

2.1 Introduction

Berger is proposing to harvest 532 ha contained within a 1,441 ha lease area approximately 65 kilometres (km) north of Big River, Saskatchewan. The Project will assist Berger in moving closer to the increasing western markets and meeting the horticultural market demand for peat.

2.2 Project Alternatives

The only Project alternative evaluated at this time was "No Project". Berger would maintain their current peat harvesting and production facilities in Manitoba, New Brunswick and Quebec and would continue to look for other opportunities to expand operations in other provinces. Berger is attempting to become more involved in the western peat market to reduce the cost and greenhouse gas emissions associated with transporting peat long distances.

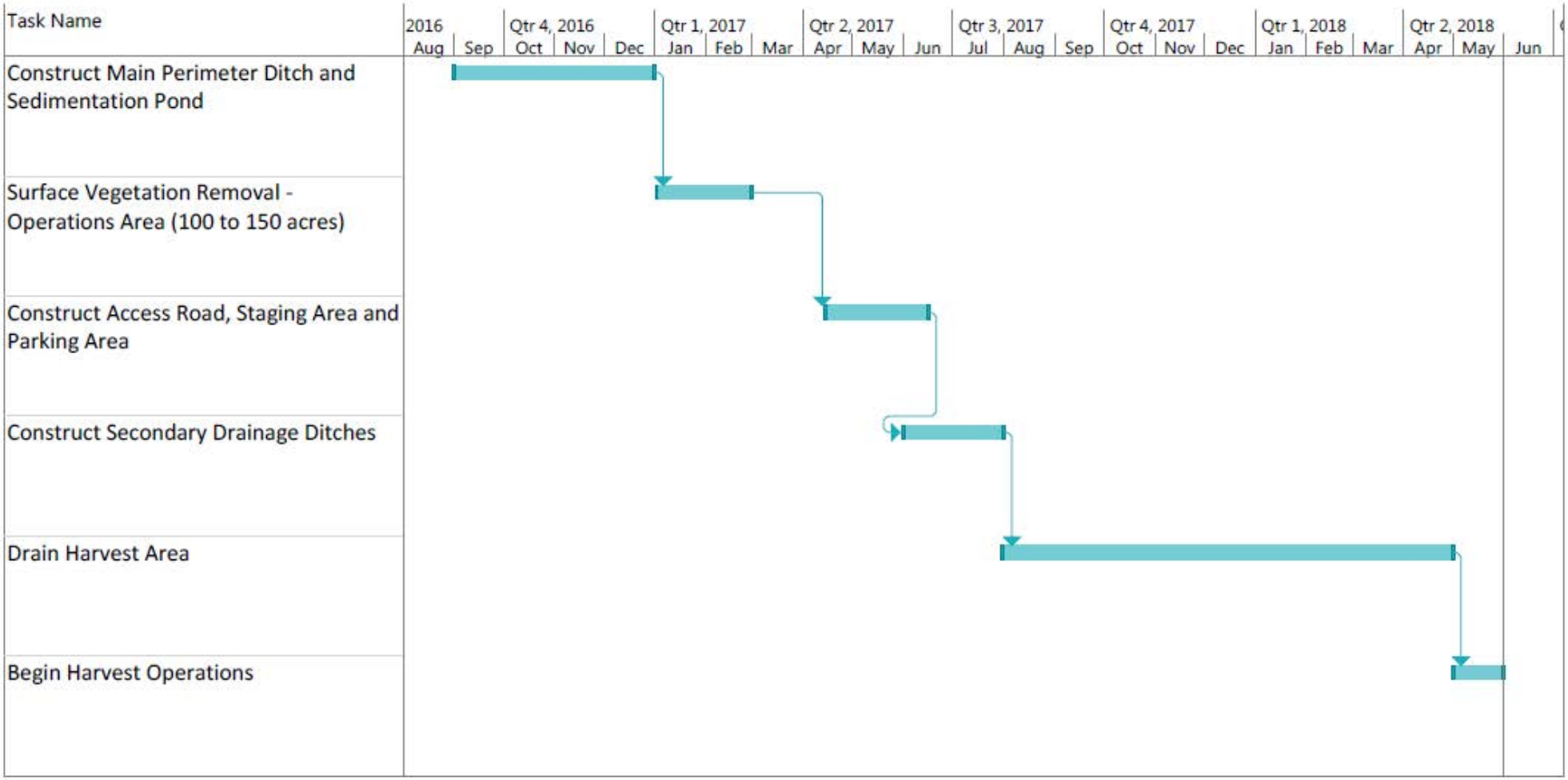
As part of the evaluation process when exploring for new harvesting areas, Berger considers a number of criteria related to peat quality and volume. The preferred conditions for a peat bog to be suitable for harvest include the following:

- peat quality must meet horticultural market requirement;
- the thickness of the quality peat layer must be sufficient to warrant development, an average depth of 2 metre (m) across the entire bog is a minimum requirement;
- the aerial extent of the peatland should be large enough to warrant development, an area of approximately 300 ha is typically required;
- the peatland must have good potential for development of enhanced drainage;
- low density of tree cover is preferred;
- close proximity to transportation infrastructure, availability of a labor force, access to electrical power are preferred; and
- climatic factors must be suitable for drying of the peat layer during the harvesting period (i.e., appropriate periods of consecutive days without rain).

Since 2015 Berger has been exploring and conducting non-intrusive sampling of peat in the Big River bog to identify sufficient quality and volume of peat to justify the investment necessary to establish a new operation in Saskatchewan. It is Berger's opinion that peat from the Big River bog has both the quality and volume necessary to support harvesting.

2.3 Project Schedule

Berger's conceptual schedule for the Big River bog is to start construction in the fall of 2016; however, this will be subject to obtaining the necessary environmental permits and approvals in advance. The typical schedule for site preparation and construction prior to harvesting is provided in Figure 3. Peat will be harvested seasonally (e.g., April to October) from the Big River bog with harvest areas being opened in small sections at a time to limit the size of the Project footprint over the course of harvesting operations. Final closure and decommissioning of the site facilities will occur over three years once harvesting operations are complete; however, it is anticipated that reclamation of fully harvested areas will occur progressively throughout operations. Equipment and internal infrastructure (e.g., bog roads, and drainage ditches) that are no longer required and can be removed without adversely affecting adjacent peat harvesting operations or previously re-established areas will be removed.



Berger

Figure 3 - Anticipated Project Schedule |

Author : Pierre-Olivier Sauvageau

2.4 Project Scope

The Project scope includes all aspects that relate to the planning, design, construction, operation and maintenance, and closure of the Project. While the total lease area is 1,441 ha, only 532 ha or 37 percent (%) has currently been identified for harvesting. The total harvest area will be confirmed with further evaluation of the peat resource. The remaining lease area will be used as a buffer area (undeveloped), donor sites to facilitate future reclamation activities, staging area, and internal bog roads. Specifically, the scope of the Project includes:

- site preparation, including vegetation clearing and mulching and temporarily stockpiling trees for use in constructing the internal bog roads;
- construction of staging area for supporting infrastructure, including a site office/lunch room facility, parking lot, an equipment repair and maintenance garage, a containment pad for aboveground storage tanks, and the generator facility;
- construction and maintenance of sedimentation ponds;
- construction and maintenance of a main drainage ditch around the harvest site, outlet ditch that releases discharge (water) into the surrounding environment, and field drainage ditches dividing the area to be harvested into individual peat fields;
- construction and maintenance of internal bog roads;
- peat harvesting and temporary stockpiling of the peat on-site;
- transportation of the peat to packaging facilities (the packaging facility itself is not included as part of the scope of this Project); and
- decommissioning of support infrastructure and reclamation of the Project footprint.

2.5 Project Components and Activities

2.5.1 Project Components

The Project involves the construction or establishment of the following components. A depiction of the Project components and a typical field layout for Berger peat harvesting operations is shown in Figure 4.

2.5.1.1 Access Road

Prior to any site development, an access road to the site is required to allow transportation of vehicles and equipment into the bog. The Big River bog is located immediately east of secondary Highway 922 and there is an existing access road into the lease area; as such, construction of a new access road will not be required. Upgrades (e.g., clearing of vegetation, surface leveling) to portions of the existing road will be required to allow vehicles and equipment to safely access the site.

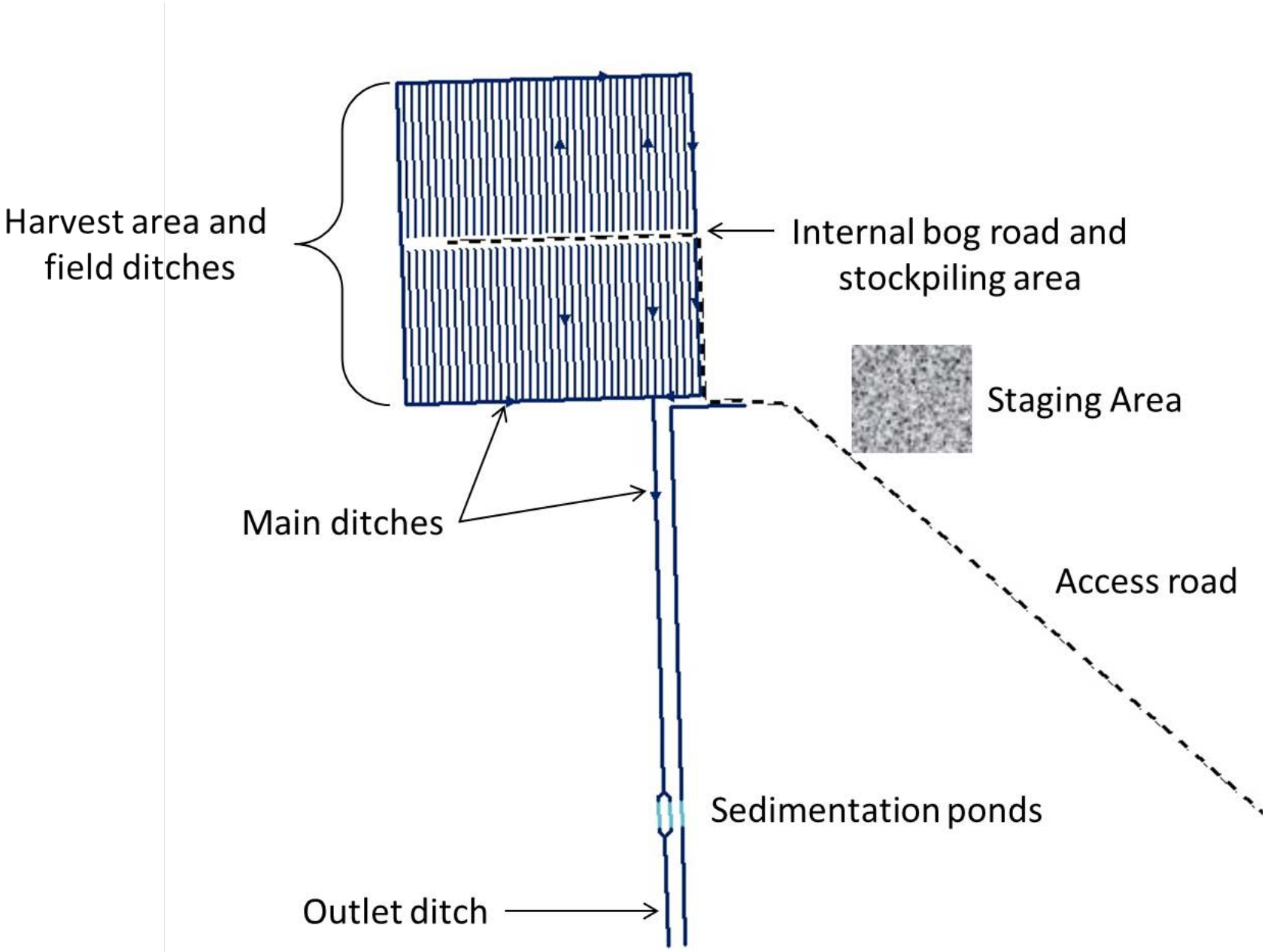


Figure 4 - A Typical Field Layout for Berger Peat Harvesting Operations |

Author : Pierre-Olivier Sauvageau

2.5.1.2 Internal Bog Roads

Internal bog roads are required to connect the staging area to the harvesting areas and to navigate between the harvesting areas. The exact location of the internal bog roads will be determined as part of the controlled drainage plan for the site. Internal bog roads will be approximately 7 m wide and will begin with a base layer of wooded debris obtained during the clearing of surficial vegetation and roots from the harvesting areas. A geotextile membrane will then be placed on top of the road base. A layer of fine roots or gravel may be added, depending on site conditions and the expected usage of the road.

2.5.1.3 Sedimentation Ponds

The Project requires a controlled drainage plan that allows the surface water to be directed off site, and subsequently lower the water table within the peat bog. Sedimentation ponds will be constructed prior to the construction of field drainage ditches or the main drainage ditch. Sedimentation ponds are required to provide retention of the surface water and to facilitate the settlement of suspended peat particles prior to discharge to the surrounding environment. The sedimentation ponds will be designed to treat a minimum volume of 25 cubic metres (m^3) per ha of drained surface.

A control culvert with a sliding gate will be placed at the outflow of the sedimentation ponds. The gate will be used to limit the amount of sediment released into the outlet ditch when the sedimentation ponds are cleaned. The gate can also be used to assist in regulating water levels within the harvesting area and reduce or stop outflow to the outlet ditch in the event that of a major precipitation event (e.g., to limit potential flooding downstream or to avoid the release of water with increased Total Suspended Solids [TSS]). A tarp (boom) is installed in the sedimentation ponds to catch floating debris and larger pieces of peat that are more fibric and less decomposed. To enhance function, a serial or parallel system of sedimentation ponds may be constructed; this will be determined as part of the controlled drainage plan.

Figure 5 shows the typical sedimentation pond construction that will be used for the Project.

2.5.1.4 Main Drainage Ditch

Following the completion of the sedimentation ponds, the main drainage ditch will be excavated around the perimeter of the selected harvest area. The main drainage ditch will be approximately 3 m deep and 2 m wide. The purpose of the main drainage ditch is to lower the water level in the peatland. The gradient of the ditch is designed with a low gradient to maintain a slow flow of water to facilitate the settlement of suspended solids. The main drainage ditch connects the field ditches to the sedimentation ponds. As new harvest areas are opened, the main drainage ditch is expanded to encompass the new area.

2.5.1.5 Field Drainage Ditches

Within the harvest site, the construction of 1.5 m deep and 1.5 m wide field ditches will divide the area into separate peat fields. The field ditches will be spaced approximately 25 m apart and will be cut through the bog perpendicular to the main ditches using a “V” ditcher. Field ditches are used to remove interstitial surface water and prepare the peat for harvesting. Drainage is accomplished through the development of field drainage ditches between each of the peat fields; these ditches allow the water to flow into a main drainage ditch and subsequently into sedimentation ponds for a period of retention prior to being discharged through outlet ditches to the surrounding environment.

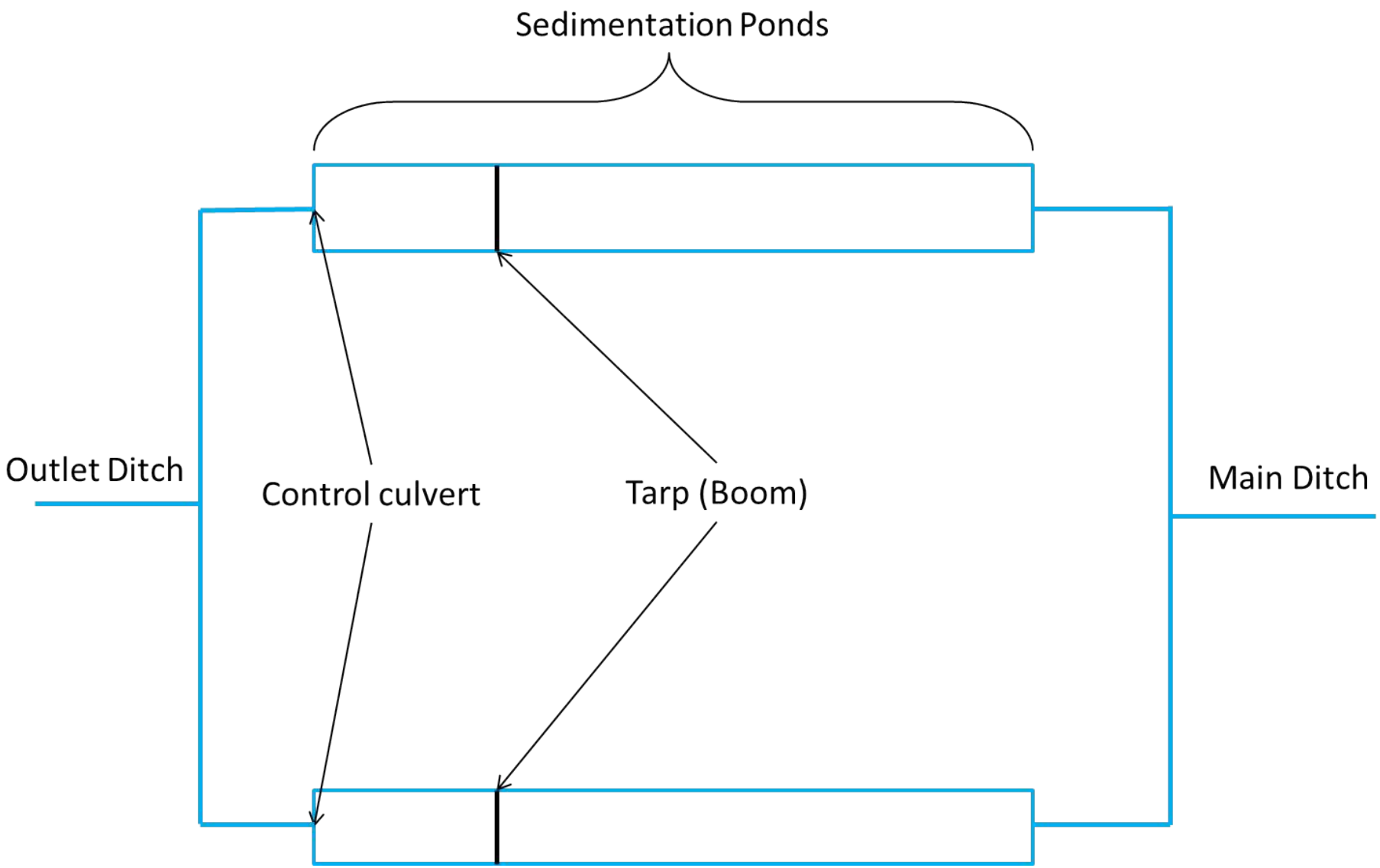


Figure 5 - Sedimentation Pond System Typical of Those Proposed to be Used for the Project |

Author : Pierre-Olivier Sauvageau

2.5.1.6 Outlet Ditch

The sedimentation pond will have an outlet ditch that releases discharge into the surrounding environment. The number of outlet ditches required will be determined by the number of sedimentation pond systems required to meet the controlled drainage plan for the Site. The outlet ditch will be 3 m deep and 2 m wide and will be surrounded by a buffer zone of wetland habitat. The wetland habitat is expected to improve sedimentation, prevent the controlled drainage system from discharging sediments into surrounding waterbodies, and limit the potential for downstream flooding.

2.5.1.7 Supporting Infrastructure and Staging Area

Although no temporary work camp is required, some supporting infrastructure will be required as part of the Project. This infrastructure will be located in a staging area (Figure 4), which is anticipated to cover approximately 10 ha (0.10 km^2). Preparation for the staging area will include clearing the area and grading drainage to match the surrounding topography, followed by placement of a gravel base. Supporting infrastructure will include the following:

- an office/lunch room facility;
- portable chemical toilet (cleaned/serviced regularly);
- an equipment repair and maintenance garage (constructed from steel shipping containers);
- a generator facility; and
- a concrete containment pad for above ground storage tanks.

Bottled drinking water will be delivered to site and smoking outside of approved areas (e.g., smoke shack) will not be permitted.

Power Supply

Electrical power will be produced on site by a fuel-powered generator, located in the staging area, with appropriate secondary containment capable of containing a spill of fuel, oil, or antifreeze in the event that an unanticipated discharge of such materials occurs from the generator or its fuel supply.

Electrical power will be produced on site by a fuel-powered generator, located in the staging area, with appropriate secondary containment capable of containing a spill of fuel, oil, or antifreeze in the event that an unanticipated discharge of such materials occurs from the generator or its fuel supply. Fuel for the generator will be stored in an appropriate double-walled tank equipped with an electric pump for dispensing fuel and will also be located in the staging area. A concrete pad will be built below the tank to contain potential spills. The fuel tank will be protected from machinery and vehicles by a barrier constructed of concrete blocks. The number and volume of the tanks will be determined in accordance with the specific needs of the site. The Canadian Council of Ministers of the Environment (CCME) Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products (2003), as well as provincial and municipal guidelines and regulations will be followed in the installation, operation, and maintenance of all fuel storage. The fuel tank, fuel lines, and generator facility will be inspected regularly.

Equipment

The typical equipment required for site preparation and peat harvesting includes the following:

- vacuum harvester (2 heads);
- agricultural tractors;
- mulcher;
- wheel loader;
- excavator;
- “V” ditcher;
- ditch-cleaner;
- scraper (tractor attachment);
- grader (tractor attachment);
- profiler;
- harrows;
- hauling wagons and trailers;
- 4 wheeler; and
- pick-up truck.

The number of each piece of equipment may vary over time based on the size of the harvesting area which is expected to fluctuate over time. New harvest areas will be opened up as others reach the end of harvesting and begin the reclamation process.

2.5.1.8 Stockpiling Areas

Stockpiling areas are necessary for stockpiling of harvested peat until it is transported to the processing and packaging facility. Stockpiling areas will be located adjacent to the internal bog roads and will be profiled similar to the harvesting fields to correspond with the depletion of the surrounding fields and enhance water runoff. Once the adjacent harvesting fields are depleted, the stockpiling areas will also be harvested.

2.5.2 Project Activities

2.5.2.1 Exploration Activities

Berger completed preliminary exploration and non-intrusive sampling in the Big River bog in 2015. The purpose of this preliminary exploration was to collected data on the quality and depth of peat. Additionally, site access and basic hydraulic information were evaluated and vegetation and wildlife observations in the area were documented. This information was used to evaluate the Big River bog’s suitability for harvesting.

2.5.2.2 Site Preparation

Site preparation will be initiated by development of a controlled drainage plan that allows surface water to be directed off-site, and subsequently, lower the water table within the harvest site. Drainage is accomplished through the development of ditches between each of the peat fields, which direct the water into sedimentation ponds for a period of retention prior to being discharged through outlet ditches to the surrounding environment. All relevant guidance will be considered (e.g., A Guide to Waterworks Design [Water Security Agency 2012]).

Following the construction of the sediment ponds, main drainage ditch, and outlet ditch the surface vegetation from the harvest area is removed; all trees and stumps within the harvest area will be removed. Berger will work with the local Forest Management Agreement (FMA) holder to determine if there is interest in any merchantable timber within the harvest area should it be present. Non-merchantable timber will be stockpiled for use as a base underlying the internal bog road (i.e., a corduroy road base), or will be transported off-site to an approved disposal location. In areas of open bog with shrubs and small trees, a mulcher will be used to clear the surface layer. The vegetation will then be spread on the peat fields and mixed with the harvestable material.

The Big River bog will not be cleared or mulched in its entirety, rather it will be gradually opened over time as previously opened sections are almost fully harvested and new harvest areas are required. Surficial vegetation will be left in place in areas that are not yet opened and areas not identified for harvesting. Areas that will not be harvested may be used as donor sites for the reclamation of post-harvest parcels. Keeping the surface layer intact protects underlying peat from decomposition, preserves the quality of the resource, and reduces the release of greenhouse gases, and reduces the size of the Project footprint required at one time.

Once the field ditches are constructed, the excavated material is used to shape the fields for better surface water runoff (e.g., crowning the harvest area). Following field shaping, the peat fields are left to dry by solar heat from the sun and natural air movement (i.e., wind) until the moisture content is reduced to the desired level for harvesting.

2.5.2.3 Operations and Maintenance

2.5.2.3.1 Water Level Management

Water levels will be lowered within the harvest site to allow for safe operation of equipment in the peat field and to allow the peat to dry to the optimal moisture content for harvesting. The rate at which the water level within the harvest site is managed during construction and harvest operation will be controlled in part by a control culvert with a sliding gate installed at the inflow of the sedimentation ponds. The gate can be used to reduce or stop inflow to the sedimentation ponds in an effort to reduce erosion and not change the downstream wetland regime. The lowering of water levels within the peatland harvest area will take place at a slow rate. Flow changes will be less than experienced during a typical spring runoff. It is anticipated that during Project operations discharge flow volumes and water quality monitoring will be completed to meet regulatory requirements.

2.5.2.3.2 Field Harrowing

To initiate the harvesting activities, the surface of each peat field is loosened using a variety of harrows, which break up and smooth out the peat surface. Harrowing is completed using a tooth rake to a depth of 2 to 3 centimetres (cm) that breaks capillary flow and enhances the drying process. This process separates the peatland surface and in-fills small depressions. The top layer of peat is then turned over to allow peat particles and fibres to dry by solar heat from the sun and wind until the moisture content is reduced to the required moisture level.

2.5.2.3.3 Peat Harvesting

Once a layer of peat has dried to the required moisture level, vacuum harvesters are used to collect the peat on the surface. The vacuum harvester deposits peat at the designated stockpile areas at the end of the field adjacent the internal bog roads. To reduce the emission of peat particles in the air, vacuum harvesters are equipped with dust collectors. A front-end loader is used to stockpile the harvested peat into windrows for temporary storage. To reduce wind erosion and to maintain the quantity and quality of the harvested peat, the stockpiles will be covered with large reusable plastic sheets to prevent it from being blown away by wind or becoming wet during rainfall. Covering of the harvested peat stockpiles also reduces the amount of peat particles being carried into drainage systems or off-site.

Peat harvesting is a seasonal activity and is strongly related to weather conditions. All harvesting operations will be halted during heavy rain events. Operations are also halted during strong wind gusts and sustained winds during dry conditions to reduce the risk of forest fires. Over the course of a season, the harrows and vacuum harvester will pass over the peat fields numerous times. Notwithstanding weather fluctuations, approximately 6 cm to 10 cm per year (cm/year) of peat surface is expected to be harvested.

A residual peat layer will remain after harvesting of the peat fields has been completed. This layer of peat is critical in facilitating the reclamation of the peatland at closure. The slow rate of harvest (6 to 10 cm/year) allows Berger to monitor and determine when the appropriate final depth of harvesting has been reached based on the Closure and Reclamation Plan for that particular area. A detailed Closure and Reclamation Plan will be developed for the Big River bog based on the specific site conditions (e.g., topography, hydrology, and peat chemistry), the surrounding habitat, and the reclamation goals for the Project.

2.5.2.3.4 Field Maintenance and Monitoring

Regular maintenance of the drainage system will be completed to maintain a gradient to allow for slow and managed lowering of water levels within the harvest area. This includes the correction of any erosion or siltation and icing problems, and removal of noxious or nuisance weeds or other invasive species, beaver dams (if required), and debris that interferes with the passage of water. Field ditch maintenance will be accomplished using an excavator or ditch-cleaner; the peat from the ditches will be placed on the fields where it will be harvested later. Ditch inspection and cleaning will occur at least once a year, or as necessary (e.g., following strong winds).

Maintenance of sedimentation ponds includes regular inspections to verify the overall functioning capacity of the pond and the position of the tarp (boom). Sedimentation ponds will be regularly monitored to assess the accumulation of sedimentation. The sedimentation ponds will be cleaned on a regular basis to maintain optimal efficiency with sediments removed at least once per year. The cleaning of sedimentation ponds will be accomplished using an excavator, with debris being placed on the peat fields to be harvested again, unless mineral soil is reached (e.g., avoid contamination of peat products).

Given that the presence of weeds and other invasive species will affect the quality of the peat, the peat harvesting areas are routinely inspected. Weed control is completed manually without the use of any chemicals since the spreading of pesticides and herbicides could contaminate the peat. The overall management system for the harvesting sites is closely connected with the monitoring of various aspects of the peatland and operations that are further described in Section 2.7.1.

2.5.2.3.5 Transportation of Product

There is an existing access road from the site to Highway 922 that will be used to transport harvested peat to a processing and packaging facility. It is anticipated that road maintenance will be determined during the regulatory permitting phase in consultation with Saskatchewan Ministry of Highways and the local Rural Municipality. Dust suppression measures such as watering, will be carried out as necessary to limit fugitive dust. Project vehicles and equipment will be inspected regularly and maintained to limit air emissions and vehicle idling will be limited.

The stockpiled peat will be loaded onto transport trucks. Once loaded on the trucks, the peat will be covered and the trucks will travel to the processing and packaging facility. Peat harvesting will be seasonal; however transport to the facility is expected to occur throughout the year based on weather and driving conditions.

2.5.2.3.6 Domestic and Industrial Waste Management

Berger will employ the 4Rs Principles in waste management for the Project. These four principles are as follows.

- Reduce - wherever possible, waste reduction will be the preferable option.
- Reuse - if waste is produced, every effort will be made to reuse the material.
- Recycle - for those materials that cannot be avoided or reused, recycling will be considered.
- Recover - for those materials that cannot be avoided, reused, or recycled, recovery will be considered.

Site Solid Waste

There are minimal wastes produced from peat harvesting operations. Domestic and industrial waste generated at the harvest site will be collected and temporarily stored in wildlife-proof containers. Any waste that cannot be reused or recycled will be disposed of off-site in an approved waste disposal facility (i.e., Big River landfill) as agreed upon during the regulatory permitting phase of the Project.

Trees removed from the harvest areas, including branches and roots are saved and used during construction of the internal bog roads. Any trees or shrubs that cannot be used on-site will be collected, and transported off-site for disposal at an appropriate and approved location.

Site Sewage Waste

Sewage management will consist of the use of portable toilets located at the site. These will consist of portable enclosures containing a chemical toilet (i.e., a toilet bowl filled with disinfectant instead of water), which will be emptied regularly by a licenced sewage handling contractor.

Hazardous Substances and Waste Dangerous Goods

Berger will manage and store all hazardous substances and waste dangerous goods in accordance with the requirements specified in *The Hazardous Substance and Waste Dangerous Goods Regulations* (Government of Saskatchewan 1989). Used oil and lubricants on-site will be stored in appropriate containers and transported off-site for recycling or disposal at a licensed disposal facility. Berger will handle used absorbents and oily rags in a manner similar to used oil, using appropriate storage with secondary containment and disposal at a licensed facility.

Berger will prepare and submit an Application for Approval to Construct (or Upgrade) a Storage Facility (EPB #133) in accordance with *The Hazardous Substances and Waste Dangerous Goods Regulations* (Government of

Saskatchewan 1989). Construction of the hazardous substances and waste dangerous goods storage facility will occur after approval of the storage facility has been received. All hazardous substances and waste dangerous goods will be stored in appropriate containers (i.e., double-walled tanks to prevent potential leakage from the primary containment). Storage will occur on the containment pad, a concrete pad, which will provide backup containment in the unlikely event of a spill. All fueling of equipment will occur within the containment pad. As such, no fuels, oils, or other hazardous substances will be stored and no equipment maintenance or re-fuelling will occur within 100 m of any water body. A spill kit will be located in the immediate vicinity of the fueling station.

2.5.2.4 Closure

Berger will complete reclamation activities by incorporating experience gained from successful reclamation of other sites and following the reclamation practices that are standard in the industry and outlined in *The Peatland Restoration Guide* (Quinty and Rochefort 2003). Additionally, all relevant guidance will be considered (e.g., *Guidelines for Northern Mine Decommissioning and Reclamation* [MOE 2008] and *Field Guide to the Ecosite of Saskatchewan's Provincial Forests* [McLaughlin et al. 2010]). Reclamation will be undertaken in accordance with the specific hydrological, physical and chemical properties of the bog including, but not limited to, sphagnum restoration and the creation of forested wetland habitats, ponds, and swampy areas.

Progressive reclamation will occur over the Project's operational life, where possible. Once a peat field has been harvested to its final depth, reclamation activities for the field will be completed within three years. Activities associated with progressive reclamation include the removal of all equipment, and reclamation of internal bog roads and drainage ditches that are no longer required for adjacent peat harvesting activities.

The final closure of the Project will be initiated and completed after all areas of the bog have been fully harvested. Final closure will be accomplished by decommissioning and reclamation activities that will include, but not be necessarily limited to, the following:

- all buildings and other infrastructure including concrete pads constructed at the site will be removed and reused, recycled, or disposed of unless otherwise approved by the appropriate regulatory agency;
- the internal bog roads will be reclaimed;
- all drainage ditches, drainage flow control gates, and drainage sedimentation ponds will be decommissioned (i.e., blocked but not necessarily filled in depending on final Reclamation Plan for the site);
- disturbed wildlife habitat will be restored in consultation with the Ministry of Environment (MOE);
- all waste material from decommissioning activities will be removed from the site and taken to a licenced waste disposal ground.

During Project operations, it is expected that the Big River bog will experience a temporary loss or reduction in its ecological function; however, after successful reclamation the peatland's function is expected to be re-established. Closure objectives aim to reduce the lasting environmental effects of the Project to the extent practical and allow disturbed areas to return to equivalent capability and structure as the surrounding environment and time period. In addition, closure objectives include restoring the area to provide useful economic and ecological services in accordance with environmental and government objectives and regulations. A detailed Closure Plan will be developed for the Project in accordance with applicable regulations.

2.6 Human Resources

Peat harvesting is not a labour intensive activity and typically requires only a few employees to maintain operations. In the early phases of site preparation and construction, it is anticipated that a field foreman and 3 or 4 operators for the machinery and vacuums will be required; however, as the number of harvesting areas expand to reach full productivity, more personnel will be required to reach a total of 10 to 15 employees. Berger prefers to hire employees from local communities and will focus hiring efforts in the areas surrounding the Project. Applicable training and site orientation will be provided to all new employees. During the early stages of the Project (e.g., site preparation), Berger will likely hire local contractors to complete tasks such as surveying the site, tree clearing, mulching, and to build the site infrastructure (e.g., site office and staging area).

2.7 Environmental Management System

Berger works with reliable management systems so that operations run smoothly and that applicable environmental regulations are followed. As such Berger's Permit Management and Environmental Management System teams work together to maintain compliance with environmental requirements on harvesting and production sites. Internal procedures describing activities including environmental monitoring, best management practice, and the Emergency Response Plans are updated regularly and personnel are monitored for compliance. All employees are provided the necessary training and personal protective equipment to adhere with the requirements of Berger's Environmental Management System and Safety Program.

2.7.1 Environmental Monitoring

Management of the harvest sites are closely linked with monitoring of activities on the peatland. Monitoring during construction, operations and closure activities are carried out through the Environmental Management System. The Environmental Management System includes, but is not limited to the following monitoring activities:

- analysis of environmental parameters including water samples taken at the outlet of sedimentation ponds to measure and analyze concentrations of total suspended solids at each outlet point;
- systematic visual inspections are conducted to record sedimentation pond function during the harvest season;
- systematic visual inspections to identify the presence of invasive species during the harvest season;
- monitor reclamation to determine the success of re-establishment of vegetation during the closure period; and
- use of an electronic management system for environmental monitoring, inspection and maintenance tasks so that the environmental program is completed as required.

2.7.2 Best Management Practices

Berger is committed to best management practices to reduce the potential for environmental effects including:

- reduction of peat dust emissions through anti-dust equipment on the vacuum harvester and covering of stockpiles and transport trucks;
- monitoring for invasive plant species during the construction, operation, and closure phases;
- monitoring and analysis of water quality at sedimentation pond outlet ditches;

- reduction of local erosion and sedimentation through monitoring and cleaning of the water management system;
- implementation of a progressive development plan including sequential opening and reclamation of the bog, in turn reducing the greenhouse gas potential of the peatland;
- implementation of monitoring and systems to protect and conserve ecosystems and biodiversity;
- conservation of resources by recycling of wood, plastic, and other materials;
- reducing noise and vibrations during construction and harvesting operations (e.g., proper vehicle and equipment maintenance); and
- equitable working conditions for personnel.

As part of Berger's overarching Environmental Management System and Safety Program, methods to achieve the best management practices are documented and communicated to all employees.

2.7.3 Emergency Response Plan

An Emergency Response Plan will be in place to provide rapid and competent response to incidents that may occur. Continual employee and contractor training will be foremost in the Emergency Response Plan. Rapid site response to fire, medical emergencies, hydrocarbon spills, and natural incidents (e.g., extreme weather events) will be fundamental to the Emergency Response Plan. The plan will be developed in conjunction with local and regional first responders including fire, medical, and hazardous materials response agencies.

Once the harvest site has been drained, there is an increased risk of fire during operations. A peat fire is one of the primary hazards during peat harvesting at all sites and fire prevention is a top priority for Berger. Detailed emergency procedures will be regularly updated and all operation personnel will be adequately trained in emergency protocols in case of fire. A key component of Berger's Emergency Response Plan and Safety Program will be to establish a relationship with the surrounding fire services and emergency responders. Firefighting equipment (i.e., water tank wagon with pump, fire extinguishers, and shovels) will be regularly maintained and readily available on site. Sedimentation ponds will be used as a water reserve; however, if necessary, additional reserves of water will be created or sourced. Available water sources will be indicated on a site map posted in the site office and distributed to fire service providers and emergency responders. All field operations will be halted during when strong winds are combined with dry ground conditions, to reduce the risk of peat fires spreading uncontrollably.

Spill response procedures will be developed prior to construction and operation. Appropriate spill response materials (e.g., absorbent pads or booms) and equipment will be located on-site at strategic locations. Employees will be trained to implement spill response procedures.

2.8 Ancillary Projects

During the preliminary stages of the Project it is expected that peat will be transported to an existing processing and packaging facility in Saskatchewan that is owned and operated by another peat producer or to Berger's existing facility in Hadashville, Manitoba. However, once the Project is fully operational Berger intends to establish a processing and packaging facility will be required in Saskatchewan. Currently, a location and schedule has not been determined for the processing and packaging facility; as such, it has not been included as part of the scope

of this Project. Once a decision has been made on the location and additional details are available the appropriate regulatory permits and approvals will be obtained prior to construction of the facility.

It is anticipated that the processing and packaging facility would be located in an area that has been previously disturbed, is close to existing roads and other utilities, and would avoid sensitive areas such as native prairie, and wetlands. The facility would include a processing building, office, loading area, maintenance building, parking and storage area for processed and packaged peat product.

3.0 DESCRIPTION OF THE ENVIRONMENT

3.1 Physiography

The Big River bog is located in the Clarke Lake Plain Landscape Area of the Mid-Boreal Upland Ecoregion within the Boreal Plain Ecozone (Acton et al. 1998). The Boreal Plain Ecozone in Saskatchewan extends in a band from the Precambrian Shield south to the aspen parkland and is dominated by northern boreal forest. It is an area of level to gently rolling plain based on sedimentary rock and covered by thick glacial deposits, interspersed by lakes and glacial kettles. The Mid-Boreal Upland Ecoregion has uplands with hummocky morainal landscapes surrounded by adjacent plains dominated by level glaciofluvial and glaciolacustrine deposits with wetlands and peatlands. Soils in this ecozone and ecoregion are dominantly Luvisolic, with Brunisolic soils in higher elevations and Organic soils or peatlands in lower elevations. Organic soils and peatlands are typically found in low-lying areas where drainage is restricted. Peatlands are found throughout the ecozone especially within the mid-boreal ecoregions. The Clarke lake Plain Landscape Area is an extensive area of low relief of which approximately 40% is peatlands, and 60% is gently undulating underlain by glacial till.

3.2 Climate

The climate of the Boreal Plain Ecozone is humid continental at lower elevations in the southern part, and exhibits more subarctic climate conditions at higher elevations in the south and throughout the northern part. The Mid-Boreal Upland Ecoregion has a subarctic climate and is characterized by cold winters and short, warm summers. Maximum precipitation in this area usually occurs from May to September. Mean annual temperatures in this area are near freezing. The summers are cool and short, having an average frost-free period of 114 days and 1,395 degree-days above 5 degrees Celsius (°C) (Acton et al. 1998).

3.3 Air and Noise

Canada has recently shifted towards an airshed approach to assessing regional air quality. To align provincial air quality monitoring with the federal air quality management system, Saskatchewan has created a number of regional airsheds whose air quality is monitored by a network of measurement stations maintained by a local airshed association. The Big River bog is located in the Boreal Air Zone; however, the management of this zone is not yet active. The nearest active management air zone is the Western Yellowhead Air Management Zone (WYAMZ[1]) that extends from Wakaw and Manitou Beach in the east, to the Alberta border in the west. The WYAMZ extends from Kyle, just north of Swift Current in the south, to Meadow Lake Provincial Park in the north. There are six active air quality monitoring stations in the airshed, the closest being the Meadow Lake Station, which measures

[1] http://www.wyamz.ca/home/index.php

oxides of nitrogen (NO, NO_2 and NO_x), ozone (O_3) and particulate matter smaller than 2.5 micrometers in aerodynamic diameter ($PM_{2.5}$).

Historical background air quality in north-central Saskatchewan has been measured by the MOE and results are tabulated for use by air quality professionals in the Saskatchewan Air Quality Modelling Guideline (MOE 2012). Background concentrations of criteria air contaminants in north-central Saskatchewan are summarized in Table 1. Emissions of criteria air contaminants (CACs) that can affect air quality are regulated through compliance with the Saskatchewan Ambient Air Quality Standards (SAAQS) (SAAQS 1996).

Table 1: Summary of Background Concentrations (μg/m^3) of Criteria Air Contaminants

Criteria Air Contaminant	Averaging Period	Percentile	North Central Background
Carbon monoxide (CO)	1-hour	90th	572[(a)]
	8-hour	90th	572[(a)]
Nitrogen dioxide (NO_2)	1-hour	90th	32.0
	24-hour	90th	28.2
	Annual	90th	5.6
Sulfur dioxide (SO_2)	1-hour	90th	2.6
	24-hour	90th	2.6
	Annual	90th	0.0
Fine particulate matter ($PM_{2.5}$)	24-hour	90th	6.6
	Annual	90th	3.0
Particulate matter (PM_{10})	24-hour	90th	23.1[(a)]

(a) No north-central values, northern (boreal) values listed instead.

The Big River bog is located in a relatively remote area and no major industrial or residential sources exist in the immediate vicinity of the lease area. In remote areas far from human development or activities, the acoustic environment is usually dominated by natural noise sources, including:

- interactions between wind and vegetation (e.g., trees, shrubs, grass);
- birds, insects, and other wildlife; and
- moving water – for areas close to streams or lakes.

Noise levels of 40 to 50 dBA are commonly cited as values observed for streams, bird calls and wind rustling though trees (Acoustical 2012). The Big River bog is, however, located close to a secondary highway, and therefore road traffic will also influence the acoustic environment.

3.4 Hydrology

The Big River bog is located in the Beaver River watershed within the Churchill River Basin near a drainage divide with the Smoothstone River watershed within the Churchill River Basin. Based on aerial imagery from 2016, disturbance to surface hydrology by human activities is limited in the Big River bog with the majority of current land use in the area related to forestry, hunting and trapping. Highway 922 is located just west of the Big River bog. The land cover in this area is mostly forested areas and wetlands or peatlands. The Big River bog has three outflow paths: the main outflow discharges north towards Mirasty Lake and ultimately into Sled lake; a second discharges northwest across Highway 922 towards Mirasty Lake and the third discharge west into Appleby Creek and into Sled Lake (Figure 6). The discharge locations cross Highways 922 and 916 presumably through culverts.

Pre-construction surveys will be completed to obtain site-specific information regarding water levels and flow direction and volumes. As part of the exploration phase, Berger has documented site-specific information such as drainage, flow direction, and the lakes and rivers in the vicinity of the Big River bog. These data will be used to support design of drainage ditches during construction and reclamation of the peatland in the harvested area.

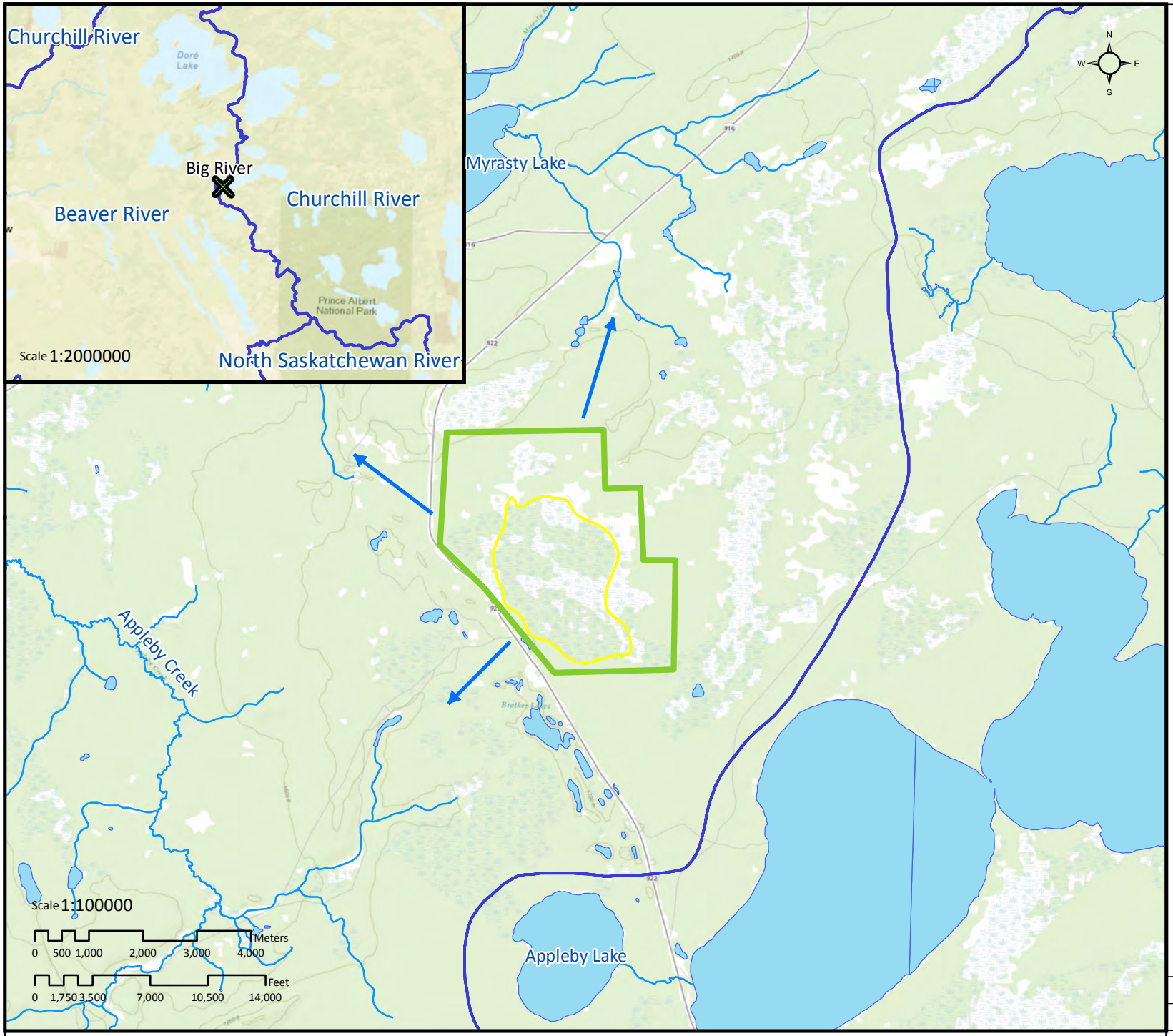
3.5 Aquatic Resources

Fish diversity is high within the Boreal Plain Ecozone, with nearly 40 fish species reported (Acton et al. 1998). In the northern portion of the Mid-Boreal Upland Ecoregion, common fish species include northern pike (*Esox lucius*), walleye (*Sander vitreus*) and lake whitefish (C*oregonus clupeaformis*), while yellow perch (*Perca flavescens*) and lake trout (*Salvelinus* namaycush) are more common further south.

As indicated in Section 3.4, surface water discharges from the Big River bog into Sled Lake, which is known to support populations of northern pike, walleye, lake whitefish, and white sucker (*Catostomus commersonii*) (Saskatchewan Parks and Renewable Resources [SPRR] 1991).

The Saskatchewan Conservation Data Centre (SKCDC) maintains a database that records the presence of sensitive species in the province (SKCDC 2016), including sensitive fish species. This includes those species listed by the Committee on the Status of Endangered Wildlife in Canada ([COSEWIC] 2016) and the Species at Risk Act ([SARA] 2016). For the purposes of this report, all species identified by the SKCDC, the COSEWIC and Schedule 1 of the *SARA* will be referred to as “listed species”. No listed fish species have been recorded within these waterbodies (SKCDC 2016).

Pre-construction surveys will be completed to obtain site-specific information regarding water quality, fish health, and fish habitat in the vicinity of the Big River bog. The field and analytical results will be compared to existing guidelines for surface water quality and drinking water for the protection of aquatic life, wildlife health and livestock watering, recreational use and aesthetics, and human health. Non-lethal sampling methods of capture (e.g., minnow traps and backpack electrofishing) will be used to determine the presence or absence of fish.



Site Boundaries

- Proposed Lease
- Harvestable Area

Hydrology

- Watercourse
- Waterbody
- Watershed
- Flow Direction

Berger

CARTOGRAPHE	Pierre-Olivier Sauvageau
DATE	2016/04/13
PROJECTION	NAD 1983 CSRS UTM Zone 13N
SOURCES	Berger (2016) ESRI (2016) Basemap GeoSask (2016)

Figure 6 - Regional Hydrology for the Big River Bog |

3.6 Vegetation

The warmer climate of the Boreal Plain Ecozone in relation to the boreal shield to the north, supports more diversity and productivity in plant communities. Forest communities dominate the Ecozone, and generally consist of mixed hardwood and coniferous stands of trembling aspen (*Populus tremuloides*), white birch (*Betula papyrifera*), balsam poplar (*Populus balsamifera*), white and black spruce (*Picea glauca* and *Picea mariana,* respectively), and jack pine (*Pinus banksiana*) species. Within the Mid-Boreal Upland Ecoregion, these species are present in varying proportions, depending on slope position and soil type.

Peatlands in the Ecoregion support open stands of black spruce and tamarack, and range in occurrence from plateau-like areas in the uplands to the flat areas in the lowlands. Approximately 40% of the Clarke Lake Plain Landscape Area is comprised of peatlands, most of which are sparsely treed fens that are associated with the Clarke Lakes (Acton et al. 1998).

The SKCDC maintains a database that records the presence of sensitive plant species in the province (SKCDC 2016). This includes those species listed by the COSEWIC (2016) and the *SARA* (2016), as well as those listed under *The Wildlife Act* (1998). For the purpose of this report, all species identified by the SKCDC, the COSEWIC, and Schedule 1 of the *SARA* will be referred to as “listed species”.

A search of the SKCDC database (SKCDC 2016) provided occurrence records of one listed plant species observed within a 10 km radius of the Big River bog lease. The large roundleaf orchid (*Platanthera oriculata*) is provincially listed as not Vulnerable/Rare to Uncommon and is commonly found in moist coniferous or mixed wood habitats.

Pre-construction surveys will be completed to obtain site-specific, descriptive information on the nature and characteristics of plant communities within all vegetation units present in the vicinity of the Big River bog; document the types and general extent of invasive plant species (weeds); and document the listed plant species and wetlands present. Adhering to MOE survey protocols as applicable, the surveys that will be completed include the following:

- listed plant surveys;
- general vegetation surveys; and
- wetland classification.

3.7 Wildlife

Similar to plant species, there is a gradual increase in wildlife species diversity and productivity within the Boreal Plain Ecozone in comparison to the Boreal Shield Ecozone to the north. Over 50 mammal species are known to occur in the Boreal Plain Ecozone; the Mid-Boreal Upland Ecoregion includes black bear (*Ursus americanus*), moose (*Alces alces*), woodland caribou (*Rangifer tarandus caribou*), and further south, gray wolf (*Canis lupus*), white-tailed deer (*Odocoileus virginianus*), mule deer (*Odocoileus hemionus*), and elk (*Cervus canadensis*). Small mammals found in the ecoregion include muskrat (*Ondatra zibethicus*), beaver (*Castor canadensis*), meadow vole (*Microtus pennsyvanicus*), northern flying squirrel (*Glaucomy sabrinus*), and least chipmunk (*Tamias minimus*) (Acton et al. 1998).

Approximately 300 avian species have been reported within the Boreal Ecozone; however, species composition is depended on specific habitat types and the time of year. Within the Mid-Boreal Upland Ecoregion, avian species diversity is relatively low compared to ecoregions in the southern extents of the ecozone, and species typically

encountered during the breeding season may include ruffed grouse (*Bonasa umbellus*), great gray owl (*Strix nebulosa*), blue jay (*Cyanocitta cristata*), sharp-shinned hawk (*Accipiter striatus*), broad-winged hawk (*Buteo playpterus*), yellow-bellied sapsucker (*Sphyrapicus varius*), sandhill crane (*Grus canadensis*), western tanager (*Piranga ludoviciana*), rose-breasted grosbeak (*Pheucticus ludovicianus*), ruby-throated hummingbird (*Archilochus colubris*), and many species of warblers. The chimney swift (*Chaetura pelagica*) and whip-poor-will (*Antrostomus vociferous*) occur in the more eastern portions of the ecoregion (Acton et al. 1998).

Amphibian and reptile species known to occur in the ecoregion include red-sided garter snake (*Thamnophis sirtalis*), Canadian toad (*Anaxyrus hemiophrys*), northern leopard frog (*Lithobates pipiens*), and boreal chorus frog (*Pseudacris maculata*) (Acton et al. 1998).

Given the limited disturbance in the vicinity of the Big River bog and the presence of a variety of native habitat including a mosaic of wetland and upland habitats, and browse and cover for ungulates, the area has high potential to provide suitable habitat for a diversity of mammal, avian, amphibian, and reptile species.

A search of the SKCDC database (SKCDC 2016) provided occurrence records of seven listed wildlife species within a 30 km radius of the Big River bog lease including six bird species, and one mammal. Rankings and/or designations for these wildlife species are provided in Table 2.

Table 2: Listed Wildlife Species Historically Observed in the Vicinity of the Big River Bog Lease Area

Common Name	Scientific Name	COSEWIC Status[(a)]	*SARA* Status[(b)]	Provincial Status[(c)]	Habitat
Birds					
double-crested cormorant	*Phalacrocorax auritus*	Not at Risk	-	S4B	Rivers and freshwater lakes.
great blue heron	*Ardea herodias*	-	-	S3B	Prefers shallow margins of marshes, ponds, lakes, and streams.
bald eagle	*Haliaeetus leucocephalus*	Not at Risk	-	S5B, S4M, S4N	Found near large water bodies such as lakes where there are tall trees near the shore for nesting and roosting.
Forster's tern	*Sterna forsteri*	Data Deficient	-	S4B	Breeding habitat is primarily fresh, brackish, and saltwater marshes, including marshy borders of lakes, islands or streams.
barn swallow	*Hirundo rustica*	Threatened	No Status	S5B, S5M	Nesting sites include buildings, bridges, and mobile structures such as ferries and farm equipment.
common nighthawk	*Chordeiles minor*	Threatened	Threatened – Schedule 1	S4B, S4M	Found year-round in open or semi-open habitats, such as forest clearings, meadows, badlands, lakeshores, gravel pits, and rooftops.

Table 2: Listed Wildlife Species Historically Observed in the Vicinity of the Big River Bog Lease Area

Common Name	Scientific Name	COSEWIC Status[a]	*SARA* Status[b]	Provincial Status[c]	Habitat
Mammals					
woodland caribou	*Rangifer tarandus caribou*	Threatened	Threatened – Schedule 1	S3	In winter the species uses mature and old-growth coniferous forests containing large quantities of tree-inhabiting lichens and generally associated with marshes, bogs, lakes, and rivers. In summer, they occasionally feed in young stands after fire or logging. The species shows preference for peatlands but avoids clear cuts, shrub-rich habitat, and aspen-poplar dominated sites.

[a] COSEWIC 2016
[b] SARA 2016; Government of Canada 2016; Smith 2001; Godrey 1986; McNicholl et al. 2001.
[c] Sources include: SKCDC 2016

Provincial Rank Definitions (SKCDC 2016)

S3 Vulnerable/Rare to uncommon – at moderate risk of extinction or extirpation due to a restricted range, relatively few populations, recent and widespread declines, threats, or other factors;
S4 Apparently secure - uncommon but not rare; some cause for long- term concern due to declines or other factors;
S5 Secure/Common - demonstrably secure under present conditions; widespread and abundant; low threat level.
B – for a migratory species, applies to the breeding population in the province.
M – for a migratory species, applies to the transient (migrant) population in the province.
N – for a migratory species, applies to the non-breeding population in the province.

Fourteen listed wildlife including nine birds, four mammals, and one amphibian have historical breeding ranges that overlap with the Big River bog lease area (Table 3). No federally listed plant species have historical ranges overlapping the Big River bog lease area.

Table 3: Listed Wildlife Species with Potential to Occur Based in the Vicinity of the Big River Bog Lease Area Based on Historical Range

Common Name	Scientific Name	COSEWIC Status[a]	*SARA* Status[b]	Provincial Status[c]	Habitat	Potential for Occurrence in the Lease Area
northern leopard frog	*Lithobates pipiens*	Special Concern	Special Concern – Schedule 1	S3	Inhabits scattered, permanent, small water bodies with emergent vegetation in the spring for breeding, and moves out to the permanent wet areas adjacent to the breeding sites in summer (Alberta Fish and Wildlife 1991; Alberta Sustainable Resource Development 2003).	Moderate to High - the region contains many wetlands of varying permanency suitable for breeding and overwintering.
bank swallow	Riparia riparia	Threatened	No Status	S5B,S5M	Bank swallows nest in a variety of natural and man-made sites with vertical banks (COSEWIC 2013a). Nesting sites can include riverbanks, lack and ocean cliffs, gravel pits, road and railway cuts, and soil stock piles.	Low – potential habitat is limited in the lease area; the species is a confirmed breeder in the map sheet south of the lease (Smith 1996).
barn swallow	*Hirundo rustica*	Threatened	No Status	S5B, S5M	Nesting sites include buildings, bridges, and mobile structures such as ferries and farm equipment (Smith 1996).	High –the species is recorded as a confirmed breeder in the lease area and has been historically recorded in the region (Smith 1996).

Table 3: Listed Wildlife Species with Potential to Occur Based in the Vicinity of the Big River Bog Lease Area Based on Historical Range

Common Name	Scientific Name	COSEWIC Status[a]	*SARA* Status[b]	Provincial Status[c]	Habitat	Potential for Occurrence in the Lease Area
Canada warbler	*Cardellina canadensis*	Threatened	Threatened – Schedule 1	S5B	Nesting habitat consists of riparian willow and alder shrubbery (Smith 1996).	Moderate – the species prefers riparian areas which are found in the lease area and is a possible breeder in the area (Smith 1996).
common nighthawk	*Chordeiles minor*	Threatened	Threatened – Schedule 1	S4B, S4M	Forages in the air over city or wilderness. Roosts in trees in open woodlands, fence posts in open areas or on the ground. Nests on the ground in woodland openings and clearings, natural open areas, burnt lands, flat tops of buildings (Godfrey 1986; Smith 1996).	Moderate - the species is documented as a probable breeder in the lease area (Smith 1996).
horned grebe	*Podiceps auritus*	Special Concern	No Status	S5B	This species prefers small waterbodies (slough, ponds, and dugout) with extensive marshy areas.	Low - species recorded as a probable breeder south of the lease area (Smith 1996).
olive-sided flycatcher	*Contopus cooperi*	Threatened	Threatened – Schedule 1	S4B, S4M	Nesting habitat includes many forest types with mixed age stands with openings and tall snags	Moderate – the species is recorded as a probable breeder in the lease area (Smith 1996).
rusty blackbird	*Euphagnus carolinus*	Special Concern	Special Concern – Schedule 1	S4B	Rusty blackbirds typically prefer wet woods and tall shrubbery around pools of water (Godfrey 1986). It is a fairly common resident of the bogs and fens of the north, as they nest in trees generally near standing water (Godfrey 1986; Smith 1996).	Moderate - species recorded as a winter resident in the lease area (Smith 1996).
short-eared owl	*Asio flammeus*	Special Concern	Special Concern – Schedule 1	S3B, S2N	Short-eared owls typically prefer large patches of tall, open grassland and hay field areas. (Wiggins et al. 2006).	Low – species has been recorded as a possible breeder south of the lease; however, suitable breeding habitat is limited in the vicinity of the lease (Smith 1996).
western grebe	*Aechmophorus occidentalis*	Special Concern	No Status	S5B	Western grebes breed in freshwater lakes and marshes that have large areas of open water bordered by emergent vegetation (Storer and Nuechterlein 1992).	Moderate – confirmed breeder within the vicinity of the lease (Smith 1996).
yellow rail	*Coturnicops noveboracensis*	Special Concern	Special Concern – Schedule 1	S3B, S2M	Typically found nesting in marshes dominated by sedges, grasses, and rushes where there is little or no standing water (generally 0.0 cm to 12.0 cm water depth) and where the substrate remains saturated throughout the summer (COSEWIC 2009).	Low - suitable breeding habitat is limited in the vicinity of the lease (Smith 1996).

Table 3: Listed Wildlife Species with Potential to Occur Based in the Vicinity of the Big River Bog Lease Area Based on Historical Range

Common Name	Scientific Name	COSEWIC Status[a]	*SARA* Status[b]	Provincial Status[c]	Habitat	Potential for Occurrence in the Lease Area
little brown myotis	*Myotis lucifugus*	Endangered	Endangered – Schedule 1	S4B, S4N	Both the little brown myotis and the northern myotis require hibernacula (e.g., caves or buildings) for overwintering, and summer foraging areas with structures for roosting and maternal colonies (e.g., trees, rock crevices, buildings, bat houses) (COSEWIC 2013b).	Moderate – suitable habitat is available within the lease area.
northern myotis	*Myotis septentrionalis*	Endangered	Endangered – Schedule 1	S3B		
wolverine	*Gulo gulo*	Special Concern	No Status	S3	Wolverine habitat ranges from forested areas, alpine tundra of the western mountain ranges, and arctic tundra, particularly in ecologically intact areas with an abundant variety of prey and other carnivore species (COSEWIC 2014).	Moderate – suitable habitat is available within the lease area.
woodland caribou	*Rangifer tarandus caribou*	Threatened	Threatened – Schedule 1	S3	In winter the species uses mature and old-growth coniferous forests containing large quantities of tree-inhabiting lichens and generally associated with marshes, bogs, lakes, and rivers. In summer, they occasionally feed in young stands after fire or logging. The species shows preference for peatlands but avoids clear cuts, shrub-rich habitat, and aspen-poplar dominated sites.	Moderate to High – the species shows preference for peatlands.

[a] COSEWIC (2016)

[b] SKCDC (2016)

[c] SKCDC 2016

Provincial Rank Definitions (SKCDC 2016)

S1 Critically Imperiled/Extremely Rare – At very high risk of extinction or extirpation due to extreme rarity, very steep declines, high threat level, or other factors;

S2 Imperiled/Very Rare – At high risk of extinction or extirpation due to a very restricted range, very few populations, steep declines, threats or other factors;

S3 Vulnerable/Rare to uncommon – at moderate risk of extinction or extirpation due to a restricted range, relatively few populations, recent and widespread declines, threats, or other factors;

S4 Apparently secure - uncommon but not rare; some cause for long- term concern due to declines or other factors;

S5 Secure/Common - demonstrably secure under present conditions; widespread and abundant; low threat level.

B – for a migratory species, applies to the breeding population in the province.

M – for a migratory species, applies to the transient (migrant) population in the province.

N – for a migratory species, applies to the non-breeding population in the province.

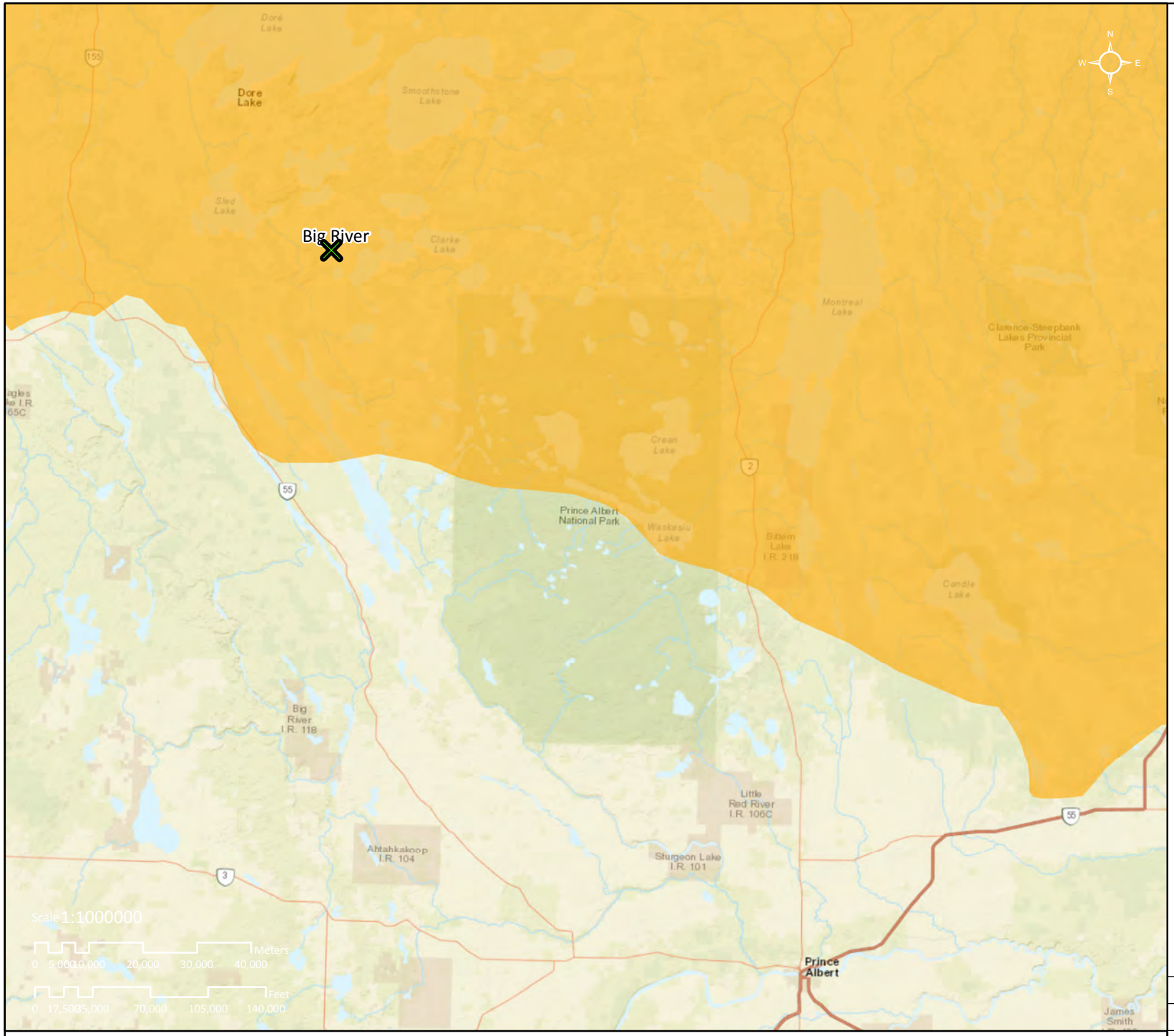
As indicated in Table 3, woodland caribou (*Rangifer tarandus caribou*) is designated as threatened by both COSEWIC and SARA and has a provincial ranking of S3 (rare/uncommon). The Big River bog is located within an area designated as Critical Habitat for Boreal Caribou in Canada as identified in the *Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal population, in Canada- 2012* (Environment Canada 2012) (Figure 7). The federal woodland caribou recovery strategy was released in 2012 with the goal of achieving, to the extent possible, self-sustaining local populations in all woodland caribou ranges throughout Canada (Environment Canada 2012). Specifically, the Big River bog is located within the Boreal Plain SK2 Central woodland caribou range. Management for woodland caribou through habitat will be guided by “range plans” of which the first is underway in the Boreal Plain SK2 Central range. These plans will address how the province meets the federally prompted goal of attaining and maintaining a minimum undisturbed habitat of 65% (MOE 2015).

A Migratory Bird Concentration Site (MBCS) is located approximately 25 km southeast of the Big River bog lease area. The MBCS represents important breeding, moulting, and staging sites for migratory birds; however, the Big River bog is located outside of the recommended setback (i.e., 250 m from all Project activity during peak use) from this area (SKCDC 2016). The sensitive breeding periods vary for the species listed; however, for most migratory birds, the nesting and breeding season extends from April 15 to August 31 (Environment Canada 2014).

Pre-construction surveys will be completed to obtain site-specific, descriptive information on wildlife species and to describe habitat features that are important to wildlife in the Big River bog lease area. Adhering to MOE survey protocols as applicable, the baseline surveys that will be completed include the following:

- amphibian surveys;
- raptor survey;
- songbird surveys; and
- yellow rail surveys.

Based on discussions with the MOE Fish and Wildlife Branch on March 14, 2016 current provincially available data on woodland caribou and moose occurrence and potential habitat in the vicinity of the Big River bog will be available for use. This data will be obtained from the Ministry of Environment Fish and Wildlife Branch to support the preparation of a Woodland Caribou Offsetting and Monitoring Plan. As agreed with the MOE Fish and Wildlife Branch, aerial surveys are not required for Big River bog.



Woodland Caribou

Critical Habitat Boundary

Berger

CARTOGRAPHER	Pierre-Olivier Sauvageau
DATE	2016/04/13
PROJECTION	NAD 1983 CSRS UTM Zone 13N
SOURCES	Berger (2016) ESRI (2016) Basemap GeoSask (2016)

Figure 7 - Location of Big River Bog within the Critical Habitat Range for Boreal Caribou |

3.8 Heritage Resources

In Saskatchewan, a heritage resource is broadly defined as any object that is of interest for its architectural, historical, cultural, environmental, archaeological, paleontological, aesthetic, or scientific value. Heritage resources are property of the Provincial Crown, and as such, are protected under the *Heritage Property Act* (1979-80).

The Saskatchewan Ministry of Parks, Culture and Sport - Heritage Conservation Branch (Heritage Conservation Branch) has identified two primary factors for determining if a Heritage Resources Impact Assessment is required for a project as per Section 63 of *The Heritage Property Act*. This includes the presence of previously recorded heritage resources and the archaeological sensitivity or potential for undocumented heritage resources to be present in the Big River bog lease area. Secondary factors include the nature and extent of previous land disturbance (including cultivation), and nature and scope of proposed land alteration.

For northern Saskatchewan (northern parklands, boreal forest), the Heritage Conservation Branch considers lands to be heritage sensitive if they are:

- within 500 m of a Site of a Special Nature (per s.64 of *The Heritage Property Act*), or other previously recorded site(s), unless it is shown to be of low heritage significance;
- along dry, upland margins of major bog or fen (>1 km in length);
- within 250 m of watercourses and lakes (>1 km in length);
- within 50 m of historic trails;
- within 250 m of strandlines; and
- on escarpments (defined by 2 or more contour intervals within 200 m), prominent uplands, and hills/ridges (including eskers) within 500 m of a water source.

The archaeological sites database maintained by the Heritage Conservation Branch was consulted to identify any know heritage resources listed in the lease area. The results indicate that only one heritage resource, GcNu-1, has been recorded on the same NTS map sheet (73J/6) as the Big River bog. GcNu-1 is a historic cemetery located on the shore of Sled Lake, approximately 17 km to the northwest.

A description of the proposed Project was submitted to the Heritage Conservation Branch and reviewed in accordance with the criteria outlined above to determine the potential to impact known heritage resources and/or heritage sensitive lands. The Heritage Conservation Branch (File No. 16-637) determined that there are no known heritage resources in conflict and that harvesting activities will occur on lands that have been deemed as low heritage potential. As a result, a Heritage Resource Impact Assessment is not required and there are no heritage concerns with the Project proceeding as planned (Appendix A).

3.9 Socio-economic Environment

Approximately 25% of the Boreal Plain Ecozone, along its southern boundary in Saskatchewan, is used for agricultural production. Approximately 16% of the land is cultivated, along the southern margins which includes grain production, hay crops, beekeeping and livestock management. Forestry operations harvest large volumes

of wood for pulp and paper production. Land use in the area include forest-based hunting, commercial and sport fishing, water-oriented recreation and trapping.

4.0 PROJECT INTERACTIONS AND MITIGATION

The purpose of this section is to determine whether the Project will cause a change that will have an effect on environmental or socio-economic components after the application of mitigation. The approach includes the identification of potential environmental interactions and links them to Project components and activities that can affect the biophysical and socio-economic environments. Mitigations are incorporated into the Project planning and can include design considerations and environmental best practices, management policies and procedures, and social programs. Mitigation is developed through an iterative process, and are used to remove the interaction, limit (mitigate) effects of the Project or increase benefits. Each potential interaction is evaluated and mitigation identified that can be developed and incorporated to remove the interaction or limit the potential environmental effects.

Key potential environmental interactions related to the proposed Project were identified from a number of sources including:

- a review of the Project description (Section 2.0);
- scientific knowledge and experience with other peat mines in Saskatchewan;
- professional experience and judgment of potential interactions between the Project components and the socio-economic characteristics and structures of the regional and local communities; and
- issues identified by MOE for other proposed peat harvest projects.

The following sections summarize the key environmental interactions identified for the Project, the potential effect, and mitigation incorporated into the Project to eliminate or reduce potential effects.

4.1 Air Quality

The construction, operation, and closure of the Project will result in changes to air quality from air and dust emissions. Potential pathways through which the Project can modify air quality in the local receiving environment include emissions from mobile equipment and fugitive dust from access roads. Wind erosion of stockpiles of loose peat can also increase dust emissions in the surrounding area. Changes in ambient air quality and deposition may have indirect effects on surface water quality. Air and dust emissions may also affect the quality of vegetation and wildlife habitat, which could subsequently lead to changes in wildlife populations. Mitigation will be incorporated during the design of the Project to limit potential effects associated with air emissions. For example, to reduce the emission of peat particles in the air, vacuum harvesters are equipped with dust collectors. In addition, stockpiles will also be covered with large reusable plastic sheets to reduce wind erosion. Dust suppression measures such as watering, will be carried out as necessary to limit fugitive road dust and vehicles and equipment will be inspected regularly and maintained to limit air emissions. Compliance with regulatory emission requirements will be maintained.

The release of greenhouse gas emissions associated with harvesting of peat may also result in changes to the atmospheric environment. After being drained for harvesting, aerobic decomposition of peat above the new water table emits large amounts of carbon dioxide (CO_2) and the peatland becomes a source of carbon emissions to the

atmosphere. Ditches and other areas of standing water may also become a source of methane (CH_4) emissions, likely resulting in low but non-zero methane emissions from the Project.

4.2 Hydrology

Harvesting of the peat resource will require the development of drainage ditches and the removal of water from the Big River bog. The drained water will be transported using the drainage ditches to the sediment ponds and then into a natural buffer/filtration zone before discharging into surrounding waterbodies or peatlands. The proposed perimeter drain network construction for the Project is expected to lower the water table within the peatland and may affect the storage of water in, and flows from, the peatland. To help restore natural hydrologic conditions the harvested fields are flattened with the profiler to help the water reach the surface equally on the land and drainages are blocked after the Project is completed. The final reclamation goals for the site, including restoration of natural hydrologic conditions will be determined as part of the site specific Closure and Reclamation Plan.

4.3 Aquatic Resources

As mentioned above, the drained water from the bog will be discharged into surrounding waterbodies or peatlands, which has the potential to adversely affect aquatic habitat due to changes in surface water quality. Mitigation implemented to limit effects to surface water quality includes the construction of sedimentation ponds and release of discharge water to nearby peatlands. The sedimentation ponds constructed at the discharge locations will facilitate the removal of sediments from drainage water prior to release. In addition, peat drainage is proposed to be discharged to an adjacent natural vegetated area that is expected to provide natural filtration for loose organic material released with discharged water from the drainage network. Implementation of appropriate mitigation (i.e., site water management and erosion control practices) is expected to limit changes to surface water quality and potential effects to aquatic resources.

4.4 Vegetation

Project effects on plant communities, including traditional use plants and listed plant species, are expected to be associated primarily with direct disturbance from the Project footprint. In addition, the establishment of a network of drainage ditches throughout the Project footprint may cause changes to the surrounding wetland ecosystem. Wetlands represent unique habitats that support specific plant species and that are used by various wildlife species. Disturbance of vegetation will be limited to the minimum extent necessary for construction and operation of the Project. Progressive reclamation is expected to occur during operations and is anticipated to limit incremental effects on vegetation. Once a peat field has been harvested to its final depth, reclamation activities for the field will be completed. Closure objectives aim to reduce the lasting environmental effects of the Project to the extent practical and allow disturbed areas to return to equivalent capability and structure as the surrounding environment and time period.

4.5 Wildlife

Project effects on wildlife abundance and distribution are expected to be associated primarily with loss alteration, and fragmentation of habitat from the Project footprint. Decreases in habitat area can directly influence wildlife population size by reducing the carrying capacity of the landscape. Sensory disturbance (e.g., presence of people, lights, smells, and noise) can also change the quality of wildlife habitat and alter wildlife movement and behaviour. The Project is located within the Boreal Plain (SK2 Central) woodland caribou range, and within the Boreal Forest

Wildlife Management Zone 66. Data gathered from the aerial surveys will also be used to support the preparation of a Woodland Caribou Offsetting and Monitoring Plan. Mitigation implemented to limit effects on moose and other wildlife species may include gating of the access road to discourage public access and placement of signs along the access road to identify industrial activity and warn of the dangers of discharging firearms within the road corridor. In addition, trees around the perimeter of the peatland and in the non-harvested area of the peatland will be left standing and all wetlands and natural drainage areas that may have been disturbed will be rehabilitated to the pre-disturbed condition whenever possible.

Site preparation and construction can result in the destruction of nests and eggs of migratory birds, and activities associated with heavy equipment can result in the disturbance of birds and waterfowl during nesting and rearing periods. Mitigation implemented to reduce effects to migratory birds include clearing and grubbing of vegetation during the winter period and implementation of a Wildlife and Wildlife Habitat Protection Plan.

Progressive reclamation is expected to occur during operations and is anticipated to limit incremental effects on wildlife. Once a peat field has been harvested to its final depth, reclamation activities for the field will be completed. Closure objectives aim to reduce the lasting environmental effects of the Project to the extent practical and allow disturbed areas to return to equivalent capability and structure as the surrounding environment and time period.

4.6 Heritage Resources

Project effects on potential heritage resources and/or heritage sensitive lands are associated primarily with direct disturbance from construction and operation activities. In Saskatchewan, Heritage Resources include all historic and pre-contact archaeological sites, architecturally significant structures, and paleontological resources. Heritage Resources are important because they reveal past and present land use, cultural identity, and relationships with other cultures and the social and biophysical environments. Historic resources represent archival information from the past and the Project may result in the alteration or loss of such information. Heritage Resources are also property of the Provincial Crown and are protected under *The Heritage Property Act*. Prior to construction, a Heritage Resource Impact Assessment will be completed for the Project as per the screening letter issued by the Heritage Conservation Branch (Appendix A).

4.7 Socio-economic Environment

Potential interactions with the socio-economic environment includes effects to employment and economy, community services and infrastructure, and land and resource use in the area surrounding the Project. Project employment and expenditures (i.e., purchase of goods and services) are the key drivers of economic effects. It is expected that the Project would result in positive effects directly by hiring a workforce, as well as indirectly by buying goods and services. The Project would also contribute to government revenues, which are key to funding community services and infrastructure. However, the Project also has the potential to negatively affect community services and infrastructure through increased traffic on individual roads used to access the Project. Land use within the area includes a mixture of resource extraction and recreation including forestry, agriculture, hunting, trapping, fishing, outfitting, snowmobiling, camping and recreational cabins. The Project has the potential to result in both negative and positive effects on land use. Mitigation implemented to eliminate or limit potential adverse effects to infrastructure and land use includes provisions that Project-related traffic will abide by all traffic laws and regulations and acquisition of all required permits and licenses (e.g., road use agreements) prior to construction.

5.0 MONITORING

Environmental monitoring programs are designed to measure the actual effects of the Project, test predictions and effectiveness of mitigation, and identify unanticipated effects. Specific monitoring activities and programs to be implemented as part of the Project are discussed in Section 2.7.1. Berger's monitoring and follow-up programs will be developed prior to the start of construction and will include recommendations made by regulatory agencies and stakeholders, as appropriate. Monitoring and follow-up programs will be developed by Berger to comply with regulatory requirements, permits, and corporate commitments. Typically, monitoring includes one or more of the following categories, which may be applied during the development of the Project:

- Compliance Inspections – monitoring activities, procedures and programs undertaken to confirm the implementation of approved design standards, mitigation and conditions of approval, and company commitments (e.g., inspecting the installation of a silt fence).
- Environmental Monitoring – monitoring to track conditions or issues during the development lifespan of the Project, and to subsequently provide for the implementation of adaptive management (e.g., monitoring of discharge from sediment ponds).
- Follow-up Monitoring – programs designed to test the accuracy of effects predictions, reduce or address uncertainties, determine the effectiveness of mitigation, or provide appropriate feedback to operations for modifying or adopting new mitigation designs, policies and practices (e.g., wildlife effects monitoring). Results from these programs can be used to increase the certainty of effect predictions in future environmental assessments.

The goals of a monitoring program are to confirm that effective practices and controls are in place to reduce the potential for environmental effects during all phases of Project development and to provide clearly defined action plans and emergency response procedures to account for human and environmental health and safety. If monitoring detects effects that are different from the predicted effects or detects the need for improved or modified design features, then adaptive management will be implemented. This may include increased monitoring, changes in monitoring programs, or additional mitigation.

The monitoring programs will be designed to maintain the continued compliance of the Project with environmental requirements set out in this document and applicable legislation during construction and operation. Pertinent legislation, regulations, industry standards, documents, and legislative guides will be used in the development of the monitoring program. Additional monitoring may be identified as part of the permits and applications, which will be obtained for the Project prior to construction.

6.0 ENGAGEMENT

Berger recognises the importance of meaningful engagement with stakeholders to identify local issues that may be related to or have an effect on the proposed Project. Engagement is a valuable aspect of Berger's planning and development phase as it provides an opportunity for Berger to achieve the following objectives:

- foster an understanding of the Project and provide an opportunity for people in the area to show support and/or identify concerns about the potential effects of the Project through public notification and involvement;
- provide an opportunity to build relationships with the nearest residents to the project, and discuss and incorporate local concerns into Project planning; and

- respond to and documenting public issues in a timely manner.

As a new company working in Saskatchewan, Berger also recognises the importance of establishing a local presence and building and maintaining a positing relationship with the communities surrounding the Project. Berger is in the process of developing an engagement plan for the Project. The high level approach to this plan is described below. Throughout this document, the "public" refers to all stakeholders: landowners, municipal officials, special interest groups and others. A specific focused First Nations and Métis Engagement program is also described.

6.1 Engagement Approach

The engagement approach for the Project encompasses several elements: local communities (including interested members of the public), First Nations and Métis Communities, and regulatory agencies. The approach described here outlines how Berger plans to engage with these stakeholders and groups as part of the planning and development phase of the Project.

Stakeholder mapping and risk analysis will be used to initiate the engagement process by identifying and targeting the different stakeholders in the vicinity of the Project who may be interested in the Project. Once potential stakeholders have been identified, Berger will begin to reach out to communicate information about Berger and the proposed Project, and to gather feedback about the Project and on other people or groups that should be contacted.

6.1.1 Public Engagement

An effective approach to providing information to the public is through the use of community information sessions. Following submission of the Technical Proposal, Berger plans to hold community information sessions (an open house style meeting) within the community or adjacent communities, and invite the public and regulators. The community information session will explain the Project, outline the pre-construction surveys to be completed, and document public feedback and concerns. As the Project evolves and more information is available about the Project, additional community information sessions will be planned.

6.1.2 First Nations and Métis Community Engagement

While there are no First Nations or Métis communities identified in the immediate vicinity of the Project, there are a number of First Nations within 100 km of the Project. The purpose of the First Nations and Métis Community engagement is to provide a solid foundation for the communication and engagement that will occur throughout Project development, identify any specific issues that will be of interest locally, and establish relationships with First Nations and Métis leadership in the vicinity of the Project. The objectives of the First Nations and Métis community engagement activities include the following:

- lay a solid foundation for the First Nations and Métis community engagement that will occur throughout the Project development;
- identify any specific issues early in the process that will be of interest locally; and
- establish relationships with First Nations and Métis leadership in the vicinity of the Project.

Following initial contact with First Nations and Métis communicates to provide introductory information about Berger and the Big River bog Project, Berger will determine the extent and scope of the detailed First Nations and Métis community engagement plan.

6.1.3 Regulatory Engagement

Peat harvesting is a growing industry in Saskatchewan and Berger is a new proponent in the province. It is an important component of the engagement approach that Berger communicate with the regulatory agencies to build a positive working relationship. It is Berger's intent to continue to communicate with regulatory agencies to provide updates on the status of the Project, and to clarify the needs and expectations throughout the Project development and the requirements for Crown land dispositions in Saskatchewan. It is anticipated that engagement with the regulatory agencies will occur through face-to-face meetings, telephone calls and email correspondence as appropriate.

6.2 Preliminary Engagement Activities

The following section describes the engagement activities that Berger has completed to date.

6.2.1 Public Engagement

In October 2015, Berger met the owners of the Clarke Lake Lodge located 10 km from the Big River bog. Representatives from Berger stayed at the lodge while completing exploration activities in 2014 and 2015; and therefore, used the opportunity to describe the proposed Project (e.g., exploration that may result in a peat harvesting operation). This was of particular interest to the owners as they also have an outfitting license for this area. At the time, the owners of the Clarke Lake Lodge did not have any concerns with Berger's exploration activities or the proposed Project.

6.2.2 Regulatory Agencies

Given that Berger is relatively new to the province, it was recognized early on that it would be important to establish and maintain a working relationship with the provincial regulatory agencies that would be involved in issuing the required approvals and permits for the Project. As such, Berger has had introductory meetings and communication with representatives from the Ministry of Environment (Table 4). Going forward, Berger plans to continue to engage with the regulatory agencies as appropriate.

Table 4: Regulatory Engagement Completed to Date

Date	Regulatory Agency	Representative		Purpose of Meeting
		Name	Title	
October 24, 2012	Ministry of Environment	Tom Maher	Senior Environmental Assessment Administrator	To discuss the Crown land lease application process in Saskatchewan and identify any terrestrial or socio-economic constraints related to peat exploration activities.
		Gigi Pittoello	Habitat Ecologist, Fish and Wildlife Branch	
		Jenna Mouck	Manager, Environmental Assessment Branch	
		Greg Hayes	Manager, Lands Branch	
		Tim Trottier	Wildlife Ecologist, Fish and Wildlife Branch	
		Ryan Mulligan	Ecological Protection Specialist, Lands Branch	
		Jamie Seiferling	Crown Land Manager(eastern part of Saskatchewan)	
		Kevin Krakowski	Crown Land Manager(northern part of Saskatchewan)	
		Corinne Kulyk	Crown Land Manager(central part of Saskatchewan)	
February 3, 2016	Ministry of Environment	Erika Ritchie	Assistant Deputy Minister – Environmental Protection and Audit Division	To gain clarity with respect to the regulatory process (e.g., environmental assessment process) and decision making criteria for Crown land dispositions associated with the allocation of peat harvesting lands.
		Kevin Murphy	Assistant Deputy Minister – Resource Management and Compliance Division	
		Sharla Hordenchuck	Director – Environmental Assessment	
		Todd Olexson	Acting Director – Lands (participated by conference call)	
		Megan Tyman	Golder Associates Ltd., attended on behalf of Berger Peat Moss	
		Ron Barsi	Golder Associates Ltd., attended on behalf of Berger Peat Moss	
February 29, 2016	Ministry of Environment	Kevin Murphy	Assistant Deputy Minister – Resource Management and Compliance Division	To discuss a letter Berger received from the Ministry of Environment Lands Branch regarding the Crown Land disposition application for the Saskola bog and to further discuss in detail the regulatory process that would be followed for Berger's projects.
		Melissa Berger	Berger Peat Moss	
		Alexandre Brisson	Berger Peat Moss	
		Ron Barsi	Golder Associates Ltd.	
		Marci Mehl	Golder Associates Ltd.	

Table 4: Regulatory Engagement Completed to Date

Date	Regulatory Agency	Representative		Purpose of Meeting
		Name	Title	
March 14, 2016	Ministry of Environment	Tim Trottier	Wildlife Ecologist, Fish and Wildlife Branch	To discuss the permit application to conduct ungulate aerial surveys at all three of Berger's proposed project locations and determine a path forward to obtain sufficient data for each location based on existing information or the completion of aerial surveys.
		Megan Tyman	Golder Associates Ltd., on behalf of Berger Peat Moss	
		Paula Bentham	Golder Associates Ltd.	
		John Virgl	Golder Associates Ltd	
March 16, 2016	Ministry of Environment	Marci Mehl	Golder Associates Ltd., on behalf of Berger Peat Moss	To discuss the application information requirements for issuing a Crown land disposition (e.g., Peat Lease).
		Megan Tyman	Golder Associates Ltd., on behalf of Berger	To discuss the application information requirements for issuing a Crown land disposition (e.g., Peat Lease).

7.0 REFERENCES

Acoustical 2012 *Noise Level Chart*. Acoustical Solutions. 2012 Website: http://www.acousticalsolutions.com/noise-level-chart.

Acton, D.F., G.A. Padbury, and C.T. Stushnoff. 1998. The Ecoregions of Saskatchewan. Canadian Plains Research Centre, University of Regina.

Alberta Fish and Wildlife. 1991. Alberta's Threatened Wildlife. Northern Leopard Frog. Edmonton, Alberta.

Alberta Sustainable Resource Development. 2003. Status of the Northern Leopard Frog (*Lithobates pipiens*) in Alberta, Update 2003. Alberta Sustainable Resource Development, Fish and Wildlife Division, and Alberta Conservation Association. Wildlife Status Report No. 9 (Update 2003). Edmonton, Alberta. 61 pp.

Cink, Clavin L. 2002. Eastern Wip-poor-will (Antrostomus vociferus), the Birds of North America Online (A. Poole Ed.). Ithaca: Cornell Lab of Ornithology; retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/620

CCME (Canadian Council of Ministers of the Environment). 2003. Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products. Winnipeg, MB. 51 pp. Available at: http://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=61B26EE8-1. Accessed: March 9, 2016

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2007a. Assessment and Update Status Report on the Red-headed Woodpecker Melanerpes erythrocephalus in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 27 pp. Available at: http://www.sararegistry.gc.ca/status_e.cfm.

COSEWIC. 2007b. Assessment and Status report on the Chimney Swift Chaetura pelagica in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. Vii + 49 pp. Available at: http://www.sararegistry.gc.ca/status_e.cfm.

COSEWIC. 2009. Assessment and Status report on the Yellow Rail Coturnicops noveboracensis in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. Vii +32 pp. Available at: www.sararegistry.gc.ca/status/status_e.cfm.

COSEWIC. 2013a. COSEWIC assessment and status report on the Bank Swallow Riparia riparia in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. ix + 48 pp. Available at: www.registrelep-sararegistry.gc.ca/default_e.cfm.

COSEWIC. 2013b. COSEWIC assessment and status report on the Little Brown Myotis Myotis lucifugus, Northern Myotis Myotis septentrionalis and Tri-colored Bat Perimyotis subflavus in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxiv + 93 pp. Available at: www.registrelep-sararegistry.gc.ca/default_e.cfm.

COSEWIC 2014. Assessment and Status Report on the Wolverine Gulo gulo in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. Xi + 76 pp. Available at: www.sararegistry.gc.ca/status/status_e.cfm

COSEWIC. 2016. Canadian Species at Risk. Committee on the Status of Endangered Wildlife in Canada website: http://www.cosewic.gc.ca/eng/sct1/searchform_e.cfm

Environment Canada. 2012. Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal population, in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. xi + 138pp.

Environment Canada. 2014. General Nesting Periods of Migratory Birds in Canada. Available online at: http://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=4F39A78F-1. Accessed: March 10, 2016.

Godfrey, W.E. 1986. The Birds of Canada. National Museum of Canada. 595 pp.

Government of Canada. 2016. Species at Risk Public Registry: Species Profile: Caribou Boreal population. Availabe at: http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=636. Accessed: March 8, 2016.

Government of Saskatchewan. 1989. *The Hazardous Substance and Waste Dangerous Goods Regulations.* Regina, SK. 48 pp. Available at: http://www.qp.gov.sk.ca/documents/English/Regulations/Regulations/E10-2R3.pdf. Accessed: March 9, 2016.

McLaughlan, M.S., R.A. Wright, and R.D. Jiricka. 2010. Field Guide to the Ecosites of Saskatchewan's Provincial Forests. Saskatchewan Ministry of Environment, Forest Service. Prince Albert, SK. 338 pp.

McNicholl, M.K., P.E. Lowther, and J.A. Hall. 2001. Forester's Tern (Sterna forsteri). In A. Poole and F. Gill, eds. The birds of North America, No 595. The Academy of Natural Sciences, Philadelphia, and the American Ornithologists' Union, Washington D.C.

Mitchell, C. D., and M. W. Eichholz. 2010. Trumpeter Swan (Cygnus buccinator). In The Birds of North America Online, No. 105 (A. Poole, Ed.). Cornell Lab of Ornithology, Ithaca, New York.

MOE (Ministry of Environment). 2008. Guidelines for Northern Mine Decommissioning and Reclamation. November 2008. 17 pp.

MOE 2012. Saskatchewan Air Quality Modelling Guideline. Technical Resources Branch, Air Science and Monitoring Unit, Saskatchewan Ministry of Environment. March 2012. 80 pages.

MOE. 2015. Saskatchewan Wildlife Management Report 2013-2014. Fish and Wildlife Technical Report 2015-XX. 109pp

Quinty, F. and L. Rochefort. 2003. Peatland Restoration Guide, 2nd Edition. Canadian Peat Moss Association and New Brunswick Department of Natural Resources and Energy, Quebec, Quebec,106 pp.

SAAQS (Saskatchewan Ambient Air Quality Standards). 1996. Appendix of the Clean Air Regulations. C-12.1 REG.1

Saskatchewan Parks and Renewable Resources. 1991. Fish Species Distribution in Saskatchewan. Fisheries Branch. Saskatoon, Saskatchewan. 102 pp.

SKCDC (Saskatchewan Conservation Data Centre). 2016. Sensitive species website. Available at: http://gisweb1.serm.gov.sk.ca/wildlifelogin/form.asp

Smith, A.R. 1996. Atlas of Saskatchewan Birds, Special Publication No. 22. Saskatchewan Natural History Society (Nature Saskatchewan). Regina, Saskatchewan. 456pp.

Species at Risk Act. 2010. Chapter 29. Government of Canada.

Species at Risk Public Registry. 2016. A to Z Species Index. Government of Canada. Available at: http://www.sararegistry.gc.ca/sar/index/default_e.cfm.

Storer, R. W. and G. L. Nuechterlein. 1992. Western Grebe (Aechmophorus occidentalis) and Clark's Grebe (Aechmophorus clarkii) in The Birds of North America, No. 26 (A. Poole, P. Stettenheim, and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union. Available at: http://www.allaboutbirds.org/guide/Western_Grebe/lifehistory

The Heritage Property Act. 1979-80. Chapter H-2.2 of the Statutes of Saskatchewan. Government of Saskatchewan

The Wildlife Act. 1998. Chapter W-13.12. As amended by the Statutes of Saskatchewan. Government of Saskatchewan.

Water Security Agency. 2012. A Guide to Waterworks Design. Saskatchewan Ministry of Environment. Regina, SK. 34 pp. Available at: http://www.saskh2o.ca/DWBinder/EPB201.pdf. Accessed: March 9, 2016.

Wiggins, D.A., D.W. Holt, and S.M. Leasure. 2006. Short-eared Owl (Asio flammeus). The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology. Available at: http://bna.birds.cornell.edu/bna/species/062.

APPENDIX A

Heritage Conservation Branch Screening Letter

Ministry of Parks, Culture and Sport

Heritage Conservation Branch
2nd Floor, 3211 Albert Street
Regina, Saskatchewan
S4S 5W6

(306) 787-5774
nathan.friesen@gov.sk.ca

March 7, 2016

Our File: 16-637

Mr. Patrick Young
Golder Associates Ltd.
1721 8th Street East
SASKATOON SK S7H 0T4

Dear Mr. Young:

RE: Berger Peat Moss Ltd. Peat Harvesting Areas:
Big River, Prairie River and Saskola;
HERITAGE RESOURCE REVIEW

Thank you for referring this development proposal to our office for heritage resource review.

In determining the need for, and scope of, heritage resource impact assessment (HRIA) pursuant to S. 63 of *The Heritage Property Act*, the following factors were considered: the presence of previously recorded heritage sites, the area's overall heritage resource potential, the extent of previous land disturbance, and the scope of new proposed land development.

No HRIA Required - Big River Harvesting Area
There are no known archaeological sites located in potential conflict with this proposed development. The harvesting area is not located within 250 m of major water sources. As such, the heritage potential for this project is considered to be low. Accordingly, an HRIA is not required for this development.

HRIA Required - Prairie River Harvesting Area
There are no known archaeological sites located in potential conflict with this proposed development. However, this harvesting area is located within 250 m of unnamed creeks and Buckmayer Lake. As such, the heritage potential for this project is considered to be moderate to high. Accordingly, an HRIA is required only for the portions of this development that are located within 250 m of Buckmayer Lake and the unnamed creeks.

HRIA Required - Saskola Harvesting Area
There is one known archaeological site located in conflict with this proposed development, namely site FcMp-7. However, this site consists of a single artifact find and has low heritage significance. This harvesting area is located within 250 m of

unnamed creeks. As such, the heritage potential for this project is considered to be moderate to high. Accordingly, an HRIA is required only for the portions of this development that are located within 250 m of the unnamed creeks.

The HRIA study, including systematic pedestrian survey and sub-surface test exploration, is a proponent responsibility. The study will first establish the presence of heritage sites within the project area, as well as where suitable site avoidance measures (including the right-of-way relocation) may be implemented. The study will also establish the content, structure, and importance of those heritage sites located in unavoidable conflict with development. On that basis, both the need for and scope of any mitigation follow-up (including archaeological salvage excavation or other preservation action) will be determined. The HRIA must be carried out by qualified personnel under an approved investigation permit issued through this office. Normally, two days are required to process a heritage contractor's permit application.

Assuming weather conditions and surface visibility are favourable, a conventional HRIA, including routine pedestrian reconnaissance and subsurface testing, is required prior to construction. However, if field conditions are limiting (e.g. by snow cover and ground frost), a conventional HRIA may not be possible. Under these conditions, a qualified consulting archaeologist should be on-site to carefully monitor snow and topsoil stripping in all sensitive areas. Monitoring will ensure that if heritage resources are uncovered during construction, they can be immediately assessed, and, if deemed significant, any further destruction can perhaps be averted. The need for any follow-up investigation next spring (e.g. post-impact assessment, compensatory salvage, or other conservation action) will also be determined at this time.

If you have any questions regarding these projects, please do not hesitate to contact me or Jennifer Thompson at the above address or by calling 787-2848.

Sincerely,

ORIGINAL SIGNED BY

Nathan Friesen
Senior Archaeologist
Archaeological Resource Management

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

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